Research Methodology

(In 2 Volumes)

Volume I

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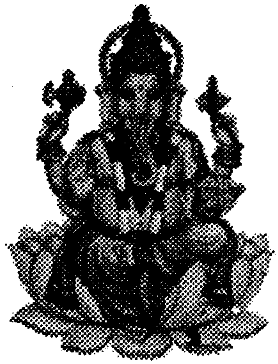

This book is dedicated to
LORD GANESHA,
the God of Wisdom and his
vehicle the Rat, master of Logic

PREFACE

The present book on "Research Methodology" has been written keeping in view the requirements of students who are persuing the Post Graduate studies in the areas of Library and Information Science and social science including sociology, psychology and anthropology of Indian universities leading to the degrees of MLIS and M.A. respectively by various disciplines. It can serve as the main book for them as the topic of the book forms one of the papers in their Masters Degree course. Sinha, the first author had the privilege of offering this paper at M.A. Sociology level in Lucknow University, Lucknow first as PG Student and then as research scholar. In Delhi University, in the Master of Library Science he had another opportunity to study this paper in the year 1970. He wrote 3 dissertations in Sociology, Library Science and at Associateship in Information Science at INSDOC, Delhi during 1977 - 79 under different eminent experts/ professors of repute. Sinha's long experience and exposure to work in a Research Laboratory for more than 3 decades had further sharpened his skills, methodology and techniques in the scientific environment.

Dr. Dhiman studied Research Methodology at MLIS and applied the same in writing his thesis which earned him the doctorate in the area of Botany and further sharpened the methodology and this technique got exposure in the library of College of Management Studies at Gurukul Kangri University, Haridwar where he had worked for about four and half years as its In-charge. He has two more dissertations to his credit; One at M.Sc. (Botany) level and another at P.G.D.C.A. (Computers).

Many good books are available in the market written by eminent authors who are teachers of the subject, but most of them are on social research. The present book shall be multifaceted book covering Social Sciences, Sciences and Technology (S&T) and the area of Library & Information Science. Dr. S.R. Ranganathan's approach to library science research and his concept of research on the structure and development of the universe of subjects and his concept of spiral of scientific method is unique as he had combined his mathematical skills in studying the scientific methods. This concept has also been explained.

In compiling this monograph, the authors have banked upon the work of different authors and their ideas have been incorporated. The authors are deeply indebted to them and profusely acknowledge their contributions/works in the course of writing this book. The authors are very much sure that the present book will be useful not only to the students of Library and Information Science leading to their Masters Degree but will be equally useful to all those students who are studying Masters Degree in Social Science viz. Sociology, Anthropology, Psychology as well as the Research Scholars engaged in their Doctoral Degree Programmes

This book is written in two volumes for the convenience of the readers; both of them can be studied independently. First volume of this book covers basic aspects of Research Methodology describing concept of research, research and theory, designing of research, formulation of research and different techniques of research, data analysis, scaling techniques and research report writing etc. Its second volume is devoted to applied aspects of Research Methodology containing chapters on different types of researches such as historical research, descriptive research and experimental methods of research, basic statistical methods and application of computers in researches and application of research techniques in different fields of study.

In the end, the authors can confidently state that this book has a wide scope in the various areas of studies. The authors are grateful to the members of their families, who bore the brunt of the time and their family activities, when the authors were busy in preparing this book. We are indebted and greatful for their moral encouragement and their affection which the authors needed psychologically, and morally. The authors shall feel grateful if a sound criticism is received to further improve the work, by the learned teachers and users of the book. Last but not the least, the authors are also greatful to Shri Sumit Sethi of Ess Ess Publications, who took pains to give this book an attractive form which is in the hands of our readers, the real critics of this book. Wishing our readers a useful reading.

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1. Theory and Methods of Social Research, by Galtung, John. London, George Allen and Unwin Ltd., 1967, 954 p.
2. Methods of Research in the Behavioural Sciences by Mc Cormic, Thomas, C. and Francis, Roy. G. New York, Harpar and Brothers, 1958, 244p.
3. Methods in Social Research, by Goode, William J. and Hatt, P.K. New York, McGraw-Hill, 1952. 378 p.
4. Methodology and Techniques of Social Research, by Bhandakar, P.L. and Willkinson, T. S. Bombay, Himalayan Publishing House, 1996. 458 p.
5. Research Methodology in Social Sciences, by Pandey, G.C. New Delhi, Anmol Publications Pvt. Ltd., 1999. 285 p.
6. Dictionaries and Encyclopedias.

CONTENTS

1

INTRODUCTION

There are many terms which are used in the areas of **Research & Development (R&D)** in any scientific activities and they carry different meanings but are sometimes used for one another. These terms are **Discovery, Invention & Research**, it will not be out of place to clarify their meanings, the help of good **Dictionaries, Encyclopaedias** will have to be taken. Let us look at their meanings from dictionaries first.

As per Oxford Advanced Learner's Dictionary of English, by AS Hornby or meanings of Discovery is "to find out", otherwise the meaning of "DIS" is taken as "NOT" or "NO" which means that anything which is not found earlier. It gives another meaning "Existing but not known" Franklin's first observation was that the lightening is electricity. Similarly, the term invention also carries the same type of meaning "creation of design" that did not exist before, as the Edison's discovery of steam engine. Research means "investigations undertaken in order to discover new facts", get additional information", it is said that research workers are examinng the people."

Sometimes, even the term explore is also used but it has a different meaning, it means to examine throughly in order to test, learn about the problem. In this way it can be observed that almost all the terms pointed out have almost the same meaning but when the team Research is used in the context of Scientific Research or

Social Research, it conveys an entirely different meanings in this context.

It will be better if it is examined in detail in terms of scientific, social science research methodology or techniques.

DEFINITION OF RESEARCH

The Webster's International Dictionary proposes a very inclusive definition of research "a careful, critical inquiry or examination in seeking facts or principles; dilligent investigation in order to ascertain something." The above definition while helpful in indicating very general way what people mean, when they talk about research is not specific and precise enough to afford us a thorough and clear idea of the name of research involve mainly a 're-search', i.e., activities undertaken to repeat a search. Thus, perhaps improving upon the definition presented above, it may be said that research refers to "a critical and exhaustive investingation or experminentation having as its aim the revision of accepted conclusions in the light of newly discovered facts."

The researcher is constantly concerned with researching the accepted conclusions of his field, i.e., the theories with different levels of generality and degrees of confirmation (trustworthiness) existing at a given point of time. He does this researching by probing in to the facts of the empirical world that confirm one or several predications generated by his accepted conclusions, his acceptance, a consequence of his assumption about the correctness of the existing theories. Thus, researching may in effect turn to the construction of new theories to take the place of those on longer able to fit the data of the empirical world. Research, stated otherwise, is a systematic attempt to push back the bounds of comprehension and seek beyond the horizons of our knowledge some "truth" or some reality, shrounded in a subtle way and consequently, to keep or extending as also consolidating these horizons without end.

D. Slesinger and M. Stephenson in the Encyclopedia of Social Sciences propose a very comprehensive definition of research: "the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art."

What is Research

It is a process of refining human experience for being embodied in the stock of knowledge. In course of this refinig operation the obvious steps are collection of data, neat filteration and examination of the facts collected under the prescribed procedures and codes of making conclusions. With every new experience added, it again needs re-interpretation to get an insight for identification of truth. The exploration of outer world and the curiosities to trace central facts of nature were the beginning of this research process. Exploration of new facts, careful observation of natural and social phenomena and ascertaining truth behind the observed phenomena, tracing of new inter-relations, re-interpretation of an existing theory, propounding new theories, extension and further application of these theories, proving or falsification of some old notions, believed facts, retesting of old theories in the light of some new observations, testing of the theories in the light of some new observations, testing of the collected human experience by application of research method, logic and emprirical verification are covered in the process of reserch. Collecting data regarding unexplored fields of human knowledge and verification of truth behind the observed phenomena as suggested by the data, propounding relatinships of causal nature between observed phenomena, devising new tools of verifying the truth content of the experiences and observations, presenting a new conceptualisation, making of a new method, of analysis better and expendient than the existing methods, discovery of new facts, sequencing analysis and establishing sound causal relations among things, rejecting the outworn assumptions and logically falsifed value judgements in the existing theories and preparing a systematic and organised body of knowledge are also covered by the process of research.

Reseach is essentially oriented towards problem solving. J.W.

Best has very neatly presented the idea of research when he opined that research is not only specifically problem-shooting but is also closely associated with verification of truth underlying the observed data in his book *Research in Education*. Research involves the prolonged procedures of ascertaining truth behind the hypothesis under examination, testing the logically validity of hunches, examination of empirical supports for traditionally accepted beliefs, guessmarks and believed facts. Identification of common tendencies in experiences and exact tracing of the actual casual factors leading to events, particular behaviour or a given reaction are the inner searches in research. These muddling and working on test of hypotheses makes the path for finding out some interrelations. Further reasoning with these either rejects the tentative inter-relations or leads to building of a sound base towards a theoretical proposition. Inductive method affords the empirical testing on the basis of the data. More and more verification of the proposed facts by evidences suggests as to whether the fact stands validated or invalidated. The validity of the proposition tested within a specific, delimited and well defined demarcations of research domains. Then it is extended to further application and validity is thoroughly checked. It is not necessarily true that a fact proved valid with some observations would be true to the same extent even elsewhere. Therefore, the statistically tested and by trying the proposition to further applications are resorted. Unless the phenomena are well sorted out to identify the facts inside it and neatly classed the verification of truth becomes quite complicated. The casual relations between the two phenomena can be established under an appropriate frame of reference to theory and the already tried out conclusions. Without a reference, these further propositions may lead to serious omissions. The consistency of facts is checked in relation to the already verified and settled postulates. To trace, how the two identified variables are interrelated some theoretical prepositions are formed and varied with the data and logic, then, furtherance of the application of the interrelation is attempted. If it seems establishing itself, further evidences are collected to find a support for understanding of operational part of interrelation.

The interrelations are expressed in terms of quantifiable data and adequate proof for the established relationship is narrated. This has to be foolproof and logically sound proposition which can afford a base for further derivaitons and extension of the relationship to other fields. It needs a long exercise of trial and error before any interrelationship proposed by the hypothesis is actually found fit to claim truth. Phenomena observed in bits, pieces, fragmented and unintegrated form are brought together to further testing in unisolated and varfying states. Test of the proposotions by logical consistencies gives a sound and firm foundation to proceed ahead for further applications. Contradicitions and falsifying elements hidden in the tentative relationships are revealed by further testing which affords the basis for delimitation of application to specified situations. Checking and rechecking process continues till the application to all situations is exhausted.

Thus, research is a very strict discipline of patience and strong determination. Half hearted, hurried, and slip-short habits do not fit in the temperament of the researcher. No tentatively observed and hurriedly carried proposition can clain truth. Generalisations on the basis of such propositions can lead to serious consquences to the human knowledge building. The observation process has to be continuous and persistent and not the casual one to build the verifiable data. Some facts are not at all provable by the empirically provable data and are relating to human reactions motivated by sentiments, moods, emotions anger and plesure. We observe the outer features of the phenomena in the form of gestures, movement of body organs, etc., but do not get any reliable indicator of human feelings except the reportings of the feeler. Thus, feeler's bias is always retained in reports. In the state of fever a patient shivers with cold and his body-temperature goes up, is a correct conclusion but does not report the agony and pain involved. Pain and discomfort are the person's specific feelings which vary from person to person. The search of the objective indicators is also an important part of the research process. The indicators should be applicable equally to every new case of experience. Indicators should be quantifiable and measurable and should be value-neutral.

Concept of Research

A hypothesis based on some tentative experience or data may be subject to verification by the already recorded data. Fresh data collection may not be essential for each research project. Already collected figures and experiences, if carefully understood and analysed, can yield new interrelationships. At times, a base line data are obtained from the secondary sources and further evidences for verification of hypotheses built on the secondary data may be collected by the researcher, then it is classed, sequenced and ordered for further processing. The secondary source-data are utilised in research studies for supporting the phenomena observed in primary data and attesting the validity of relationship between variables proposed under the researchers investigation. Unless a thorough knowledge is gained regarding the past and current parallel research studies, attempts, successes and failures therein, the researcher does not know where to begin. One should be aware of the tools of analysis and the form in which the data are colledted. The knowledge of indicators, measuring instruments and vocabulary of experts of the discipline. Testing procedures and verifying apparatus should be within reach and grip of the researcher so that he becomes able to master the facts unker investigation. The theoretical frame of research may contain some postulates and observational testings. Such concepts are logically derived but leave space for non-observable experience and these are bearing indirect dependence for their truth on the straight correspondence with the physical world. Logical and mathematical manipulation is the course of their validation. The deductive method of reasoning with facts leads to the prediction for future course of behaviour of the investigated object and these can be empirically examined. Theories are drawn from the observed phenomena of the world and the world is free from the bondage of theory. Therefore, untested theoretical derivations fail to explain future course of events by interaction of variables.

The measurement procedures have to be mastered by the researcher before he proceeds to handle the data collection and has to strain hard for tracing out a new indicators, adequate and foolproof. Most of the measurements have been designed to make use of the principle of association of correlation. How the two given variables behave together in relationship and what is the pattern of this relationship has to be identified. Improved measurement techniques also constitute the research problem. The theory decisions which a researcher has to exercise in order to decide his course of action are concerned with the chosen marks of proof to attest the truth.

A vast catalogue of associations seem to exist between several variables in course of study as a researcher starts fiddling with the data. Some associations seem to prove stronger than others still they do carry weaknesses in some respect and verifications indicate that these are quite illusory and only casual. As the things are further verified and more situations are brought under coverage of the study, it is detected that such casual association does not become meaningful for any conclusion. Some facts are attributed to measurement errors. They seem to be related to some unknown and unidentifiable variables. As the further experiments are tried and broader applications are checked these prove only superficial. A researcher may begin his research at one point of investigation and on way he finds various other clues opening to attest some other relationships on the basis of the tentative data. If he extends his investigation further to this side issue, he may be able to develop a hypothesis, the verification of which would entail more varied data collection. His curiosity may drag him to further collection of the evidences wherein he may come across several other tentative interrelationships which at their face value seem to bear truth. In this sense the research process is long and persistent. It is started at one point and by the time he ends the problem is found extending quite beyond the presupposed boundaries. The more deeply he penetrates into the problem the more complicated and interesting interrelationships are found by out making more and more hypotheses for further researches. The delimitation of the research study becomes very necessary to avoid the disappointment of getting lost in the ocean of data. Precise statement of the predemarcated research problem is essential for the research student. Identification of variables is equally essential and precise definitions of each part are needed to attain meaningfulness. The relationships between the variables should be having a direct bearing the research problem. Own conjectures, imaginations and wishfulness should not be allowed to interfere with the identification of truth. Research methods and the procedures are as essential for the researcher as his curiosity. Without adequate training in the research procedures research in its true meaning is impossible. There are several university departments even today which permit research without preliminary dnowledge of methods and procedures and their output in research is qualitatively poorest of all. Research requires references to the theory every now and then therefore, advanced courses on theory of the subject have to crossed through before attempting for any worth while research.

SCIENCE : THEORY AND FACT

Science is popularly defined as an accumulation of systematic knowledge. Such a definition is adequate only to the extent that the words "systematic" and "knowledge" are themselves propely defined. Logical argument or systematic theology might otherwise be equated with natural science.

It is therefore necessary to elaborate upon the hidden content of these terms before the phrase can stand as a definition of science.

In the first place the fundamental character of science is ignored in this definition. Science is a method of approach to the entire empirical world, *i.e.*, to the world which is susceptible to experience by man. It is furthermore an approach which is susceptible of experience by man. It is furthermore an approach which does not aim at persuasion, at the finding of "ultimate truth", or at conversion. It is merely a mode of analysis that permits the scientist to state propositions in the form of "if — then —,". Thus, no matter how systematic any body of knowledge may be, it is not science if it merely begins with axioms, or "self-evident" propositions, and ends with deductions from those axioms.

Put succinctly, the sole purpose of science is to understand the world in which man lives. What is meant by understanding the empirical world is, however, very complex and will require considerable explanation.

THEORY AND FACT

Basic to modern science is an *intricate* relation between theory and fact. The popular understanding of this relationship obscures more than it illuminates. Popular opinion generally conceives of these as direct opposites: *Theory is confused with speculation, and thus a theory remains speculation until it is proved. When this proof is made, theory becomes fact. Facts are thought to be definite, certain, without question, and their meaning to be self-evident.*

Furthermore, in this popular *misconception* science is thought to be concerned with facts alone. Theory (speculation) is supposed to be the realm of philosophers. Scientific theory therefore, is thought to be merely the summation of facts which have been accumulated upon a given subject. Even this function, however, is a restricted one, since facts are thought to speak for themselves.

If however, we look at what scientists actually do when engaged in research, it becomes clear (1) that theory and facts are not diametrically opposed, but inextricably intertwined; (2) that theory is not a speculation; and (3) that scientists are very much concerned with both theory and facts.

The way the scientist views theory and facts is indeed quite different from a popular conception of them. *A fact is regarded as an empirically verifiable observation*. The careful reader will see that this statement is very complex and one which would require an extensive philosophic treatment to explain fully. The implications of the statement will, however, become clearer later. To the scientist, *theory refers to the relationships between facts*, or to the ordering of them in some meaningful way.

Facts, or empirically verifiable observations, could never have produced modern science if they had been gathered at random. One scientist might count the grains of sand in a sand pile; another might survey the range of size and shape of leaves on the maple tree; still another might record the variations in color of rainbow trout taken from a particular river Ganga. The infinity of possible procedures, objects for observation, and of ways to make those observations would effectively prohibit any substantial progress from one generation to the next. Without some system, some ordering principles, in short, *without theory*, science could yield no predictions. Without prediction there would be no control over the material world.

It can therefore be said that the fact of science are the product of observations that are not random but meaningful, *i.e.*, theoretically relevant. Thus we cannot think of facts and theory as being opposed. Rather, they are interrelated in many complex ways. The development of science can be considered as a constant interplay between theory and fact.

Theory is a tool of science in five ways : (1) it defines the major orientation of a science, by defining the kinds of data which are to be abstracted; (2) it offers a conceptual scheme by which the relevant phenomena are systematized, classified, and interrelated; (3) it summarizes facts into (a) empirical generalizations and (b) systems of generalizations; (4) it predicts facts; and (5) it points to gaps in our knowledge.

On the other hand, facts are also productive of theory, in five ways : (1) facts help to initiate theories; (2) they lead to the reformulation of existing theory; (3) they cause the rejection of theories which do not fit the facts; (4) they change the focus and orientation of theory; and (5) they clarify and redefine theory.

THE ROLE OF THEORY

Theory as orientation. A major function of a theoretical system is that it narrows the range of facts to be studied. Any phenomenon or object may be studied in many different ways. A football, for example, can be investigated within an economic framework, as we ascertain the patterns of demand and supply relating to this play object. It may also be the object of chemical research, for it is made up of organic chemicals. It has mass and may be studied as a physical object undergoing different stresses and attaining certain velocities under various conditions. It may also be seen as the center of many sociologically interesting activities-play, communication, group organization, etc.

Each science and each specialization within a broader field abstracts from reality, keeping its attention upon a few aspects of given phenomena rather than upon all aspects. Only thus can the work of science be reduced to manageability. The broad orientation of each field, then, focuses upon a limited range of things while ignoring or making assumptions about others. It is in the light of these considerations that much of nineteenth century sociology may be understood, for a major task of such masters of theory as Corote, Spencer, Tunnies, or Sillmel was to define the task and object of study for the future science. Theory, then, helps to define which kinds of facts are relevant.

Theory as conceptualization and classification. Every science is also organized by a structure of concepts, which refer to the major processes and objects to be studied. It is the relationships between these concepts which are stated in "the facts of science." Such terms make up the specialized vocabulary that the scientist uses. They change as the science develops, for different phenomena come to be of major importance. However, it is clear that if knowledge is to be organized, there must be some system imposed upon the facts which are observable. As a consequence, a major task in any science is the development of systems of classification, a structure of concepts, and an increasingly precise set of definitions for these terms has been probably learn it from the history of sociology, much of sociology has been the development of elaborate conceptual schemata. These pointed to certain phenomena as the most important to be studied and thus helped to organize the facts of social relations. Some of the concepts now used may be mentioned to remind the student that he is already familiar with this function of theory: invasion and succession, marginal man, status and role, class system, socialization, social mobility, and social distance.

Another task of theory : *Summarizing* further task which a theory performs is to summarize concisely what is already known about the object of study. These summaries may be divided into two simple categories : (1) empirical generalizations, and (2) systems of relationships between propositions.

Although the scientist may things of his field as a complex structure of relationships, most of his daily work is concerned with a prior task: the simple addition of data, expressed in empirical generalizations. Entomologists may be studying the habits of social insects in order to summarize these observations in a set of descriptions. The sociologist or social psychologist may gather data on the differences in the child-rearing practices of various classes. The demographer may tabulate births and deaths during a given period in order to ascertain the crude rate of reproduction. These facts are useful and are summarized in simple or complex theoretical relationships.

Summarizing at this level is often not even considered theory, an certainly it was going on long before there were scientists. Man's continuing existence depends upon such empirical observations: "objects fall," "wood floats, 'strangers are dangerous," etc., are propositions of this kind, embodied in tribal wisdom.

It is clear, on the other hand, that such statements go beyond a single observation or a single group of observations. They may become very complex, and contain some expression of the conditions under which they are accurate. Furthermore, as a body of such summarizing statements develops, it is possible to see *relationships between the statements*. Hazing of freshmen, ordination of a minister, ritual circumcision, graduation ceremonies, and baptism are phenomena about which a number of summarizing propositions can be made, but they can also be seen as related to one another: ways by which a group gives a different status to an individual, patterns of asserting group control, ceremonial expressions of group unity, etc.

Theorizing on a still larger scale, some may attempt to integrate the major empirical generalizations of an era. From time to time in any science, there will be changes in this structure of relationships between propositions. Newton's *Principia* was such an example, as was Einstein's work on the special theory of relativity. Talcott Parsons has shown in his *Structure* of *Social Action* that major shifts of this kind may be traced in the work of Weber, Durkheim, and Pareto as each of them moved from older systems of theory toward a more acceptable system.

It is through systems of propositions that many of our common statements. must be interpreted. Facts are seen within a framework rather than in an isolated fashion. Let us look at a few examples: " A social group is not just the sum of its members." "This is a patrilineal society." "The delinquency rate is higher in slum areas than in middle-class areas." If we study such apparently simple statements more closely, it is clear that behind each of them is a complex series of observations, a set of assumptions about the effect of social factors upon behavior, and a system of propositions about the way in which groups act. There is an implicit or explicit fact-chain or theory which gives such "simple" statements their full meaning.

Usually, of course, the existence of such theoretical systems is taken for granted, and we do not give them much thought. However, when we wish to communicate with great accuracy or to explain complex ideas, the systems are made explicit. For the scientist, then, it is important that such structures of facts be stated openly. Theoretical clarity demands that the scientist must be more conscious of the thought system being employed than is the average man.

Theory predicts facts. If theory summarizes facts and states a general uniformity beyond the immediate observations, it also becomes a prediction of facts. This prediction has several facets. The most obvious is the extrapolation from the known to the unknown. For example, we may observe that in every known case the introduction of Western technology has led to a sharp drop in the death rate and a relatively minor drop in the birth rate of a given nation, at least during the initial phases. Thus we predict that if Western technology is introduced into a native culture, we shall find this process again taking place. Correspondingly, we predict that in a region where Western technology has already been introduced, we shall find that this process has occurred.

Similarly, we should be surprised to find that delinquency rates in an American slum are lower than in the rest of the city, or that the remarriage rates of divorcees aged 25 to 34 are lower than the marriage rates of single persons at those ages. We have recorded many observations which have led to these generalizations. We expect to find the same patterns in areas for which we now have no data, and we expect to find these patterns in the future.

We expect the same patterns, however, simply because it might be (1) we believe we know *which factors* cause these patterns; and (2) we believe that *these factors* will be found in the new situation. This is a common-sense way of saying that behind our empirical generalizations is a body of theory. The theories state that under conditions X, Y will be observable. A given theory may be incorrect, but it does make predictions about observations of phenomena. It is a set of directions, stating how certain operations, observations, and calculations are to be made, with a prediction about the outcome. Because sociology as a science is in its infancy, the predictions that can be made are relatively crude. Often we have not identified the causal factors and may make an erroneous prediction. For example, the factors that lead to a high remarriage rate for divorcees in this country may not be found in other countries, and a mechanical prediction from the United States pattern might be incorrect.

Nevertheless, it is clear that theory performs the task of stating what facts are to be expected, This becomes a set of directions to the researcher, telling him what data he should be able to observe.

Theory points to gaps in our knowledge. Since theory summarizes the known facts and predicts facts which have not yet been observed, it must also point to areas which have not yet been explored. The simple fact of prediction suggests where to test our knowledge. If a theory states a general relationship, such as an inverse correlation between income and fertility', we can see immediately where further facts might be sought, We can break our income classes into smaller groups to see whether fertility might *be* higher (instead or lower) at the extreme upper income groups; \We can ascertain whether this pattern is to be found in rural as in urban areas, or ill other countries; or we can study the historical relationship between income ,and fertility. 'These are only examples, and the student can \work out others suggested by the general proposition. However, theory also points to gaps of a more basic kind. While these gaps are being filled, changes in the conceptual scheme usually occur. It might be noted in addition that "seeing the gap" is very easy once it has been done. An example may be taken from criminology. Although a substantial body of knowledge had been built up concerning criminal behavior and its causes by the time Sutherland began his researches, most of it related to the more common crimes such as murder, arson, theft, burglary, and so on. It is now possible, with good hindsight, to see that the body of theory dealing with causation was oriented almost exclusively to the crimes committed (in the main) by the lower classes. Almost no attention was paid to the crimes committed by the middle classes or, more especially, to the crimes which may be labelled "white collar" and which grow out of the usual activities of businessmen. Sutherland saw this as a major gap in criminological theory, which pointed to a lack of knowledge about this kind of crime. Soon mainly other researchers began to investigate this area.

Such a gap would not be visible if our facts were not systematized and organized, was a consequence, we may say that theory does suggest where our knowledge is deficient. The beginning student must, then, acquaint himself with existing theory. It \will then become clearer to him why one research problem selects productive, and another sterile. As we shall see later, the formulation of a good question in science is an important step in the development of knowledge. Alerting oneself to the gaps in theory' and fact will increase the likelihood of formulating good questions.

THE ROLE OF FACT

Theory and fact are, then, in constant interaction. Developments in one may lead to developments in the other. Theory, implicit or explicit, basic to knowledge and even perception. Theory is not merely a passive element. It plays an active role in the uncovering of facts. We should expect, however, that "fact" has an equally significant part to play in the development of theory. Science actually depends upon a continuous stimulation of fact by theory and of theory by fact.

Fact initiates theory : Many of the human-interest stories in the history of science describe how a striking fact, sometimes stumbled upon, led to important new theories. This is what the public thinks of as a "discovery." Examples may be taken from many sciences: the accidental finding that the penicillium fungus inhibits bacterial growth; that excision of the pancreas in the dog is followed by the symptoms of diabetes; that radium will expose film even through opaque objects; that many errors in reading, speaking, or seeing are not accidental but have deep and systematic causes; or that a pendulum of given length, in free motion, will swing back and forth in equal time. Many of these stories take on added drama in the retelling, but they express a funclainenlal fact in the growth of science, that an apparently simple observation may lead to significant theory.

Merton has called this kind of observation "the unanticipated, anomalous, and strategic datum" and cites an example from the Craftown research. The datum was the frequent report from interviewees that community participation was easier because there were so many baby sitters available for any event. This fact was anomalous and unanticipated because the research team possessed the relevant population data: actually, these were mostly young couples with infants or young children, and the proportion of teen-age children was lower than in the general United States population. Attempting to account for the anomalous datum in this case led to an interesting development of theory: It was not the absolute number of adolescents that was the important fact, but the number that had a *social existence* for these couples seeking baby sitters. There were fewer teen-agers, but they were all part of the community which was real to these couples and were thus available. This development can, in turn, be related to the larger body of theory dealing with socia perception.

It must be emphasized that such strategic facts do not "speak to themselves." Nor will every researcher be capable of responding to the challenge. Almost every "discoverer" was preceded by others who saw his discovery first and thought no further about it. "Everyone" knew that many slips of the tongue and errors were caused by other factors that accident, but it was Freud who used his own experience to begin an elaborate, useful theory of such common observations. The fact can initiate theory only if the student is alert to the possible interplay between the two.

Facts lead to the rejection and reformulation of existing theory : Facts do not completely determine theory, since many possible theories can be developed to take account of a specific set of observations. Nevertheless facts are the more stubborn of the two. Any theory must adjust to the facts and is rejected or reformulated if they cannot be fitted into its structure. Since research is a continuing process, rejection and reformulation are likely to be going on simultaneously. Observations are graduallly accumulated which seem to cast doubt upon existing theory. While new tests are being planned, new formulations of theory are developed which might fit these new facts. One result of this situation is that at any given time there may be several scientists who have come to doubt older theories, without having actually developed a satisfactory new body of theory.

Perhaps the classical case in sociology is Durkheim's work on the phenomenon of suicide. Suicide had occupied the attention of many analysts prior to Durkheim. Some had explained suicide by theories of psychopathology, while others had used climate, race and nationality, etc., in an effort to take account of all the facts' However, as Durkheim showed, there were acceptable bodies of fact which did not fit any of these varied theories. In particular, when any one of these factors was held constant the suicide rate was not constant. Durkheim then attempted to demonstrate that all these facts were in conformity with a classification of different kinds of suicide (*i.e.*, a new conceptualization) and a theory of social and personal disorganization. Later, of course, new facts led in turn to a reformulation of Durkheim's theoretical structure.

This relation between fact and theory may be expressed in syllogistic terms. A theory predicts that certain facts will be observable: "If *X* condition exists, then *Y* is observable; if *Y* is not observable, then X conditic does not obtain." However, if X condition *does* exist, and *Y* is *not* obtain servable, then the original roposition is denied. Unfortunately for the servable, then the original proposition is denied. Unfortunately for the scientist's peace of mind, such a syllogistic pattern of logic does not guarantee that the original theory *is* correct when the facts *are* as predicted. Conformity merely guarantees that certain other theoretical propositions are *not* correct. Thus, the scientist is engaged in a process of narrowing possibilities, not of pinning down a certainty. His new facts can lead to the rejection of old theories and thus lead to new formulations, but these must in turn be tested by still further observation and experiment. The older notions of "bad blood" and race as factors in juvenile delinquency were based upon some facts (the high rates of delinquency in certain families and ethnic groups). These theories were, however, inconsistent with a growing body of fact about (1) how delinquency is recorded by the police in different areas, and (2) the social causation of crime as against biological theories of crime. Within each decade, however, new facts are recorded which demand that the most recent theory be changed in some particulars.

However, the reformulation usually means a new *focus* for the J\ote, nowever, tnat reformulation usually means a new *focus* for the 'scientist, for it is from the theoretical system that the major lines of research come. In turn, then, new facts will be recorded. Once we become sensitive to the fact that juvenile delinquency cannot be understood in biological terms but rather has social dimensions, we then become sensitive to *further* facts about the social determination of this phenomenon. We begin to explore these new data by further study. By leading to new theoretical formulations, facts may change the direction of scientific search. Thus, even negative facts may be useful.

Facts redefine and clarify theory : Usually the scientist has investigated his problem for a long time prior to actual field or laboratory test and is not surprised by his results. It is rare that he finds a fact that simply does not fit prior theory, or tests two alternative hypotheses for each of which there is an equal amount of evidence. In the main, his work consists in demonstrating what he has already come to believe is true.

However, new facts that fit the theory will always redefine the theory, for they state in detail what the theory states in very general terms. They clarify that theory, for they throw further light upon its concepts. Finally, they may actually present new theoretical problems, in that the redefinition may be far more specific than the theory. An example is the general hypothesis that when individuals from a rural population enter the urban environment we expect a considerable amount of personal disorganization. This process has been studied in most detail for immigrant groups and the children of such immigrants. We also expect that many changes in habit patterns will occur in this adjustment process. One of these is a decline in fertility. As a consequence of these notions, we would predict that when Negroes settle in large cities their birth rate will drop. Actually, the net reproduction rate of urban Negroes *is* much lower than that of rural Negroes, and we can say that the fact is in accord with the theoretical prediction.

The theory, however, is a general expectation, while the demographic facts are specific. The theory does not state how much the difference will be. In actuality the fertility of urban Negroes is even lower than that of urban whites. We are thus left with a redefinition of the theory toward greater specificity, and we also see that our older theory simply does not account for these new facts. The facts do not reject the older theory; they are simply more complex and definite than the predictions of the original theory, and they call for further research.

Indeed, it is one of the major experiences of researchers that actually testing any existing theory is likely to redefine it. The concepts that have been accepted assimple and obvious turn out to be elusive, vague, and ill defined when we fit them to the facts. It is not that the facts do not fit. It is rather that they are much richer, more precise and definite, than concept or theory. Furthermore, such redefini lions and clarifications may in turn lead to the discovery of new hypotheses. For so long as our theories use general terms and make rough predictions, it is difficult to disprove them. We may predict that in any social system there will be some integration between the political and the religious structures, for example investigation shows that such a proposition is true, but it is so general as not to predict all the varied ways and degrees of integration. How much integration of what? Priests and politicians? Magicians and chiefs? Ritual devotees and lay citizens? Taxes and devotional gifts? Temples and judicial chambers? When we look at the facts, we find that we have to sharpen our theories considerably to be able to disprove or prove them.

Facts, then, become a stimulus to the redefinition and clarification of theory even when they are in conformity with it. This process leads in turn to the reformulation of theory and the discovery of new facts.

VALUES AND SCIENCE

The subject of values has been touched in at least two places. No attempt was made to clarify the relationships between science and values at that time because of its complexity.

First of all it was stated that the work of science is not persuasion or conversion, but rather a demonstration that, given certain conditions certain events inevitably follow. Persuasion or conversion may be systematic; they may even make use of scientific findings; but fundamentally they differ from simple demonstration. Their function is to convince that something is *right, good, proper,* or in some other way *desirable.*

Demonstration aims merely at staling that a given relationship *exists,* regardless of its goodness, rightness, or beauty. In effect this amounts to an assertion that science is devoid of value judgments. The careful student should not accept such an assertion, however, without a much more detailed consideration of the nature of science and the scientist.

Values were touched at another point in the preceding chapter in referring to the evaluation of a fact in terms of its theoretic relevance. It was suggested, indeed, that needed facts might be *evaluated* in advance by an adequate body of theory. This is the equivalent of an assertion that science discriminates between problems, judging one as more important than another and thus more desirable of solution.

It must also be seen that the question of the "importance" of a particular fact can be asked in two ways. It may be put as the question, "Of what scientific *significance* is this finding?" Or it may be put, "Of what practical *utility* is this finding?"

While it was suggested in the preceding chapter that scientific theory may help point to the answer of at least the first question, science must introduce values in order to answer the second. Furthermore, there is always the question as to whether the first can itself ever be scientifically answered. There are two reasons for this difficulty. The preference for one problem over anotherwhen neither is dependent upon the answer to the othermust be made on the basis of a belief that one is more pressing than another. However, this belief is only a conviction, a faith, and it must be based upon values. Secondly, even as a *prediction* of what the answer to the problem will lead to in the future, such a decision has at best a flimsy basis in fact. Those who feel that such decisions are easily made will do well to ponder an answer reportedly given by Benjamin Franklin. To a critic who asked what importance could possibly be attached to his findings about the relationship between thunderclouds and electricity, he replied, "Of what use is a newborn child?"

These comments suggest that the sociologist needs a thorough understanding of the relationships between values and science. Before analyzing these relationships, however, several other connections between values and science may be noted, of which two have a particular significance for sociologists.

A broad value problem, of concern to all science, is posed by the spectacular destructiveness caused by some of the *applications* of modern science. The question is usually phrased in some such manner as, "What is the moral responsibility of the scientist in the world today?" Scientists of all branches have indicated their awareness of this problem, even going so far as to form special organizations for its consideration. It is true, of course, that such a problem refers to the *uses* of science rather than the *methods* of science. Nevertheless, it seems obvious that the answers given to this question will affect the course of science markedly.

Of a somewhat different order are the two areas of the *interaction* of values and science that are of particular interest to sociologists. One of these arises from the fact that much of the *subject matter* of sociology is values. The ways in which this fact may possibly interfere with the application of scientific method to sociology must be investigated.

The other arises from the fact that *moral involvement* with his subject matter may tempt the social scientist rather more than the physical scientist to bias his results in favor of his own values. For example, it has frequently been observed that in American communities certain families associate more with each other than with other families. Furthermore, club memberships, childhood friendships, and marriages follow these same clique lines. It may also be observed that this group of families possesses the most material advantages and receives deference in one way or another from the other families in the community. These statements, of course, simply represent observations of the social relations that actually exist.

To the scientist this is a description of the facts. In a society where social class has moral implications, however, such facts may produce emotional reactions. Some may feel resentful, on the grounds that such distinctions should not exist in a democratic society. Others may feel that these distinctions are perfectly justifiable and right.

Whatever the scientist's feelings may be, it is certainly necessary for social science to distinguish between statements of what and statements of what *should be*.

Several ways in which science and values do interact have been illustrated. There are, of course, others, but these should suffice to indicate the need for a systematic treatment of the relationships between values and both science and scientist. Inspite of its breviety, the following discussion presents an outline for such a treatment.

VARIOUS BASES OF SCIENCE

Science itself rests upon a series of postulates, or assumptions, which are themselves fundamentally unproved and unprovable. It can be *asserted* that these postulates are true; we can *believe* them; but we cannot prove them. They represent those problems in the area of the philosophy of science which is usually called epistemology. These postulates deal with the validity of human knowledge. Since this is not a book on epistemology but rather a work on scientific method, it is only necessary to make clear that these problems exist and then simply to assume their truth. This, ofcourse, is what all scientists do, except when writing in a philosophical vein. Here are some of these "nonscientific bases of science."

The world exists. Those students who are acquainted with philosophical literature, particularly with the great names of Locke, Berkeley, Hume, and Kant, will recall that every attempt to prove the existence of the world has resulted in failure. Indeed, it is possible to deny philosophically its existence. Science, however, rests upon the *assertion* that this elementary statement is true, and further asserts that the world is a *physical* world.

We can know the world. This proposition is no more provable than the assumption of the world's existence. It *must* be true because we *wish* it to be" true, and because science depends upon the acceptance of the proposition.

We know the world through our senses. Science assumes that through our various sense organs, aided in most cases by extensions of those sense organs through such devices as rulers, scales, telescopes, etc., we can know the world. There is no other mode of knowing the world. Once more, this postulate cannot be proved, but if it were not true, then science could not exist. This is the case because science depends upoi the agreement of sense impressions for verification of its observation. To arrive at an answer by "intuition" is not satisfactory as a scientific method.

Phenomena are related causally. There is some controversy as to whether science actually posits this or not. There is reason, however, to believe that this disagreement is largely verbal. What is assumed in science is that events may be related in such a way that under specified conditions, event will be observed to follow from event *B*. It is further to be noted that the relationship is assumed to occur in time and space.

The foregoing statements are fundamental postulates of science. They are not provable, but they are "true" because we wish them to be true. In this sense, then, science itself is founded upon evaluative assertions.

ETHICS IN SCIENCE

An ethic is more than the presence of a basic value or values. It is also an injunction to action. In science the basic value is most simply stated as the faith that "it is better to know than not to know." The injunction to action contained in this simple proposition is. that knowledge should be actively sought. This value, the seeking after knowledge, does not apply to the scientist alone, however, and carried with it, therefore, is the further injunction to disseminate knowledge. Since knowledge is believed to be better than ignorance for ordinary people as well as for scientists, the findings of science must be made public. They are not to be closely guarded secrets, but essentially unpatentable and unsalable, a part of the public domain, freely given.

The acceptance of the belief that knowledge is good is by itself sufficient to indicate the ethical quality of science. There are, however, some further corollaries of the proposition which make this even plainer. If knowledge is a value, then all factors which endanger its achievement are undesirable. One such clear danger is the personal involvement of the scientist in his results. Thus the scientist must always be willing to throw aside his ideas in the face of contrary evidence. The man who fails to do this suffers through loss of esteem and severe criticism, for this is an *ideal,* an emotionally toned value.

The training of the scientist, of course, prepares him to behave in this way, not only by moral injunction but also in a practical fashion. It is early learned that falsification or distortion of facts cannot succeed for long. Science is the most pitilessly public activity in which men can engage.

Reputations are frequently made by young men through finding holes in the work of older scientists. Every important bit of research is repeated many timesin Japan, in Russia, in England, or in a South African laboratory. As a practical matter it is impossible to falsify anything in which other scientists are interested. Absolute honesty, therefore, is required of the scientist, not only by morality but also by necessity. The full acceptance of this kind of honesty requires that the scientist admit his error when he is wrong, since truth is rated a higher value than sparing one's own feelings.

The biasing of data through the personal involvement of the scientist, however, is by no means the only source of interference with the goal of securing knowledge. Another of these is the presence in a society of any form of social organization which restricts the freedom of inquiry or the dissemination of knowledge.

This is a somewhat complicated proposition, since under even that most repressive kind of political, religious, or special interest domination, some sorts of science may continue to grow.

SCIENCE : PURE AND APPLIED

The role of theory and fact and the importance of values for science are very crucial and valuable. These areas interrelate logically when the question is raised: "How practical is scientific sociology?"

This is a basic question for the student of sociology. The major portion of sociological effort is expended in the solution of practical problems for government and business. If this is true, then most students will have more concern with these practical problems than with the theoretic advancement of sociology. A course in the methods of sociological research, then, should have some value in training for the solution of practical problems. Whether or not to emphasize theory is not, however, a question that faces sociology alone. It is common to all science and is generally thought of as the consequence of a controversy between pure and applied science. This dichotomy, like that between "values and science," rests in part upon false bases.

THE PRESSURES TOWARDS APPLIED SCIENCE

It is commonplace to hear science decried as being deaf to the values of the arts, as being morally obtuse, or as being narrow in its range of problems. All this may be true, but there is still the brute fact that science grows ever stronger. The reasons for this lie in its practical applications. It takes no great sophistication to appreciate these. Members of the most isolated and simple preliterate society can appreciate that an ax designed on good engineering principles will fell a tree faster than one of their own design. It requires no knowledge of mathematics, chemistry, and physics to grasp their consequences in the modern world. As a result of the applications of scientific study. Western civilization will leave the most impressive ruins yet found on this globe. Science is known to the vast majority of the public almost solely by its engineering results. These practical applications therefore become the most frequently used criterion of the degree to which a discipline is scientific. If sociology is a science, then this fact must be demonstrated by acievement of .practical results. All other activity will tend to be put a side as "pure theory," that is, as mere speculation and as evidence that the field is not scientifically oriented.

Such pressures, plus the widespread faith that science can solve problems"can save us," in the words of one writerresult in the suggestion that sociology tackle immediate and practical problems. This pressure does not come from laymen alone but is also exerted by those in social agencies and by university administrators and professors.

Sociologists have further contributed to this situation, particularly those who allow their vision of the bright future to color their appraisal of present actualities. Again, this is not characteristic of sociology alone but of science in general. Persuaded by their belief in the progress of knowledge, many scientists have predicted too early the appearance of many engineering devices. The motor car and airplane are cases in point, *for example*, many scientists have predicted too early the appearance of many engineering devices. The motor car and airplane are cases in point, like other applications of science they were predicted hundreds of years before their appearance. Every important engineering triumph comes only after repeated failures to solve the problem. Sociologists who claim applications of the field beyond the range of present possible achievement do no service to their own discipline. They contribute instead to pressures which demand that sociology prove its scientific nature by dlicing applications of a practical nature far beyond the limits of its body of knowledge.

COUNTER-PRESSURE

Resistance to the foregoing emphasis upon practical results is of two types. First, there is resistance based upon the belief that science has best been able to achieve practical results when no goals pther than those of science are considered. Those who hold this position maintain that if scientists are allowed to pursue problems dictated purely by theoretical concerns, the growth of science and hence the growth of its potential applications will best be served.

If the dichotomy of pure as against applied science is accepteted, the logical question would be "Which of these should be emphasized in contemporary sociology?" However, not all scientists accept the dichtomy to begin with, and this refusal is the basis of the second type of counter pressure to the insistence that sociology be addressed mainly to practical problems.

It will be noticed that a certain parallel between this problem and the discussion of the relationship between theory and fact is indeed a similar question, and one that requires an understanding of the nature of theory as a basis for analysis. Let us see how a redefinition of the problem affects the decision to confine oneself to "practical" sociology *A theoretical system is a way of organizing problems.* All facts collected, all analysis of th,ese facts, even the perception of the data themselves *are entereed* within some sort of theoretical framework. Such a simple statement as "Water is wet" is understandable only if it is made within the proper frame of reference. In nuclear physics, for example, water has no such characteristic. Wetness is not a property of electrons or their nucleus. Similarly, in a "common-sense" frame of reference, it may be asserted that a particular table is black. If, however, the table is examined within the theoretical system of chemistry, no such quality appears. It is, instead, a combination of complex organic compounds. These simple examples serve to make two rather complex points. First, there is a difference between the common-sense frame of reference and a scientific theoretical system. The latter is much narrower and is defined more precisely. As a consequence of this narrowness and precision, it is also clear that frames of reference shift among the several sciences, so that properties in one science simply make no sense, or do not appear, in another science. The significance of this point will be discussed later when the problems of the hypothesis are taken up. For the moment it is the difference between the common-sense viewpoint and the outlook of science which is of greater importance.

The "importance" of a fact depends upon the frame of reference. Thus, a fact may be significant in the theory of a science without making any common sense at all. For example, the classic Michelson-Morley experiment, which showed light to have a speed independent of its point of origin or its direction, was of great importance to physics. Although this is a basic datum in the special theory of relativity, its immediate impact upon the man in the street has been negligible. If the findings had been contrary that is, that light moving in the direction of the earth's spin traveled at the equator about 0.3

mile per second faster than its customary speed of 186,300 miles per secondwho would notice, and who would care?

A fact is of significance only with reference to a particular theoretical schema. It may be of great scientific importance, but of no significance to the common-sense world and vice versa. It might be concluded, however, that if science depends for its growth upon the acquisition of scientifically important facts, the scientist should concentrate on "pure" research problems. While there is undoubted merit to this proposition, it cannot be accepted as a necessary conclusion unless the common-sense world and the scientific schema are mutually exclusive.

The same fact may have relevance for both scientific and practical problems. A problem that occurs in the everyday world is set in a loosely defined frame of reference, and its solution usually depends on several sciences simultaneously. Its characteristics therefore may be quite differert from those of a scientific problem. There is nevertheless a relationship between the two.

To take a simple example, the cook, unaccustomed to the altitude, who boils his soaked beans in Delhi City for the usual 45 minutes to an hour will find them inedible. The problem he faces is that, in spite of the cooking, the beans have remained perversely hard. The solution is simple: cook them much longer until they are "done." This is a practical problem solved in a common-sense context.

It is clear that such a problem is not a scientific one, at least as it is stated here. In the first place, it is not stated what constitutes "hard" beans or what is meant when they are said to be "done." Secondly, the problem is not stated in sufficiently abstract terms to permit its solution to add anything to a scientific theory. Finally, once the solution to this problem has been reached, there is no compulsion to discover the reasons for this situation. In short, it is entirely devoid of scientific interest. *It need not be so,* however. Nothing prevents the problem of cooking beans at various altitudes from being looked at from the point of view of science.

For example, the activities of scientists in the seventeenth century, most of whom were mechanics and men of practical affairs rather than university men, were focused on problems understandable to most people. The new telescopes and microscopes were turned on any and every subject of interest that struck them. These men made better gunpowder and new cosmetics, improved firearms, and looked at ordinary ditchwater. At that time, the great flowering of modern physical science, there seemed to be little difference between practical and scientific frames of reference.

The study and solution of these everyday problems was, however, accompanied by an eager search for an understanding of the principles behind each problem. It was this fact that distinguished these solutions from merely practical adaptations and raised the activity to the level of science.

During this period the eagerness of the search for truth was so widespread that new experiments were repeated and discussed before ordinary citizens as well as scientists. When Von Guericke, Mayor of Magdeburg, invented the air pump, he found the Diet of Ratisbonne a most interested audience.

This air pump had several consequences. First, it astounded the Diet by showing that two hemispheres from which the air had been exhausted could not be pulled apart by horses. In this sense the pump served as an intellectual toy. Beyond this amusement, however, observations of the air pump led to the discovery of important facts about the weight of air, and air pressure. These discoveries in turn have produced such important practical inventions as the barometer, the thermometer, andto solve the problem of the beansthe pressure cooker. It is clear that the subject matter of earlv science was not far removed common exprience. Brewers, dyers, mayors, soldiers, merchants, and men of many other backgrounds were able to make important contributions. There was, in other words, a considerable *overlapping* between the frameworks of science and of common sense. Theoretical science and practical problem solving were not widely separated.

Since, however, men had been solving practical problems for millenniums before this period without creating natural science, there must a marked difference between empirical problem solving and the scientific method. It is also clear that this difference does not separate practical questions sharply from the sphere of scientific interest.

COMMON SENSE AND SCIENTIFIC FRAMEWORKS

Some of the relationships between these two ways of seeing problems have already been discussed. They may be summarized as showing four major differences, even when the focus of attention is an everyday practical problem.

The scientific method goes beyond the solution of the practical problem. There is a compulsion to find better instruments to help in the solution or to find alternative ways of solving it more satisfactorily. In other words, the practical problem may be solved in the area of common sense, but not in the scientific frame of reference, for here many problems remain even after "the beans are cooked."

The scientific method of solution involves controlled experimentation. This means that, even though a practical problem may be solved by the application of casual empirical observationthat is, simply by cooking the beans longera scientific solution has not necessarily been reached. For this, precise definition, measurement, and control of the variables must be employed in an experimental framework.

The scientific solution looks for broader generalizations. As the scientist works at problems, he is conscious that he is building a science. He searches for those facts (negative as well as positive), wherever they may be found, that constitute empirical uniformities. These in turn are studied in the attempt to locate underlying principles. Thus the practical solution merely an intermediate step and not the end of the road for the scientist. *Scientific experimentation is set against an existing body of generalisation.* This statement is an extension of the previous point. Not only does the scientist seek generalizations, but he also wishes to extend their utility by relating them to other generalizations; in short, he wishes to create system of theory. Thus, in the early years of the scientific epoch, experiments with boiling water at low temperatures by varying pressure, and studies on the height of mercury columns as affected by the air pumps, not only were entertaining but led to some practical results. Entertainment and practical usefulness were not, however, the only consequences of these studies. They were tests that had a bearing upon a body of learning conceijjpng vacuums and the weight of air. Each test was part of the cumu process that is the growth of science. The constant change induced in a science by this cumulative process results in the clarification of its generalizations through greater *specification of the conditions* under which the generalizations hold. This development in turn increases the *predictive power* of the science and divides the field into an ever-growing number of *specialties,* each of which is more *abstract* and further removed than its parent from the frame of reference of common sense.

THE INTERPLAY BETWEEN APPLIED AND PURE SOCIOLOGY

On the other hand, sociology is still in an early phase of growth, and its frame of reference is not much more abstract than that of common sense. It should follow, then, that practical problems can contribute to theoretical sociology, and vice versa. At the present time, it is wasteful to lose the theoretical knowledge that could be gained from well-designed applied research. Yet it should be possible to utilize in a practical fashion the discoveries of theoretical sociology. Let us sketch some of the possible interplay between these two.

FROM THE SIDE OF APPLIED RESEARCH

1. Applied research can contribute new facts

As we have noted previously, much of science consists in simply finding out what the facts are within a rather broad definition of relevance. Before we can organize a study that will neatly test a hypothesis, a considerable amount of information is necessary. If we had to develop all this information for each study, scientific as a basis of choice in order to reduce turnover. The variable may determine community participation to some extent, or reaction to proposed changes in the neighborhood. Yet it has not received the systematic attention in theoretical sociology which it deserves. A concept may thus be developed in applied research and then be utilized further in theoretical research once its importance has been noted.

4. Applied research may integrate previously existing theory

Problem solving typically draws upon many sciences, for the problem is concrete and cannot be solved by the application of abstract principles from a single science. Bridge construction, for example, may draw upon such disciplines as economics, hydrostatics, stress analysis, demography, chemistry, geology, etc. "Slum clearance" requires the data studied by the criminologist, the social worker, the sociologist, the economist, and others. Thus, the solution of a concrete problem may require some integration of the findings from many theoretical as well as applied investigations in several fields. The same principle must be applied, however, *within* sociology. Studies of socialization may be used in planning for the interaction of children from different ethnic groups or in developing a program for adult education, in designing the project that replaces the slum. Demographic data must be used to calculate the expected number of children in the schools and to plan community recreation. Studies of neighboring behavior, of the impact of physical location upon social interaction, of the bases for community participation may be used in laying out the building entrances or locating the community center.

These contributions may be seen as the application of theoretical knowledge to specific problems. It must be seen, however, that we have a pattern, a total plan, and it must then be seen how these various factors *interact* with one another. For example, previous studies have shown that physical proximity is important in the formation of clique patterns, as are factors of class, ethnic group, religion, and so on. How do these principles operate *together*, when the influence of each is in the same direction? In different directions? We may ask similar questions about the association of juvenile delinquency with such factors as income, education, association with fringe groups, or "broken" homes. This example is taken from housing research. An analogous integration could be attempted in applied industrial research and other areas. We would then be trying to discover the weights to be given such factors, so as to be able to predict their total effects more accurately. Applied social research, then, can be useful in the actual integration of existing theory.

FROM THE SIDE OF "PURE" RESEARCH

1. By developing general principles

Theory offers solutions to many practical problems. The abstractness which removes a scientific generalization from ordinary experience also broader application. When we have ascertained the differential effects of various kinds of social backgrounds upon intellectual achievement in IQ tests,' we can apply these rough principles to the analysis of first grades made by Southern Negroes or by San Francisco Chinese-Americans. We can predict what will happen when these groups migrate to other areas, or when new opportunities are given them. We can interpret more easily the different achievements of class strata. Although these judgments are not so precise or so well established as, say, those relating to the interaction between air pressure, altitude, boiling points, etc., they are similar in that there are many practical applications. Indeed, it can be said that nothing is so practical for the goals of diagnosis or treatment as good theoretical research. Too often, in contrast, practical problem solving confines itself to the concrete immediacy, so that the result is not applicable elsewhere.

2. "Pure" research helps to find the central factors in a practical problem

All too often, those who adopt a common-sense approach see the problem in traditional ways and fail to abstract the key factors. As a consequence, the solution is likely to be an inefficient one. For example, in an area torn by racial dissension, a playground director may "solve" the problem of gang fights between boys of different races by allotting different playground hours or days to the various gangs. This may "work," in the sense that the fights are avoided. However, since it fails to grapple with the causes of the tension and this outlet for it, the solution is inefficient and very likely helps to maintain the existing situation.

On the other hand, by the development and application of general principles of social interaction, group morale and cohesion, socialization, and deflection of tension, it is possible to work out a solution that both avoids gang fights and integrates these different groups. Theoretical knowledge, then, can go beyond mere common sense.

3. Research as an answer to problems may become a standard procedure for the administrator

Pure research may have an effect upon the pattern of administrative procedure, as the practitioner learns of its utility. This development has not been a common one, but both governmental and business organizations have begun to utilize "research and planning units" to evaluate the techniques which have been applied in the past and to develop new solutions to old as well as new problems. Such a unit may be given considerable freedom in its investigations. Large industrial corporations have, of course, used such units particularly in the biological and physical sciences. However, the utility of social-research units is obvious for both nonindustrial and industrial organizations, since problems of social relations are common to both. What is central to this development is the belief that problems should be anticipated where possible that traditional procedures may always be questioned, and that the development of fairly general principles can be a practical activity. Thus, the pattern of pure research has an effect upon the solution of practical problem in that its aims and procedures become the usual, long-term applied to the latter type of problem.

4. Theoretical research develops many alternative solutions, with the result that alternative costs may be weighed and ultimately reduced

The solutions that theoretical research first develops are likely to be very expensive. Most of the applications of science which have become common in our civilizationthe radio, television, mechanical refrigeration, sun lampswere originally laboratory appliances, unwieldly, costly, and inefficient. The first isolation of elements or isotopes has almost invariably required a relatively large expenditure of time and money. However, pure science characteristically continues the investigation beyond a "workable" solution to more precise generalizations, discovery the essential factors, and ascertainment of the exact conditions under which the process operates. Consequently, after a time there are many solutions for a given type of problem, with different main and subsidiary consequences. We are thus permitted to choose the best solution for our practical problem.

Because scientific sociology has had such a short history, the only acceptable examples of such multiple solutions must be taken from social research techniques. With each improvement in these techniques, we are able to solve practical social problems with considerably less waste. Developments in social theory have offered alternative solutions to such problems as juvenile delinquency, racial and ethnic assimilation, low production in office and factory, etc., but in general these are improvements over common sense, rather than over scientific generalizations that had previously been applied. However, as we learn to isolate important social factors and to clarify the lines of cause and effect, we may be able to develop out of theoretical sociology still more efficient answers to our practical problems.

This last point needs special emphasis because an increasing number of scientists are engaged in practical research. Consequently, there are inciting opportunities for the sociologist to apply his knowledge to the concrete problems of the major social institutions. There is an increasing amount of money for such research. Community councils, city governments, labor unions, business concerns, and various special interest groups will in the future underwrite still larger programs of sociological research. Their interest, however, is not in the growth of sociology but in the achievement of a practical solution. Research is expensive, and funds are limited. The development of science could be greatly accelerated by such projects. The importance of this opportunity is heightened by the fact that there is relatively little money available for "pure" research. It should be repeated at this point, however, that in applied research the work tends to be limited, the problem defined, and the frame of reference of the researcher specified without regard to the goals of scientific theory. When this occurs, we have an example of the possibly dangerous interference of personal values with science.

It is of vital importance that this danger be consciously recognized by the sociologist engaged in practical work. It need not handicap him so long as he designs his work within the scientific frame of reference as well as within the social-problem framework. The practicality of the results will in no way damage the scientific validity of work which is properly conceived and carried out.

The task for the student of sociology, then, is to develop his understanding of research design and techniques as well as his knowledge of sociological fact and theory. Whether he attempts "pure" or "applied" research, this training is necessary. It is perhaps particularly crucial when he must thread his way through complex everyday problems in such a way that he will not only help to solve them but also contribute to scientific growth.

BASIC ELEMENTS OF THE SCIENTIFIC METHODS: CONCEPTS

A fact is not merely a random observation, for example, but is an empirically verified statement about phenomena. It thus embodies both scientific observations and a known theoretical framework into which those observations are fitted. Further more, the observations themselves are systematically guided by the existing structure of knowledge. The universe presents an infinite variety of phenomena to be studied, but science limits itself to a few of these. As has been pointed out before, science abstracts from reality, dealing with certain aspects of phenomena (such as mass, speed, valence, intensity of attitude, etc.), not with the whole phenomena themselves. Indeed, to separate any phenomenon from all that is connected with it is an act of abstraction.

Since science attempts to investigate particular sections or aspects of reality, with an abstract system of thought to interpret those segments, it should not be surprising that each science develops its own terms, or *concepts,* for communicating its findings. So much is this the case that we may refer to the theoretical system of the science as a *conceptual system.* Now, we use these terms to stand for the phenomena, or aspects of phenomena, which *W*e are investigating. Consequently, when we formulate a proposition, we use concepts as *symbols* of the phenomena we are studying, and it is really these underlying phenomena which we are relating to one another. Because we deal directly with only the concepts, however, it is obvious that we may at times confuse the *concept* with the *phenomenon* it is supposed to symbolize.

Since all these concepts are abstractions and represent only certain aspects of reality, it becomes important to know (1) which aspects we should study, and (2) how to develop concepts for them. The first problem properly belongs in a discussion of theories and hypothesis. The second is the process of *conceptualiuition* and is treated in this chapter, under these headings: (a) the concept as abstraction (b) concepts and communication, (c) problem of definition, (d) reconceptualization and (e) the operational definition.

THE CONCEPT AS ABSTRACTION

It is sometimes forgotten that concepts are logical constructs created from sense impressions, percepts, or even fairly complex experiences. The tendency to assume that concepts actually exist as phenomena leads to many errors. The concept is not the phenomenon itself; that is, such logical constructs do not exist outside the stated frame of reference. The failure to recognize this is termed the *fallacy of reification*, that is, *treating abstractions as if they were actual phenomena*. This is such a common error that most of us are occasionally guilty of it.

A classic example of this error is found in sociology in the treatment and criticism of W. I. Thomas's "Four Wishes." Thomas felt that he had abstracted from human behavior certain elements that could be thought of as oriented toward (1) experiencing new situations, (2) securing the recognition of others, (3) retaining feelings of security, and (4) eliciting response from others. From his observations of human behavior, these were merely four major elements, not the totality. They were given these labels for conceptual convenience. However, some readers then reified these statements into something akin to instincts, and they were treated as though they were "forces" in their own right. As a consequence, they were subject to severe criticism because the existence of such entities was thought to be unproved.

Regardless of whether or not Thomas's observations were valid, criticism of this kind was really directed against these later reifications rather than against his concepts. Thomas was presenting his observations in conceptual terms, while his opponents were criticizing these ideas as though they were basic drives.

Since both facts and concepts are abstractions, they have meaning only within some frame of reference, some theoretical system. The discussion of the relationship between fact and theory applies also to the relationship between concept and theory. A concept, like a fact, is an abstraction, not a phenomenon. It takes its meaning from the thought framework within which it is placed.

The distinction between fact and concept is that concepts symbolize the empirical relationships and phenomena which are stated by the fact. Thus, as noted before, a fact is stated as a relationship between concepts, for each term stands for the phenomena described by the fact. In this sense, then, a fact is "a logical construct of concepts." A concept, in turn, is abstracted from many sense impressions, or percepts. The process of conceptualization is one of abstracting and generalizing sense impressions. In this way, it is possible to manipulate, study, organize, and isolate the properties of objects. It is only by thought that such properties can be isolated, and thinking can proceed only by giving names to such properties. Thus, conceptualization is essential to thought.

It is being discussed that the form of abstract manipulation called science. Concepts, however, are obviously not basic to scientific method alone: they are the foundation of all human communication and thought. Since, however, science requires a greater precision in communication, the process of conceptualization must be much more consciously a part of science than is the case for most common-sense and everyday contexts. So long as the scientist is aware of these relationships and of the abstract character of conceptualization, he can avoid the error of reification.

CONCEPTS AND COMMUNICATION

Concepts in science must be communicable in a very special sense. They must not merely arouse a vague "feeling" but must be so constructed that all their components are known. Deriving and clarifying the elements of such a construct are the major processes of definition, basic to the genenral problem of conceptualization.

Because of the differences between the common-sense framework and the scientific way of looking at the world, careful definition has a paradoxical quality. It facilitates communication within the sciences, but it also raises barriers to the lay understanding of scientific concepts. This is voiced in the common complaint that science uses "big words." Some critics are even cynical enough to suggest that science is a way of stating cliches in such polysyllabic words that no one else can understand what is said.

The same complaint is often registered by scientists against each other. The several sciences, as was seen in the preceding chapter, develop specialties which depend upon facts so abstract and complicated that no one scientist can know them all. Because each specialty deals with different phenomena, a variety of scientific vocabularies has been developed to communicate these special facts. The gap between these several sciences varies, depending upon the closeness of relationship between the frames of references. Between sociology and the physical sciences the gap is a chasm. The average sociologist cannot read with any great understanding most of the chemistry and physics reports in Science, the journal of the American Association for the Advancement of Science. He simply does not know the terms, does not possess the necessary concepts.

It is true that even for many of the articles by biologists. For example,an article chosen randomly from this journal contains in its first paragraph the following terms: "specific adsorption," "antibody molecules," "angstrom units," "antigenic protein," "diluted antiserum," and "heterologous serum." Could this paragraph have been written so that even a "well educated" but. lay public could understand it? The answer is "yes," but it should no longer be a paragraph. It would be a series of volumes piling definition upon definition until much of the complex history of modern biochemistry was reconstructed. Each concept, in short, communicates to the specialist a vast amount of experience, abstracted and clarified for those who understand the term.

Consequently, the basic equipment of any student is the possession of a scientific vocabulary adequate to understand the conceptual development of his field. These necessary terms are not merely big words chosen to impress the uninitiated, nor are they "just the difficult way of staling common sense." They are rather the "shorthand" of science, the precise terms which are basic to easy communication between scientists.

PROBLEMS OF DEFINITION AND COMMUNICATION

Not only is communication difficult between individuals who do not share the same conceptual systems, but similar problems often arise between those who do share a common frame of reference. In other words, definitions are not always clear; the concepts are not always adequately described. Several general reasons for the lack of clarity in some scientific communication are given below.

Concepts develop from a shared experience. The development of a conceptual system can, in fact, best be seen as the development of a new language. It is then easily seen why a group of scientists, in sharing experiences, is likely to develop a language not intelligible to others. This is a common problem of communication, not only in the scientific world but in translation from one language into another. Why is it so difficult to translate the German word gemutlich into English? Why do American sociologists continue to use the words Gemeinschaft and Gesellschaft in their original German form? Why has the word Gymnasium been taken from the German but given an entirely different referent in English?

The answer to these questions is that the two peoples either have experienced different things or have chosen to conceptualize different aspects of those things. Thus the word gemutlich refers to a series of qualities familiar to those who speak Englishthat is, a warm, pleasant, relaxed, "feeling-at-homeness"but this conceptualization happens not to have occurred in English. Gemeinschaft and Gesellschaft exist in American sociology for the same reason. Each may require a paragraph of English to define. The terms "community" and "society," which are the English translations of these words, do not convey the particular sociological meanings of these two German words. The Gymnasium in Germany is a kind of high school and junior college combined, but only its physical-education aspects survive in our use of the term.

The fact that language represents a shared experience has important consequences for the stuaent of a science. If verbal definitions of everyday man experience are so difficult to communicate to Americans, how greater is the problem of communicating scientific meanings to a layman in Dictionary definitions of scientific terms are seldom satisfactory either to the advanced practitioner or to the beginning student. What a chemist means by "titration," a histologist by "washing tissue," or a demographer by the "net reproductive rate" would require very elaborate verbal definitions. They are best learned by participating in the operations to which these terms refer and thus sharing the world of experience represented by them.

Terms used to denote scientific concepts may also have meanings in other frames of reference. Many scientific words are "contrived" by scientists in such a way that they will have no referent outside the specific scientific frame of reference. This is done in several ways. Frequently the terms are constructed from Greek or Latin roots, or they may be given the name of the man who first elaborated the concept, or perhaps geographic names are used. These concepts are relatively easy to keep clear Ilinguistically, since the terms are not used in lay vocabularies, but many of the other words of science are also used in other contexts. The begining student of physics, for example, must learn that a "mass" is not a 'big pile of something" but is a quality of matter which can be measured by certain operations. Even the word "pile" has taken on a specific meaning in nuclear physics and does not refer merely to a heap of matter. Similarly the student of anthropology and sociology must learn that "culture" does not refer to an acquaintanceship with opera, painting, literature, or "good" manners, but rather to the totality of the social heritage of any society. On the other hand, the word has an entirely different meaning in bacteriology. In any similar case the simultaneous existence of more than one meaning constitutes a trap for the unwary student.

While the examples given above may seem very simple and easy to bear in mind, the compounding of such concepts and the complexity of some of them make trouble for even skillful scientists. Sociologists, for example, have studied "bureaucracy." It is not easy to read into this term only the precise meaning agreed upon by sociologists, because there always exists the temptation to give the term an altogether different referent. Instead of meaning only a particular type of social structure, the term "bureaucracy" may also evoke such value-laden images as "red tape," administrative waste, and official disregard for the public interest. Both the sociologist and the layman are likely to fall into this error.

If at such simple levels the student may be misled by multiple meanings, it is no wonder that at more complex levels the possibility of confusion is still greater. To deal with this problem its dangers must be borne in mind, and clear definition must always be a fundamental principle of scientific research and discussion. Let us look at further diffculties. *A term may refer to different phenomena.* To illustrate this common experience in science, Robert K. Merton cites the complex usage of the term "function." Leaving aside its many meanings in common-sense vocabularies, or even in the various sciences, we may note that even within the field of sociology it has diverse meanings. Especially in socioeconomic analysis it may refer to occupational phenomena. Sometimes, on the other hand, it is used in a mathematical sense: phenomenon *X* (divorce rates, fertility, social acceptability) is a function of phenomenon *Y* (economic position). Again, and more commonly in social anthropology, its meaning has been taken from biology to denote the contribution which a given practice or belief makes toward the continued existence of the society. It is not surprising, then, that both the beginning student and the advanced scientist will at times be puzzled by discussions of this concept.

Different terms may refer to the same phenomenon. We can understand both this and the previous type of problem if we remember that the linguistic usage develops in response to the different experience, and the selection of experience, of different scientists. Since the researcher may use any terms he chooses, he may select his concepts for literary or historical reasons. Or he may believe that he is writing about different things, while his readers can see that he has simply introduced different terms. For example, the four conceptual sets "structure-function," "ideal-real," "formal-informal," and "primary-secondary" overlap in meaning to such an extent that these very different terms are sometimes used to refer to the same phenomenal The student must, then, be alert to these conceptual difficulties when reading or writing research reports. Both this and the preceding errors are not difficult to understand; they are, however, difficult to avoid, since the confusion exists in our own minds. If we can clarify our own thinking, the problem of the concept becomes merely linguistic. Let us now, however, note further problems in the development and use of concepts.

A term may have no immediate empirical referent at all. There are two senses in which this may be true. Both may result in making concepts less well understood, but the first of them is nevertheless necessary and useful.

First, scientific theory often deals with things that have not been directly observed. Concepts of this kind have as referents the *logical relationships between other concepts.* Consider, as an example, the problem in isolating what is meant by the common sociological term "social structure." The structure of a group cannot be weighed and will respond to none of the common physical measurements. The only data are the observations of the activities of people. Note that these data are not "acts," for so to receive the problem would violate the original concept. Continuous *patterned* activity 'is the central characteristic of the social structure. Such concept, then, has a very complex series of referenis, through other concepts, before the empirical reference is clear. There is ultimately an empirical referent, but the basic concept properly refers to logical relation ships between other.concepts.

However, it is of the greatest importance for conceptual clarity that the *ultimate* empirical referents of a concept be determinable, even though they may be several logical operations removed.

Not acceptable to science, however, is the use of such concepts when those who use them are *unaware* of the fact that they have no empirical referent. A historian faced with not only a difficult problem of analysis but also a shortage of patience and paper might write that "the sweep of history forced the rulers to acquiesce." This use of "the sweep of history" would accord with the older use in sociology of such terms as "the social milieu," or (more simply) "environment," but it would be difficult to find the referent for these concepts. It may also be recalled that not long all respectable sociologists and psychologists misused the term "instinct." Even today competent psychoanalysts write essays upon the "death wish" or "racial memory".

It is easy for man to become enchanted at times by the image-evoking power of his own eloquence. Nor is it necessary to turn to social science for examples. Until fairly recently it was possible to find elementary physics texts which referred to the concept "ether." Ether was assumed to be an invisible matter, without weight, and susceptible to neither taste nor smell. It was, however, the "medium" through which light was thought to travel, like the water through which ripples travel. It may actually have had some of these qualities, of course, for subsequent investigation vealed its sole existence to be in the word itself. Recently, however, the term has been reintroduced for purposes of mathematical description, and without these objectionable "qualities."

The meaning of concepts may change. Every science sees its terms continuously being modified as its knowledge accumulates. The more is known about the referent of a concept, the more specifically that concept can be defined. However, a somewhat different definition results, and consequent shifts in meaning may confuse the student.

Another source of such changes in meaning is the changing *focus* of a science as it grows. Attention may be centered upon different *aspect* of the same concept in such a way as to change its meaning, although the same tennis kept. Thus, a concept "grows" with the increasing experic of scientists with the phenomena to which it refers. As these experience multiply, it is seen that the original concept "covers too much," and several eral concepts are used to refer to the different kinds of experience discovered by research. Thus, instead of "status" alone, we may come to use "status," "rank," "role," "position," "situs," and so on.

The term "intelligence" has gone through such an evolution. It was not long ago that intelligence was conceived by psychology as being an inherited, fairly stable intellectual potential. Later, because so many conflicting data were discovered, it had to be redefined, and one way of describing it became merely the score made on certain types of test. With such changes occurring, it is easy to see that overlapping of meanings may occur and may well lead to confusion. It is precisely this type of misunderstanding which makes it difficult for a contemporary chemist to read treatises written two centuries ago in his field. Similarly, the sociologist of today finds the writings of even 50 years ago very confusing. Not only are some of the terms different, but those which are the same have different meanings in the two periods.

RECAPTUALIZATION

The situation, then, is not one of chaos. All these problems do arise, but as the science develops we see one conceptual difficulty after another disappear. Others, of course, take their place, but that is characteristic of communication when the things talked about are changing. These types of confusion are faced by the community of scientists in a given field and are gradually solved by joint research and discussion. Furthermore, these added considerations should be kept in mind:

1. In the main, the terms are clear and cause little difficulty.
2. Since scientists are working on much the same group of problems with similar techniques and vocabulary, an occasional confused or obscure conceptual usage may cause little difficulty. The *context* of the exposition, as is true for language generally, points to the intended meaning of the concept.
3. From time to time, conceptual analyses are made which point to confused or overlapping usage and suggest a solution. Thus, difficulties in communication do not proceed far without correction.
4. As the science develops, many conceptual problems are by-passed when the concepts themselves become irrelevant to the newer theoretical tasks.

We may say, then, that the student must learn the conceptual tools of his field. When concepts are ambiguous, he must become aware of the ambiguity. Since the only ultimate assurance of conceptual clarity in sociology is precise thinking about its phenomena and their interrelationships, he must not become lost in the mere manipulation of concepts.

It is worth while, however, to suggest some procedures for clarifying his thinking about the concepts used in his research problem. This process of clarification may be called "reconceptualization," or "respecification of concept," following Robert K. Merton and Paul F. Lazarsfeld. This oescription of w.hat the scientist does implicitly or explicitly is only a tentative statement. However, the careful student will compare some of these hints with the later discussions of the hypothesis, the logic of proof the formulation of questions, and the analysis of data, for in each of these cases the main focus of discussion is the problem of clearly defining the research project.

1. After writing out the preliminary statement of the project, the student should carefully select from the statement a list of all the major concepts: "marital adjustment," "family ritual," "adolescent," "segregation," "social class," etc.
2. Next, an analysis of the apparent *meaning elements* of the concept should be made. This is a first step in finding out how we are actually using the concept. For example, we may find that in our concept of marital adjustment there are elements such as these: (a) personal happiness; (b) conformity with the rules of the society; (c) acceptance of fate (d) being in love with one's spouse; (e) liking the marital state; (f) aceptance of monogamy; (g) a clear realization of the problems of marriage; and so on. In this case, we would have to decide how many of these meaning elements we would be able to accept as part of our concept. We might, in some cases, find contradictions between these elements. Already then, we would have located and specified part of our conceptual problem.
3. It would then be useful to return to the published literature in which the concept has been used, in order to discover the

various usages of the term. Very frequently we find that the concept has not been clearly defined at any time, but we can see how it was applied in any study. In a few cases, we may find specific aids to clear thinking. Sometimes these further definitions will change our approach to the problem. "Juvenile delinquency," for example, may be defined in terms of commitment to a reform school, in one investigation. In another, it may be defined by conviction alone. In still another, it may be defined by reference to the court calendar, the police blotter, or even to records of police calls. Each of these definitions changes the research project considerably, since the phenomenon being studied is different in each case. Such differences in usage, however, may also turn our thoughts to the notion of *types* of delinquency, so that we must develop still further definitions. We may then reanalyze the usual practice of equating adult crime with juvenile crime. We may decide that we cannot accept certain types of police offenses as "juvenile delinquency." We come to select from the complex mass of behavior called "delinquent" only certain kinds of behavior, and we thereby redefine the concept with which we began. However, since each of these steps requires an explanation and constant reference to our subject matter, we will understand our concept much more clearly. Its precision and its usefulness will both be greater.

4. A further step should also be takenthat of relating the phenomenon to similar phenomena which have been described by *other terms,* and often in other fields. This step should be taken separately from the previous one of bringing together the various phenomena or types of behavior that have been described by the *same* term. Although the student may at first be impatient with such steps, he will find that these operations are not mere exercises in ingenuity. The concept that seemed so clear and sharp will be shown to have many complex and often contradictory facets, and the final result will be a concept of much greater fruitfulness and definiteness.

Furthermore, respecification of the concept always leads to more fruitful *hypothesis'* as will be discussed later in this text. Of course, most sociological studies do not report these processes. When we read Max Weber's analysis of capitalism, we are not immediately aware of the complex ways in which the concept of capitalism was redefined in order to be more effective. There are two excellent analyses, however, that make explicit these procedures. They are even more useful to the student, since their major goal is not a discussion of these operations but the application of these techniques to modern sociological research. These are Robert K. Merton's codification of functional analysis, and Robert K. Merton and Alice Kitt's development of reference-group theory. The student who believes that he needs only to "think a bit" about a given concept in order to develop it adequately will do well to study carefully both these essays for the useful conceptual techniques applied by Merton and Kitt.

The essay on reference-group behavior makes considerable use of this third step, relating the phenomenon to similar behavior described in other studies under different terms. Beginning with the apparently concrete term "relative deprivation," used by Samuel A. Stouffer and his associates in *The American Soldier)* we are taken through many steps in the elucidation and development of this concept. Various elements in the term have been called, by one writer or another, "social frame of reference," "patterns of expectation," "definition of the situation," "in-group behavior," "generalized other," "emulation," "assimilation," etc.

Now, it must be kept in mind that the purpose of this operation is not to exhibit one's cleverness in conceptual manipulation, or even one's learning; the purpose is to isolate and recombine those elements which will be most fruitful in research. There are many examples of behaviour under each of these concepts which can be classed as identical, so that we modifying, or collating, behavior from many fields. Many elements, however, are also. dissimilar, and at these points we begin to see a more systematic framework emerge. We know that people in general see problems according to the notions of their own group. However, it is sometimes a *different* group that is taken as the basis of reference. Usually, it is the values and expectations of the group that must be the center of attention. We also note that the problem begins to divide: Which group or groups? Which individuals respond to which groups? Under what conditions? What are the relationships between the groups selected? What the process by which the individual selects one group as a reference? Note that we are not only expanding our concept into many related but sharper concepts, but also developing specific hypotheses for immediate research. It should be further noted that the usefulness of this operation is based in part upon the fact that it integrates various theoretical ideas which were the product of isolated studies. The use of different concepts for similar types of behavior may thus have obscured the common elements, while avoiding a clear definition of the differences between them. Moreover, we can also see that we are not analyzing concepts in pure abstraction but are redefining them in direct relationship to the social behaviour being reported in these other studies. Thus they have a basis in fact, at the same time that they are being integrated with further theoretical development.

5. A final operation may be mentioned, of particular use for the theoretical fruitfulness of the concept: ascertaining the next higher (or lower) level of generalization of the concept. Here again, the goal is to clarify the concept, while increasing its usefulness for research. Although most research ideas with which students begin are likely to be rather highly general concepts, such as "function," "modern society," or "socialization," a few will begin at a concrete level with such concepts as "Hell Week at Doon College," or "our corner drug store," or "my dislike of spanking." The first three will probably seem to the student to be more significant than the last three, but neither group possesses an unquestionable, intrinsic advantage over the other. The first group deals with broad forces, but when the student examines them through the procedures outlined here, they will turn out to contain many vague and

complex elements. The latter group, although apparently less important, may be much easier to define clearly.

However, science must integrate both levels. Its specific research activities must always be concerned with the concrete, while its aim is to produce the general. Similarly, in sociology we may study the apparent trivial, but our work remains trivial unless we can generalize from it. Therefore, one aim in reconceptualization, as in the development of hypothesis, is to integrate carefully these different levels of observation and theory. At the same time, we learn much more definitely which elements we are really trying to abstract from the concrete behavior under study. The result is a greater clarity in the concepts we use.

This process' may become fairly complex, but it is possible to indicate briefly its general form. For example, Hell Week at Doon College has many aspects. We might count the numbers of individuals involved. We could map their physical location on campus. We could collect data on their health, weight, height, age, or shape of skull. We could, instead, study the flora and fauna at this particular time of the year. Most of these suggestions sound absurd, but the student must see that the *social* elements have not been picked from the concept: age-grade stratification patterns, rituals, customs, social isolation of the campus town, importance of sororities and fraternities.

To analyse and study, Hell Week's work, first of all, one example of common practices on college campus is the initiation of freshmen. With this insight we have moved from a concrete case to a class of concrete cases. Although a survey might cover many cases on the one hand, on the other we are offered a hint of a still higher level of generalization when we study the elements in "initiation": physical and social punishment, out-group and in-group, and so on. Initiation, we know, is but one case of a still larger group of phenomena, which we may call "rituals of passage," *i.e.*, the rituals and customs which surround and give meaning to the *transition* from one status to another: confirmation, graduation, taking the oath of office, marriage, baptism, circumcision, etc. At each level, the concentration of interest may be in how these groups select, the aspirations and choices of those selected, the rituals themselves, the emotional responses of those selected, and other problems. What is noteworthy, however, is that at each step we are bringing our case under a still wider rubric. We must, then, see which of the relevant aspects of our case we are most interested in, so that our data will be relevant to the proper higher level category. In this case, we have moved toward the concept, "rituals of status transition," but we need not stop at this point. We could proceed to generalize this to "rituals of all kinds," or "all status changes." The still higher levels need not concern us, for we are only noting that our choice of focus at any level determines which direction our generalizing will take. To return to our poor freshmen, if we had decided to concentrate upon their emotional responses, we might have generalized toward "responses to situations of status ambiguity," or "responses to the temporary loss of status," or (at a higher level) "responses to strain."

Proceeding from the highly general concept to the more concrete simply challenges the student to translate his broad notions into concepts (such as Hell Week) that are concrete enough to be observable. From either direction, this operation forces the student to attempt an integration between theoretical levels, to locate concrete behavior for possible observation, to identify which conceptual elements are of primary concern, and thereby to have a much clearer notion of *how* general his concept is. The result is a more useful and more sharply defined concept.

THE OPERATIONAL DEFINITION

One facet of the polemic, between the "fact-oriented" and the "theory-oriented" sociologists has been a disagreement about the importance of the operational definition. The debate is a rather complex one, but its central point was whether a concept is most usefully and precisely defined by describing the operations which observe, measure, and record a given phenomenon. The "fact-minded" group has leaned toward the opinion that a concept like "mass" or "length" or "social cohesion" *means a set of operations.* Thus, the mass of an object is the number obtained when we go through the operation of weighing the object on a balance. We are not to confuse this meaning with the many other characteristics we think of when we have the notion of mass in mind.

Against this stand, the opposition group has contended that when we think of such a concept, we do not "mean" merely these operations. Rather, they are simply the techniques we have to use in order to get at, or measure, something *behind* those operationsthe phenomenon itself. Such procedures, then, are useful because we cannot directly observe or measure, say, "social cohesion." However, it is "social cohesion" that we really wish to discuss, not these operations.

At the present stage of sociology, we may find a compromise between these positions, and indeed the debate is taken less seriously at the present time. Perhaps we may deal with the problem more easily by remembering that a concept *is* a set of directions, in one major sense: it directs the reader to a particular kind of experience, one which has to some extent been shared. If it does not do so, communication is difficult. Thus, whether the concept is defined in a literary fashion or by a set of laboratory directions, the definition turns attention to this experience.

Furthermore, it is clear that the physical sciences have laid great emphasis upon the operational type of definition. Relatively few concepts in these fields refer to direct experience, such as weight, length, or color, and even these are defined by a set of operations. Most concepts refer to phenomena that are not measurable or visible to the naked eye. By defining these phenomena through a set of directions, there is greater assurance that scientists from other nations, thinking in other languages, will "mean" the same thing. It seems likely that as sociology develops a more precise and more commonly shared set of research operations, there will bf an increasing development of operational definitions.

It can be easily seen, however, where the possibility of confusion enters. Suppose, for example, the sociologist decides to define "status" by means of a set of directions which tell the researcher to mark on a standardized list of iterfis whether the family possesses certain objects such as rugs, living-room lamps, or a radio or television set; whether its members belong to certain organizations such as Camp Fire Girls, Odd Fellows, or Kiwanis; to what extent its members have attended school; etc. The directions may further indicate what weight should be given to each item, so that a final "status score" can be'calculated.

So far, there should be no confusion, and any experienced field worker should be able to follow such a set of directions and to obtain the same results for the same families. If we now attempt to analyze "status" on the basis of this research, however, we must not expect to find that our facts will be easily comparable to older analyses of status, for these used different definitions of status. Our operational definition has given the old concept a new meaning. In this case, there will be overlap in meaning, but status as traditionally defined does not refer to quite the same set of experiences. The confusion, then, arises because we are likely to use the same *term* to refer to different phenomena: (1) the data from our newly defined operations; and (2) the data traditionally associated with "status." This confusion has occurred widely in discussions of the intelligence quotient, or IQ test, since its results are often treated as relating to an innate complex of factors called "intelligence," whereas the IQ test is rather an operational definition of selected factors of intellectual achievement and potential. If we use "IQ" only in the second sense, there is no confusion; if we apply these results to the more common-sense meaning of "intelligence," many unnecessary problems arise.

An operational definition, therefore, may define a phenomenon with greater definiteness in that it outlines the directions for having the same experience as other researchers. On the other hand, the redefinition that is the result of such a definition may leave out important elements of an older concept. Furthermore, in order to develop an operational definition, considerable research must be done upon the phenomenon to be defined. Consequently, we should not attempt an operational definition merely to be in fashion. We must do so in full consciousness of its problems, knowing that the traditional term (such as "morale," "social cohesion," "social structure") is likely not to refer to exactly the same phenomena as defined by the operations we outline. And, in some cases, an operational definition may be more complex and unwieldy, while less fruitful in its results, than a traditional definition. With respect to some knotty problems in research, we may have to make a conscious decision as to which we need most-precision or significance. As our research project develops in precision and scope, however, we shall find ways as the recent history of social research clearly shows, to obtain both.

2

RESEARCH AS A CONCEPT OF DEVELOPING KNOWLEDGE

Research is a systematic, planned and refined scientific method of employing specialised tools, instruments, and procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means. It starts with a problem collection of data or facts, analyse them critically, systematically and draws conclusions based on the actual evidences. It involves original work, rather than exercise of personal opinion. F.L. Whitney who writes that all creditable research is in terms of ordered reflective thinking. Out of more or less definite feeling of need, a problem emerges and takes concrete form. A solution is sought in terms of likely hypothesis, accepted tentatively, examined objectively, evaluated through all evidences obtainable and finally corroborated as the most general conclusion appearing at that time. This is then, examined for predictions.

One may be tempted to give the views of library and information scientists on the term research. J.H. Shera writes that research is, "an intellectual process whereby a problem is perceived, divided into its constituent elements and analysed in the light of certain basic assumptions; valid and relevant data are collected; hypothesis (if any), are through objective testing rejected, amended, or proved. The generalizable results of this process, *qualify as principles,* laws, or truths, that contribute to man's understanding of himself, his works or his environment". In other words, research is an intellectual, careful, ordered, reflective and a systematic attempt to discover new facts or sets of facts, or new relationships among facts, through the formation of preliminary explanation or hypothesis which is subjected to an appropriate investigation for validation of disproof.

Dr. S.R. Ranganathan writes : "Research is critical and exhaustive investigation to discover new facts, to interpret them in the light of known ideas, laws and theories to revise the current laws and theories in the light of newly discovered facts, and to apply the conclusions to some practical purposes. The findings of research are deposited in the internal memories of individual's and also in the externalized memory of society viz., books, periodicals, and other micro-documents represent".

Best and Kahn defined research "as systematic and objective analysis and recording of controlled observations that may lead to the development as generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events."

The definitions given above is rather abstract, hence a summary of some important characteristics of research are mentioned below to clarify its spirit and meaning.

CHARACTERISTICS OR RESEARCH

1. Research is directed towards the solution of a problem. The ultimate goal is to discover cause and effect relationships between variables.
2. Research emphasizes upon the development of generalizations, principles, or theories that will be helpful in predicting future occurrence.
3. Research is based upon observed experience or empirical evidence.
4. Research demands accurate observation ad description.
5. Research involves gathering of new data from primary or secondary sources or using existing data for a new purpose.

6. Research is more often characterized by carefully designed procedures that apply strict and impartial analysis of data.
7. Research requires expertise.
8. Research strives to be objective and logical, applying every possible test to validate the procedures employed, the data collected and the conclusions reached. The researcher attempts to eliminate personal biasness.
9. Research involves the quest for answers to unsolved problems.
10. Research is characterized by patient and unhurried activity. It is rarely spectacular.
11. Research is carefully recorded and reported.
12. Research sometimes requires courage. Many important discoveries were made in the history of science in spite of the opposition of political and religious authorities.

The strict standards followed in connecting research are clear from an examination of these characteristics. Research is an honest, exhaustive, intelligent searching for facts and their meanings, implications with reference to a given piece of a hypothesis as research should be an authentic and verifiable contribution to knowledge in the field studied.

The research means "a systematic, frequentative and intensive study of the collected data. In other words, the activities that go by the name of research involve mainly a 're-search" i.e. activities undertaken to repeat a search. Thus, research refers to "a critical and exhaustive investigation or experimentation having as its aim is the revision of accepted conclusions in the light of newly discovered facts." The researcher is constantly concerned with re-searching the accepted conclusions of his field.

The obvious function of research is to add new knowledge to the existing one, but its power for cleaning our minds of cliches and removing the rubbish of inapplicable theory is equally notable. Scientific research is a cumulative process; it is also a rejective process, especially in the social sciences. Understanding can be advanced not only by gains in knowledge but also by discarding outdated assumptions. In fact, research means a movement, a movement from the known to the unknown. This movement may be an advance, and a conquest, but it could also turn out to be a rebuff and a retreat. But even a negative result, under certain circumstances, can be the crown of research. One may conclude the discussion by borrowing from the **Encyclopedia of Social Sciences,** wherein research is defined as; the manifestation of things, concepts or symbols for the purpose of generating to extend, correct, or verify knowledge, whether that knowledge aids in the construction of theory or in the practice of an art.

KINDS OF RESEARCH

1. Observational Research

Science begins with the observation and must ultimately return to the observation. Observation is the basic method of acquiring knowledge about the world around us. Observation means systematic viewing of the phenomenon. Observation is a perception with a purpose. In it, only the relevant things are taken into account. Therefore, observation should be highly selective. Observation becomes "a scientific tool for the researcher to the extent that it serves a formulated research objective, is planned systematically, is related to more general theoretical propositions, recorded systematically and is subjected to checks to control for validity and reliability.

Researcher is primarily a discoverer and his main source of information is his own experiences derived from observations and experiments. Observation implies the use of close contacts on personal level to seek the desired information data. It is the accurate watching and noting of phenomena as they occur in nature with regard to cause and effect relations. Observation, to Ranganathan, is the act of taking note of facts and depositing them in the memory either directly of after being correlated with already known facts. The accumulated knowledge of biologists, physicists, astronomers, and other natural scientists is built upon centuries of systematic observations of phenomena in their natural surroundings rather than in the laboratory. In social sciences, the term is often used in a much wider sense.

The participant observers, for example, share in the life and activities of community, observing-in the strictest sense-what is going on around him, supplementing it by conversation, interviews and studies of records. The distinguished feature of observation in the extended sense is that data required are obtained directly rather than through the reports of others. Observation often involves the measurement of some quality or quantity.

Ranganathan defines experimental research as the act of observation coupled with the manipulation of the context and the conditions of observation. It is often done in order to discover some unknown principle and relation among facts or to test and illustrate an already known principles. The distinctive mental process involved in observation and experience perception. The primary senses may be unaided or be aided by instruments. Experiment, observation, survey and other similar acts are denoted by Ranganathan by the term 'Observation Research'. This forms one level of research.

2. Empirical Research

Research can take over the results of observation, sort them out, and induct from (with the help of statistical methods including equations and correlation) certain generalized relation between facts. These are called by Ranganathan as 'Empirical Laws'. The distinctive mental process involved in arriving at these Empirical Laws is induction. It is essentially the intellect that is brought into play in induction. Ranganathan denotes it by the term 'Empirical Research'. It is really a matter-of-fact -research , both observational Research and Empirical Research are denoted by Ranganathan by a generic term 'Pragmatic Research'.

3. Fundamental Laws

Unlike the Empirical Laws, which are the product of the intellect, it is also possible to have fundamental laws apprehended by intuition without the mediation of intellect or perception. A man having abundance of intuition is called 'Seer'; sometimes, it is called 'divine or transcendental apprehension. Ranganathan writes that transcendental apprehension of fundamental laws through intuition should not be taken to be research; it is beyond research. It is the ultimate starting point for deep a priori research.

4. A Priori Research

The distinctive process involved in a Priori Research is deduction. Intellect plays the vital role in deduction. It moves from assumed cause to its effect. It has two levels; Pure Research and Applied Research.

4.1 Pure Research

A priori research-and occasionally even pragmatic research may be pursued unbiased by any possible use of its results. It may not be directed towards the solution of any practical problems of any known, immediate or ultimate utility. Ranganathan denotes it by the term 'Pure Research'. We can have pure research in any subject. Pure Mathematics is the field par excellence for pure research. For, as Bertrand Russell aptly remarked; "Mathematical research is pursued without even caring to know whether it has or does not have any correlation in the phenomenal world. A pure mathematician pursues his research without even caring to know whether its results are meaningful. "Pure Research usually establishes as a variety of tools and models. And when factual experience grows, society may find some of these models to be meaningful to some utlitarian purposes. The utility of pure research is not communicate but may be found only years or even centuries later. Nevertheless, these are highly significant as well as unexpected discoveries.

Under the term pure research, F.L. Whtiney includes two types of researches; Free Fundamental and Oriented Fundamental Research. The former type of research is pursued by an individual. He has freedom for his invention. He tries out his own ideas as appeal to him. The aim of pure research is not found directly in the realm of specific human needs. In latter type, the research worker is concerned with knowledge and understanding of nature. But this field is limited. It is usually a team work. Such research is useful for both theoretical discoveries as well as for practical application.

4.2 Applied Research

Applied research is pursued for some specific purpose outside its own domain, either for an immediate distinct utility with a specific human need or as an aid to the development of some other subject. Applied Mathematics, Applied Mechanism, Applied Chemistry, Applied Psychology and Applied Sociology are some of the examples of this type of research.

4.3 Developmental Research

It is the final stage where a new process discovered in Applied research are put to use for social and Economic benefits. The need for this type of research is now felt in almost all industries. Many industrial houses are now having wings for Developmental Research.

In modern world, Applied Research dominates particularly in developing countries to find better, quicker and cheaper ways of doing things for the betterment of people. Nevertheless, a proper balance between Pure Research and Applied Research is necessary for social progress. Pure research is a search for broad principles and synthesis without any utilitarian objective, e.g. Frankin's discovery of electricity. This is more an intellectual pursuit arising from insatable intellectual curiosity. On the other hand, Edison's work, e.g., phonograph is an example of applied research associated with particular projects and problems. Such research being of practical value may relate to current activity or immediate practical situations. Now-a-days, practical orientation dominates in most fields of study.

Robert M.W. Travers in his work, 'Introduction to Educational Research', draws the distinction between pure and applied research.

Basic (or pure) research is designed to add to an organized body of scientific knowledge and does not necessarily produce results of immediate practical value. Applied research is undertaken to solve an immediate practical problem and goal of adding to scientific knowledge is secondary.

Pure research is primarily concerned with the formulation of a theory or a contribution to the existing body of knowledge. Its major aim is to obtain and use the empirical data to formulate, expand or evaluate the theory. It aims at the discovery of knowledge solely, for the sake of knowledge. Applied research, on the other hand, is directed towards the solution of immediate, specific and practical problems. It is performed in relation to actual problems and under the conditions in which they are found in practice. The goal of applied research in terms of adding scientific knowledge acquires only a secondary position. It places importance on a problem here and now.

The applied research also utilises the scientific method of enquiry. Its methodology, however, is not as rigorous as that of basic research. Moreover, its findings are to be evaluated in terms of local applicability and not in terms of universal validity.

Pure research is original or basic in nature. An imaginative and painstaking research worker, with his lust for the search of truth, makes persistent and patient efforts to discover something new to enrich the human knowledge in a fundamental fashion. Therefore, such research is also called as fundamental or pure. Fundamental research may manifest itself as:

(i) **Discovery of a New Theory:** Fundamental Research may be entirely new discovery, the knowledge of which, has not existed so far. Such a discovery may flow from the researcher's own idea or imagination depending upon his/her ingenuity. The researcher falling in this category is often born-genius, has a sharp intellect, has a hunger for new knowledge and eventually has an ocean of knowledge in his possession and from this ocean emerges a jewel, a light that enlightens the world. Galileo's, Newton's, Darwin's Dr. Ranganathan's contributions are fundamental in imagination and scholarship. Since these fundamental contributions form the basis of different theories, such a research is also called as theoretical research.

(ii) **Development of the Existing Theory:** It involves an improvement in the existing theory by relaxing some of its assumptions or by re-interpreting it or by developing a new theory, with the existing one as its basis. For example, the

Malthusian Theory of population was rendered almost useless in England itself because of new developments invalidating the assumptions of his theory. By dropping out the invalid assumptions, researchers came out with new theories on population growth. There have also been attempts to reinterpret Malthasian doctrine trying to retain its validity. By questioning some of the assumptions of Khjnesian theory, Friedman came out the new interpretations of the monetary phenomenon. Theories developed by capitalists countries have often been attacked by the researchers of socialist block either re-interpreting or developing new theories akin to those already existing. There is a possibility of emerging new theories akin to those already existing.

Applied research on the other hand, is based on the application of known theories and models to the actual operational fields or populations. The applied, research is conducted to test the empirical content, or the basic assumptions or the very validity of a theory under given conditions. It often takes the form of a field investigation in social sciences.

Pure and Applied Research, however, are not distinct and separate activities. It is a team work of scientists activities. The difference is in emphasis, not in method or spirit. Each type is committed to the high standards of scientific objectivity and scholarship. The researcher in each type of research attempts to define the problem being studied with precision, to derive his hypothesis from a rich background of information related to the problem, to design the study so that it will result in a genuine test of hypothesis to collect and analyse facts on evidence carefully, and to draw generalizations objectivity and scholarship. The researcher in each type of research attempts to define the problem being studied with precision, to derive his hypothesis from a rich background of information related to the problem to design the study so that it will result in a genuine test of hypothesis to collect and analyse facts on evidence carefully and to draw generalizations objectively. Joseph Needham aptly comments: "There is no sharp distinction between 'pure' and 'applied' science., There is really one science with long term promise of application. The knowledge emerges from both kinds of science". Basic research resembles the sowing, whilst judging of practical problems can be compared with the harvesting.

5. Deductive and Inductive Research

Deductive research is the process by which theory is tested when from postulates or from known scientific principles, scientists draw conclusions or generate new theories relating to specific cases using deductive reasoning. But the accuracy of a conclusion reached at depends on the accuracy of the postulates or principles.

Inductive logic, on the other hand, is the process by which theory is developed; whereby observing many individual examples, the scientists draws general conclusion or genéral theory. David J. Buckley makes a distinction by saying that if the researcher does not have an answer to a question and hence embarks on a facts finding mission, he is engaged in inductive research. If he has what he believes to be an answer to a research question, but wishes to confirm or apply it through further testing, he is engaged in deductive research. In other words, deductive research is guided by a **priori hypothesis** (i.e. existing in mind prior to and independent of experience) which are either proved or disapproved during the course of investigation. Inductive method is employed to generalize from the known and verified facts of a given class to the known and as yet unverified facts of same class.

6. Seminal Research

In every discipline, over a period of a century or so, a few men of genius make landmark contributions. Their work exposes the fundamentals and lay the foundation of the subject. It will be charged with a high degree of intuition. It is likely to make a great impact on the course of developmental research and dwell upon itself a large number of works from its own as well as other related fields. Research of this kind cannot be done to order nor can it be directed. Any such men of genius; ensuring that the **solo research** done by them is not interfered with or dream un- disturbed, scientillate, and radiate at his own time and space; and finally to reduce to a minimum the environmental handicaps (e.g. difficulty of access to documents); and the expenditure of intellectual, mental, and physical energy on the necessary routines associated with the work.

7. Team-Relay Research

In its early stages of growth of a subject, a discipline may have to depend largely on the work of a few genius. When society discovers the value of the work; the kinds and number of demands on the discipline increases and thereby the number of practitioners of the profession increases. The need for wide application and full exportation of the findings of fundamental research for utilitarian ends will call for some of the following lines of work:

First, working out specific procedures for application to particular pieces of work; second, analysis, testing and evaluation; third, devising suitable methods for productive utilization of the findings of fundamental research, fourth, developing techniques for progressively reducing the dependence on mere flair; and finally, thereby making the work more and more objective.

It will be wasteful to depend upon and engage for this purpose to few men of genius. Team-relay research among intellectuals would be more productive from of organisation in such a context. It also helps in bringing to bear on problem specialised knowledge in different branches of the subject and even from other disciplines. However, team research would call proper division of labour coordination of the work, and avoidance of wastage of effort.

8. Role of Intuition in Research

While research is essentially an intellectual pursuit, it is occasionally lighted up by a flash of intuition in some researcher or other. The intuition coming into pay is so slight and so fleeting that it does not reveal any fundamental laws. Intuition may also reveal the value of something seen or done, which escapes apprehension by intellect alone. Here too, the intuition coming into play is so slight and so fleeting that it does not reveal fundamental laws. Perhaps its role in research may be described as analogous to the water flowing in a river being occasionally added to by a feeble underground spring.

A large number of intuitive ideas alone can flood- light the phenomenal world down to the near-seminal level and reveal fundamental laws. It was intuition which helped Ranganathan to formulate the Five Laws of Library Science in 1928. It took nearly two years for the intellect to make inferences from the Five Laws. Even today after so years later, the intellect has to work on the Five Laws and get more inferences to suit the present-day social concepts influencing library services. It was intuition that helped Newton to 'see' the fundamental laws of gravitation and of motion, but it was the intellect that led him to deduce from them the theorems on Plantary Orbits. This was pure research.

Though intellectually separable yet the different kinds of research are not separated in actual practice. On the contrary, they are blended at various stages and in different combinations. This is a matter of judgement in each situation. Research in physical sciences is concerned with the behaviour of matter and energy; in the biological sciences with the behaviour of life that has emerged out of matter and energy; in medical sciences with man who has grown with new dimensions of consciousness like 'mind'; in the social sciences with the behaviour that human being aggregates like family, community, society and nation etc., and in human movements of the mind and the infinitude of the spirit

3

RESEARCH AND THEORY

Theorizing is an integral part of empirical research just as empirical research has meaning only by reference to a theory or proposition from which it is generated. The scientist is constantly engaged in researching the accepted conclusions of his field; the theoretic propositions he uses. He does this researching by probing for facts of the empirical world that falsify one or more predictions or deductions generated by his accepted conclusions on theoretical models. It is also obvious that during this stage researching involves modification of the existing theoretical schemes or construction of new theoretical models that are expected to take the place of those mo longer able to make sense of or explain the existing state of things.

It is a near convention to view the relationship between theory and research from the vantage point of the former. This leads to asking, "What does research do for theory in the way of testing its utility or correspondence with reality?" If we turn it around, we may ask, "What is there about a theory that has some import for the working researcher?"

These two questions meet at some point of the scientific enterprise but their answers are determined by the direction from which the meeting point is approached. Coming from theory to research and moving towards theory, attention turns to such issues as measurement in all its phases, translation of hypotheses into operational terms, reliability of empirical indicators and so on.

There is in evidence an unfortunate tendency in quite a few methodological writings dealing with connections between theory and other from their respective starting points but fail ever to meet head on at any point of their journeys.

The rift between empiricists (empirical fact-gatherers who intend to generalize on empirical data) and theorists, is very old indeed. The great encyclopaedic minds of thinkers like Comte, Spencer and Marx developed grand conceptual schemes on social organization and change. At this time there was already some theorizing which was devoid of empirical reference.

Around 1938, a cry voiced through the Journal of Empirical Society of London went up that in the business of Social Science, principles are valid for application only in as much as they are legitimate inductions from facts accurately observed and methodologically classified. The conflict between theorists and researchers, to use Weber's words, the interpretive specialists and the subject-matter specialists, has filtered down to the present day. It is true that theory in social sciences has developed to a great extent independently of systematically pursued research and on the other hand, empirical research has seldom concerned itself with theoretic interest. The result is a deep hiatus. Alongside of this is the erroneous assumption that theory-building and researching are two mutually exclusive domains and that theorists and researching are two mutually exclusive domains and that theorists and researchers have to belong to only one of these two schools. In consequence, empiricists have rarely attempted to contribute to theory and are often anti-theoretical; for them theory is mere speculation-sterile dialectic or mysticism. On the other hand, the theorists have equally sadly shown scant regard for empirical work.

It should be appreciated that the historical and intellectual backdrop behind the apparent conflict between theory and empiricism. Firstly, social sciences had their roots in social philosophy. Early masters of social thought were speculative philosophers having a characteristics disdain for any empirical base required for spinning out theoretical schemes.

Secondly, empiricism's emphasis on measurement, quantification and their equation with scientific value has been one major cause of conflict between empirical researchers and theorists since the theorists opined that in human interaction everything cannot be counted and everything that is count does not count (matter).

Thirdly, empiricists are disillusioned by a plethora of theoretic orientations which appear as social theory since some propositions derived from them are so vague and general that they cannot be systematically tested.

Fourthly, theorists have been disenchanted by a telling discontinuity of empirical research, abundance of facts and decreased empirical generalization.

Principally, however, the scientific activity consists in producing a smashing collision on the highway connecting theory and empirical research. The purpose of such a collision is to generate a genuinely useful insight just as atom smashing produces new knowledge rather than a heap of debris. It is worthy of note that the forth, between the empirical and the systematic, i.e., theoretical (or rational).

It was on earlier occasion, pointed to the limitations inherent in the results of a single research study as also to the need for accumulating systematic knowledge founded on a broader theoretical base. Without such cumulative knowledge steadily flowing from the continuities of empirical research, the insights of social science will necessarily remain limited to the specific settings and problems in which the investigations have actually been conducted. Such a cumulative body of knowledge can be developed, provided empirical studies are theory-oriented and reciprocally, if theory is empirically confirmable.

Meaning of Theory: Scientific theory is a term which comes from the Greek word 'theorein' meaning to look at. A fair translation of scientific theory would be a knowledgeable outlook. There is a sense, of course, in which every one has a world outlook, and thus the meanest of man has his own theory; and to think at all is to theorize. Theory in ordinary speech does not mean this (more usually it means what is called a working hypothesis). Science provides the only systematic and corrigible world outlook not requiring any special suppositions beyond those readily made or ordinary men of affairs. It thus makes possible agreement and collaboration among people who in other respects, would be in severe disagreement.

Theory is a much abused term. It is, therefore, important to distinguish the modern scientific usage of the word 'theory' from other possible meanings it might have come to acquire. In common parlance, theory is identified with speculation. What is 'theoretical' is thought to be unrealistic, visionary or impracticable. Merton points out that among sociologists, the term 'sociological theory' has had at least six different meanings. In the early days of a science, theories were often the result of arm-chair speculation and had meagre support in empirical data. Theory and observation (empirical facts) become more and more connected as science develops. The social science in their present state of development do not always show a close link between research and theory and some current social theories do contain speculative elements, that leap off beyond the evidence of available data. By and large, the intention of a theory in modern science is to summarize existing knowledge, to provide an explanation for observed events and relationships and to predict the occurrence of as yet unobserved events and relationships, on the basis of the explanatory principles embodied in the conceptual scheme. Simply viewed, theory should be understood as a conceptual scheme designed to explain observed regularities or relationships between two or more variables. Writes Karl Popper in his Logic of 'scientific discovery, "Theories are nits cast to catch what we call 'the world,' to rationalize, to explain and also to master it. We endeavour to make the mesh finer and finer."Parsons observes, "The theoretical system (in the present sense) is the body of logically interdependent generalized concepts of empirical reference."

Whereas a theory in the earlier times was considered a final and irrefutable explanation of some class of things or realm of phenomena, in modern science it is always held with some measure of tentativeness, no matter how great the accumulation of findings consistent with it. It is considered as the most probable or most efficient way of accounting for those findings in the light of extant body of knowledge, but is always open to revision. On the whole, it may be said that modern science is modest in regard to its claims in as much as it is fully aware that its findings are all provisional. It do not find itself in a position to make final pronouncements having seen that the river of knowledge has too often turned back on itself. science has changed not only the face of earth and the life of its mode of thinking plays a more important role than knowledge and erudition, as of old. It was resulted in a method which leads to new knowledge and making a line of thought.

Johan Galtung conceives of theory as a set of hypotheses structured by the relation of implicating or deducibility. Formally put, " a theory T is a structure (H, I) where H is a set of hypotheses and I is a relation in H called implication or deducibility, so that H is weakly connected by I"

R. B. Braithwaite's exposition of 'theory' can barely be equalled. For him, a theory consists of a set of hypotheses which is arranged in such a way that is, which is arranged in such a way that from some of he hypotheses as premises all the other hypotheses logically follow. The propositions in a deductive system may be considered as being arranged in an order of levels, the hypotheses at the highest level being those which occur only as premises in the system, those at the lower level being those which occur as conclusions of deductions from higher level hypotheses and which serve as premises for deduction to lower level hypothesis"

Parsons would view the theoretical system as one which ideally tends to become logically closed, to reach such a state of logical integration that every logical implication of any combination of propositions in the system is explicitly stated in some other proposition in the same system.

However, it is will worth remembering that not all theories have a determinate logical structure as Braithwaite's exposition would lead us to 'believe.' Theories may have strong or weak structures. a strong theory stricture (tight-knit theory) may be represented as under:

HYPOTHESIS 1

↓

HYPOTHESIS 2

↓

HYPOTHESIS 3

↓

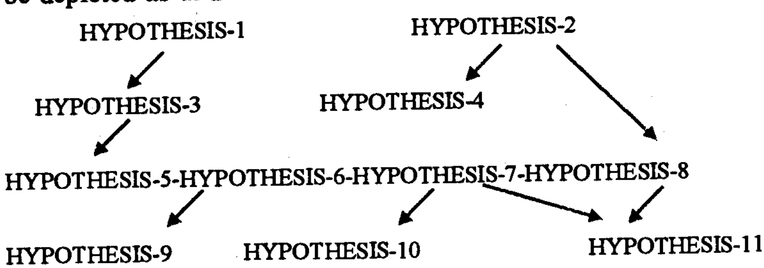
HYPOTHESIS 4

TIGHT-KNIT THEORY

Fig. 3.1

From the above representation, it is clear tat the lower level hypotheses which are deductions from the higher level hypotheses are all on the same implication path and that the chain of implication is a neat and uninterested one.

In contradiction, a weakly structured (loose-knit) theory may be depicted as under:



LOOSE-KNIT-THEORY

Fig. 3.2

It is obvious that the looke-knit structure unlike the one for tight knit theories (Fig. 3.2) is characterized by the implication chains on which the hypotheses are located.

Thus, it would seem as able puts it, "All theories fall in two extremes of a simple explanatory principle and a deductive system with an abstract relational structure formed by the theoretical postulates."

Hempel has likened a scientific theory to a network in which terms and concepts are represented by knots and the definitions and hypotheses by threads connecting the knots.

Says Hempel, "The whole system floats, as it were, above the plane observation and is anchored to it by the rules of interpretation. These might be viewed as strings which are not the part of the network but link certain points of the latter, with specific places on the plane of observation. By virtue of these interpretative connections, the network can function as a scientific theory. From certain observational data, we may ascend, via as interpretative string, to some point in the theoretical network, and from there proceed, via definitions and hypotheses, to other points, from which other interpretative strings permit ascent to the plane of observation." (See fig. 3.3)

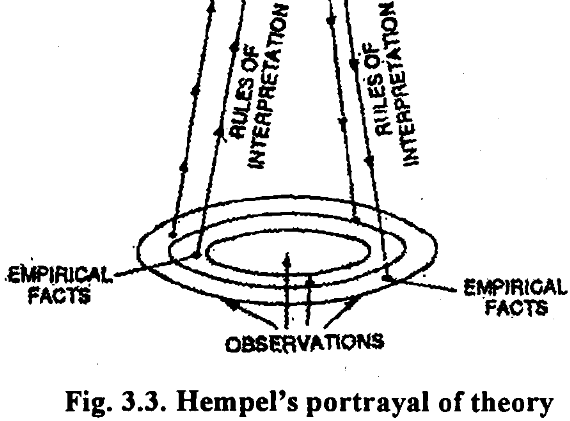


Fig. 3.3. Hempel's portrayal of theory

A theory explains empirical observations, since if anything, it is a mental construction that seeks to model the empirical system, Let us try to understand with the help of an interesting illustration, the nature of theoretical explanation.

In the third century A. D., it was observed that any natural catastrophe,, be if an earthquake, flood, drought, famine or pestilence, was followed by persecution of the Christians by the Romans.

In the 20th century around the thirties (1930-40), it was observed that a fall in the per acre value of cotton in certain southern states of the USA, was followed by incidences of lynching of Negroes by the whites. The underlying similarity in the two observations. viz., that catastrophe leads to persecution, is all the more striking because these incidents relate to periods far apart in time as also to different peoples and events. How can we go about explaining this sequence of events?

These two observations of a similar nature can be explained by means of a theory which involves the concepts: frustration, aggression, inhibition and displacement. This theory by Dollard and associates, inhibition 'Frustration aggression theory,' is constituted of interlocking hypotheses involving the above mentioned concepts. The theory in essence stated that when a person is frustrated and is inhibited from expressing his aggression directly toward the perceived source of frustration (because the source is powerful and capable of inflicting injuries, e.g., God or Government; he or she will displace his or her aggression toward weaker things(incapable of retaliating to the aggressive acts). Thus, according to this theory both the aggression by Romans against Christians after the occurrence of natural catastrophes or by fall in income of whites, results in aggression but the futility or fear of being directly aggressive against the God or society or Government inhibits the direct expression of aggression against the real sources of frustration and results in its being 'displaced' on to groups which are underprivileged and thus incapable of retaliating.

Hence, with the help of the above theory, an explanation can we offered not only for these two different observations but also on many other events such as the aggressive action of an officer against his subordinates following frustration by his superior officer or a doll, following frustration caused by its parent's actions. This way, a theoretical perspective brings out in a number of different phenomena the operation of some underlying general principle.

It must, of course, be noted that the 'frustration aggression theory' in its present form is inadequate. It does not account for the variety of relevant phenomena and cannot satisfactorily overcome some objections (Freud shows, for instance, that the frustration may lead to some highly constructive activity too).

This does not, however, mean that the 'frustration aggression theory is wrong. It is just that it is insufficient, not specific enough and not able to cover the relevant observable phenomena. The limiting conditions under which it applies (the *ceteris paribus* clause) have not yet been defined and this interferes seriously with its predictive value. In social sciences, there are very few theories that can safely be used for explanation and prediction. To speak in terms of Hempel's metaphor, one discovers isolated knots with loose threads hanging, awaiting, systematic efforts to tighten them and to tie them together; and quite often, even knots are not yet available.

Something needs to be said here what has hitherto been left implicit. The term theory as applied to the realm of social sciences is in fact used mostly to refer to some logical explanation about social phenomena or a class there of, logically constructed and systematically organised, that underscores the relationship between two well-defined variables. It is much more than a social law supported by evidence. As a systematic relation between facts, it cannot simply be derived from empirical observations and generalizations by means of rigorous induction. It represents a symbolic construction, theory building is a matter of creative achievement.

As a conceptual scheme reaches out beyond itself, it transcends the observable realm of empirical reality into a higher level of abstraction be means of symbolic construction.

In other words, theoretical statements can in most cases arise by a genetic path between sense-data and theoretical perspectives, out of sense datum statements. But by the time theoretical statements are reached, there is much more than could even be represented in terms of sense-data. A certain open texture is required in scientific theory which can be marred by an insistence on translatability criteria. Theory, if it is to be of any use, is bound to move ahead of the observations which support it in the first place. Thus, theory is not something which can be summed up in terms of observations, measurements or the positive content of our of any statement seeking entitlements as scientific theory is whether it can demonstrate the other phenomena, i.e., not merely the ones on which it rests in the first place. In this sense it stands for the symbolic dimension of experience as opposed the apprehension of brute fact.

From the very nature of social science theories emanates the limitations characterising these theories, viz., that they often represent speculative exercises and it may not be possible to establish their correspondence with will-defined propositions or laws that can be empirically tested. This state of maturity is distant goal for most social sciences. The development of these science has been marked by a large number of conflicting theoretical perspectives. Social scientists have not yet been able to develop a single inductive procedure or a mathematical model that could test their theories and validate them as applicable to all groups and societies. these theories lie between empirical law and speculative argument. Even a simple hypothesis may be regarded a minor theory and a speculative idea may come to be called theory if it generates at least one fruitful hypothesis, logically.

The theories of social sciences in the light of what has been said above can be verified only in a preliminary way, i.e., not in the strict statistical sense or not by fitting the syndrome of facts having a bearing on the class of phenomena being theorized. Social science theory can aspire for validation mostly by symbolic correspondence.

In the social-behavioural sciences, a quest for true theory could be a futile intellectual exercise. Every theory holds some pieces to the picture puzzle of the social world. A comprehensive picture of social phenomena may be expected to emerge through the integration of a variety of social

Theories: It is assumed that nothing exists except the world, then theory is part of the world; a part which stands in some way for the whole; and a comprehensive theory in dealing with the world will have to deal also with itself as apart of this world, just as the map of a country drawn somewhere in that country would have to contain a very much reduced replica of itself. a particular social theory may be linked to a map which showed only roads, or one which showed only railways. Scientific theories are selective; any one science is dealing with only a fraction of what there is to be observed. For that matter, all the sciences taken together will still give a very incomplete account of the world we know, just as the superimposition of all the specialized maps - the road map, the railway map, the demographic map, etc., would still leave indefinitely many concrete facts about the country unexpressed.

It is will-worth reminding ourselves here that no theory is absolutely true since there is no absolute truth in the first place and no theory is a final formulation because ripples of new knowledge are splashing in all the time. These modify or even repudiate the existing theory.

It will serve us will to note that theories which stand repudiated today had their days of glory. For example, at the present time Comte's theory of unilineal evolution has been used by experts on modernization to describe progress and evolution in total societies.

There is a need to sound a caution about the possible fallacy of misplaced concreteness which comprises placing of theoretical entities in the same world as the observable ones. Indeed, if they are there at all, they are there by definition, invisibly, which is certainly odd in a world whose claim to existence lies in it being observed. But the invention of theoretical entities is necessary for the progress of science and there is nothing wrong with them as long as they are not thought of as belonging to the observable world. All sorts of possible worlds with all sorts of imaginary constituents, behaving in all sorts of ways may be constructed by science and nobody would have any objection until the scientist tries to force conclusions derived from his hypothetical world upon actions to be carried out in the observable world. In essence, then, the provision of a working replica of the real world is the goal of theory and yet the claim that it is a replica of the real world is always rather presumptions.

The foregoing discussion would suggest that research and theory as co-travellers must proceed toward continuous increments of knowledge. Each has an important contribution to make to the other. A scientist may take one or the other as his starting point, but he must consider at some point of his exercise the bearing of his work on the interrelation between theory and research. That is, if he concentrates on empirical research alone, he must at some point later, examine its relevance to social theory if its potential contribution is to be realized. On the other hand, if his major testing and expanding his theory by empirical research if it is to turn out to be more than just an interesting speculation.

ROLE OF THEORY FOR RESEARCH

The existing body of knowledge inspires the scientist to formulate varied theories and to foretell what new observations would be revealed according to these theories. It should be the purpose of theory to suggest observations by which it itself may be disproved or falsified. Hence, in case observations disagree with the theory, the theory may be considered wrong, but if these agree with the forecasts or expectations based on the theory then it is the task of theory to suggest fresh observations so that it can be researched, revisited and tested again and again. In other words, there is no room for propositions in science which do not really pay their way empirically. Tying down the abstract logical system (theory) to empirical facts is an on going process of science leading to consolidation of existing knowledge and addition of newer dimensions to it.

(1) Theory provides significant guidelines and trails for the conduct of research by pointing to areas that are most likely to be fruitfully, that is areas in which meaningful relationships among

variables are likely to be found. If the variables come to be selected such that no relationships between them obtain, the research will be sterile no matter how meticulous the subsequent observations and inferences. a theoretic system narrows down the range of facts to be studied. Theory provides the researcher with a definite view point-a direction-which goes a long way toward helping him enquire into relationships between certain variables selected from among an almost infinite array of variables. As oppenheimer puts it. "in order for us to understand anything we have to fail to perceive a great deal that is there. knowledge is purchased at the expense of what might have been seen and learned and was not...it is a condition of knowledge that some how or the other we pick the clues which give us insight into what we have to find out about the would." As a storehouse of meaningful hypotheses a fruitful theory suggests potential problems for study and thus ignites new investigative studies. In fact, a theory can be judged productive to the extent it can spark off a number of questions. A productive theory suggests potential problems, fruitful hypotheses and provides new perspectives . Einstein and Infeld observe, "It is never possible to introduce only observable quantities in a theory. It is theory which decides what can be observed." Only thus can the task of science be reduced to manageability.

Besides suggesting fruitful approaches to phenomena in the general area with it si concerned, theory also provides leads for research in a different way, *viz.*, by suggesting other kinds of phenomena that may perhaps be understood or explained in the same general terms. Take the example of Cohen's theory of delinquent sub-culture'. The Central idea of Cohen's theory is that the delinquent sub-culture evolved by the working class juveniles is a response of these juveniles to deal with the problem of individual adjustment attendant upon the difficulty in meeting the criteria of status as prescribed by the middle-class standards which have to be reckoned with. The delinquent sub-culture provides alternative criteria of status which these children can meet and thus, helps them deal with the problem of individual adjustment.

Cohen's theoretical formulation constitutes a generic approach to the understanding of how and why any sub-culture arises. Thus, such different sub-cultures as those emerging among different professional groups or social classes or small communities may be understood in the same terms. Research on such groups would concentrate on discovering the common problems of adjustment faced by the members and the ways in which the particular patterns of these sub-cultures help members to deal with them. In as much as a theory summarizes known facts and predicts facts which have not yet been observed, it also points to areas which have not yet been explored, in other words, what gaps typically obtain in our knowledge.

Needless to say, such gaps would not be visible if our facts were not systematized and organized. It is thus that theory suggests where our knowledge is deficient. A researcher's acquaintance with the existing theories help him to select research problems that are likely to prove productive and worthwhile and to avoid enquiries into problems that may prove sterile, yielding no insights. As we have already stated in an earlier chapter, formulation of worthwhile questions is an important step and a precondition to the extension of knowledge. Alerting oneself to the gaps in theory and fact increases the likelihood of formulating significant questions for research.

(2) Another contribution of theory for research is in terms of increasing the meaningfulness of the findings of a particular study by helping us to perceive them as special cases of the operation of a set of more general or abstract statements of relationships rather than as isolated bits of empirical information. A theory typically enhances the meaningfulness of research, since seemingly unrelated findings of isolated studies assume new meaning and significance when they are put into proper theoretical perspective. let us take the example of observation by Durkheim that Catholics have a lower suicide rate as compared to the Protestants. As an isolated empirical

uniformity, the finding would not add greatly to our understanding of suicidal behaviour unless it conceptualized, that is, conceived of it as an illustration of a linkage amongst abstractions of an higher order (e.g, Catholicism-Social Cohesion-relieved anxieties-suicide rate). This done we are easily able to understand that what was initially taken as an isolated empirical finding of a relationship between religious affiliation and suicidal behaviour is in fact a reflection of a much more general relationship between groups with certain conceptualized attributes (social cohesion) and behaviour of their members. This way, the scope of the original empirical finding gets considerably extended and several seemingly disparate findings can be seen to be the contextual manifestations of the general principle. Similarly, to take another example, the seemingly isolated finding that wives complain of heavy expenditure when the husband's relatives are the house-guests may be understood on a higher plane of abstraction, to be an instance of the factor of emotional proximity or distance influencing perception. The scope of the findings thus enlarged, other apparently disparate findings may be seen to be interrelated by means of a theoretic thread (e.g., the distorting effect of lack of confidence or morale on perception may be derived from the same theoretical orientation). As a mental shorthand, theory summarises relationships amongst variables in a conceptual framework.

It is through establishing the theoretical pertinence of an empirical finding or uniformity, that we can provide for the cumulation both of theory and research findings. To illustrate, the empirical uniformities about differentials in the suicide rate lend added confirmation to the set of propositions (theory) from which they and other uniformities have been derived. This may be underlined as a major function of theory.

(3) The linkage of the specific empirical findings to a more general concept has another major advantage. It affords a more secure ground for prediction than do these empirical findings by

themselves. The theory by providing a rationale behind the empirical findings introduces a ground for prediction which is more secure than mere extrapolation from previously observed trends. Thus, if studies indicated a decrease in social cohesion among a community of tribals, the theory-oriented researcher would feel secure to predict increased rates of suicide in this group. On the contrary, the theoretic empiricist would have no alternative but to predict on the basis of extrapolation.

The prediction may be concerned with estimating whether a relationship between two variables, X and Y, which has been observed in the Past, will continue in future, or it may be concerned with estimating whether changes in certain conditions will lead to changes in observed relationship (among the variables). To revert to our earlier illustration of delinquency, while Cohen points out that there need not be a direct link between understanding the 'cause' of a phenomenon and finding a 'cure,' his theory nevertheless seems to suggest that a measure intended to reduce gang delinquency is likely to be successful to the extent that it either changes the standards by which working class students are judged in school and) in the community, generally) or helps them to meet and prove equal to those standards.

(4) Whereas an empirical finding as a proposition referring to certain concrete contextual manifestation of a phenomenon does not afford a basis for drawing diverse inferences about what will follow, its reformulation or revamping in theoretic terms affords a secured basis for arriving at the inferences about the varied positive consequences in areas quite remote from the central area to which the given finding relates. For example, the empirical uniformity that Catholics have a lower suicide rate relative to Protestants does not by itself suggest diverse consequences in fields of conduct apparently far removed from that of suicidal behaviour. But once this uniformity is theoretically reformulated, obsessive behaviour and other maladaptive actions may be seen to be related to inadequacies of group-cohesion. (Thus, the lower the degree of social

cohesion, higher the rate of mental illness). The imaginative conversion of empirical uniformities into theoretic statements thus increases the fruitfulness of research through successive exploration of its implications (or any empirical uniformity). Theory thus mediates between specific empirical generalization or uniformities and broad theoretical orientations anchored in the intellectual tradition.

(5) In affording broader meanings to empirical findings the theory also attests to their truth. A hypothesis is as much confirmed by fitting it into a theory as by fitting it into facts, because it then enjoys the support provided by evidence for all the other hypothesis of the given theory.

(6) Theory helps us to identity gaps in our knowledge and seek to bridge them with intuitive, impressionistic or extensional generalizations.

Laws propagate when they are united in a theory. As Karl Jespers said, "It is only when using methodologically classified sciences that we know what we know and what we do not know." This way, theory constitutes a crucially important guide to designing of fruitful research.

CONTRIBUTIONS OF RESEARCH TO THEORY

The relation between theory and research is not a one way relationship and since the two interact, it will be useful to examine the other direction of the relationship, i.e., the rate of empirical research in the development of social theory. One major function of empirical research is to test or verify hypothesis deduced from existing theories and so to test these. From a well-formulated theory, deductions are made about what will happen in the various situations under specified conditions. These deductions provide hypothesis for empirical research. If a given hypothesis is confirmed by studies designed to test it, such researches may be said to have made a contribution in terms of verifying the entire theoretical structure from which the deduction was made. If, on the other hand, a hypothesis is not confirmed by research, the theory generating the hypothesis must be re-examined to consider whether it would be discarded as invalid or whether a small modification in it would make it consistent with the research findings. Of course, further studies are required to test whether deductions from modified theory will be supported by empirical observations, i.e., metaphorically, pay their way empirically.

Merton has rightly pointed out that looking at research basically as a structure designed to test a theoretical model fails to bring home to us much of what actually occurs in fruitful research. Such an image of research exaggerates the creative role of theory in generating hypotheses for the research to test, while it tends to minimize the constructive role of empirical observations for theory.

In fact, "empirical research goes far beyond the passive role of verifying and testing theory. It does much more than just confirm or refute hypotheses. Research plays an active role; it performs... major functions which help variously to shape the development of theory." Cumulative research may be expected through successive approximations to sift out a battery of explanatory variables and establish their interdependence. This is by no means a new species of empiricism nor a new espousal of prerogatives of research against those of theory. It is simply an insistence that theoretic construction alone cannot provide scientifically legitimate grounds for admission of elements into the system (of knowledge). Let us now turn to consider the functions of research for theory.

(1) **Research initiates Theory:** Scientific research sometimes leads to findings that may press for a new formulation as a theory; a new entrant to the existing theoretical corpus of the discipline. It is important to remember, however, that creating a new theory, to use Einstein's Metaphor, is not like destroying an old barn and erecting a scraper in its place. "It is rather like climbing mountains, gaining new and wider views, discovering unexpected connections between our starting point and its rich environment. But the point from which we started out still exists and can be seen, although it appears smaller and forms a tiny part of our broad view gained by the mastery of the obstacles on our way up."

In the regular course of doing research, especially in the domain of behavioural sciences there occur accidents in data collection. These accidents involve observations not initially planned in the design of the study. Such unanticipated consequences of research spark off new hypotheses whose confirmation may result in a new theory. Merton terms it the serendipity component of research after the manner of Horace Walpole who coined the term in 1754. The serendipity component refers to the accidental stumbling upon some unanticipated, anomalous and strategic fact. The history of science is replete with instances of how a striking fact accidentally stumbled upon, led to important new theories of great import. Accidental finding that penicillin checks bacterial growth or that many errors in reading and speaking (slips of tongue) are not accidental but have deep and systemic causes, may be cited as just two among the many examples.

Merton has cited an interesting instance of 'serendipity' in sociological research. Craftown was a suburban housing community of about 700 families of largely working-class status. It was observed in the course of a study that a large proportion of residents were affiliated to and participated frequently in civic, political and other voluntary organizations than had been the case in their previous locale of residence. The surprising fact was that community participation among the parents of infants and young children had also increased. The parents when asked how they managed that this was possible because there were so many teenage baby-sitters available in the Craftown community. Enquiries, however, revealed that the ratio of teenagers capable of baby-sitting to young children and the infants was far too less in Craftown as compared to that in the communities from where these parents had moved into Craftown.

These researchers were surprised and asked: Were the parents deliberately lying and if so, why? Could there be any vested interests behind their telling such a lie? Various other theories provided possible answers to the above phenomenon but the real clue was inadvertently provided by further interviews with the Craftown residents. The real thing was that although numerically speaking, there were less adolescents in Craftown than in the previous localities there were more of them whom the parents knew intimately and who therefore existed 'socially' for these parents seeking aid in child supervision. Thus, it was not the absolute number of adolescents that was important, it was rather the number that had a social existence for these parents that really mattered. Put in a more abstract form, this meant that perception (of parents) was a function of confidence (in the adolescents) and this confidence in turn was related to social cohesion. This proposition can be related to the larger body of theory dealing with social perception. Similarly, the concept of 'relative deprivation' was introduced in an attempt to make sense of surprising and strategic observations made in American Soldier Studies conducted by Stouffer and Associates.

In sum, empirical findings emanating from research may suggest new hypotheses and relationships, as well as point to hither-to unknown uniformities, thus leading to formation of new theories and sometimes the elaboration of existing ones.

The attempts to formulate or establish systematic theoretical connections between empirical generalizations in regard to a theoretical social science, for example, in the history of social thought, have been made in various ways. In some cases, they have arisen from direct confrontation with puzzling social phenomena which provoke search for some kind of explanation. The phenomenon may be one which has not hitherto attracted much attention (until its significance was unearthed by the imaginative power of a creative thinker) or it may be something genuinely new and distinctive in social life. Marx's attempt to explain French revolution and rise of socialist movements belong to this later category. In other cases, it is the dissatisfaction with generalization or explanatory schemes of earlier thinkers which may have given rise to new theories; for example, Weber took to revision of Marxist theory of the origin of capitalism or Durkheim proposed a new sociological explanation of suicide in contradiction to the diverse explanations which were in currency towards end of the 19th century.

(2) **Research Helps Recasting of Theory:** It is also through the repeated observations of hitherto neglected facts that empirical research helps improve the theoretical model. When an existing theory commonly applied to a subject-matter does not adequately take into account the deviant cases or the non-conforming results, i.e., the ones that are not in accord with predictions suggested by the hypotheses derived from theory, research presses for its reformulation. It is from the evidence contained in the deviant cases that the insights germinate. On the basis of these the existing theory is improved by reformulating it to generate predictions that will encompass all the data, including those initially considered deviant.

The history of social sciences offers many examples where the theoretical modes was reformulated to encompass a series of fresh empirical observations. Malinowski in the course of his observation of the Trobrianders found that when these islanders fished by the reliable method of poisoning, an abundant catch was assured and also there was no danger or uncertainty, they did not practise magic. But, on the other hand, in the open sea-fishing which did not promise any certain yield and typically entailed grave danger, the ritual of magic was practised invariably. Stemming from these observations, to fortify confidence, to reduce anxieties and to open up avenues of escape from the seeming impasse. These observations suggested to Malinowski, the incorporation of new dimension into earlier theories of magic, i.e., the relation of magic to the dangerous and the uncontrollable. These new facts were not totally inconsistent with previous theories; it was only that the earlier theories had not taken them adequately into account. In effect, the new facts helped Malinowski develop an enlarged and improved theory.

Another very famous example may be cited. In the 'Hawthorne electrical studies,' the investigators started with the theory that physical conditions affect work output. The investigators were interested in understanding the effects of specific changes in order to identify the optimal conditions. At first, the observers found that improvement in physical conditions did increase the output. But to their surprise, they subsequently found that changes in the direction of poorer physical conditions were also accompanied by increased output. This led to a re-examination of the initial theory. The result was the unearthing of certain important variables that the existing theory had ignored. The fact was that the workers in the experimental group were being made to take in an experiment and were interested in its outcome. As a result, their relationship with their supervisor changed. Their being set as a small group led to a certain cohesiveness among them. These social and attitudinal factors were so important that they obscured the effects of changes in physical conditions. it was not that the physical conditions did not affect the output, but this effect was overshadowed by the effects of the social and attitudinal factors. The result of this research was a significant broadening of the theory to the effect that output is influenced by factors within the work situation, social as well as physical.

In sum, the results of scientific research very often force a change in the theoretic view of problems which may extend beyond the restricted domain of science itself. Theoretical generalizations must be founded on research results. Once formed and widely accepted, however, they very often influence the development of scientific thought by indicating one of the possible lines of procedure. Einstein and Infeld remark, "Successful revolt against the accepted views results in unexpected and completely different developments becoming a source of new philosophical aspects."

(3) **Research Refocuses Theory.** Empirical research may also refocus theory by shifting the interest of researchers to new areas. empirical research affects the more general trends in the development of theory. This occur chiefly through the foci of theoretic interest toward those new areas of knowledge that were not hitherto amenable to scientific scrutiny.

We have already seen that a scientific theory summarizes what man can apprehend through his senses or inter from these sensory cues. Research technology is the means by which man as a scientist extends the domain over which sensory cues are perceptible. Refinement in microscopy, for example, improved the resolution of objects with the advance from optical to electron microscopes and thereby extended the perceived sensory cues for the researcher approximately a thousand times. In behavioural sciences, projective tests permit probing of the psychic life of persons i ways not previously attained by depth-interviews and other kindred techniques. Similarly, the development of scaling techniques for attitude measurement now permits the observer to comprehend objectively the patters of association in expressed attitudes. All forms of correlational ad associational analysis provide means for the observer to manipulate observations which i many instances was not possible in experimental situations directly. Research technology is not bounded by any fixed limits of possible refinement. When we reach the point of finest discrimination of human perception, we develop mechanical, electronic apparatuses that are capable of translating their refined cues into those gross enough to fall within the range of human perception.

Constructive imagination increases man's comprehension of his observable world. It the process of thinking involves combining bits of information, then combinations and permutations of such bits provide an unlimited number of possible models that can be the products of man's mind. Each new advance in research technology provides accretions of information-bits. Each model of man's world likewise adds to the sum-total of information. Consequently, the opportunity to construct new theories or models of the world as man sees it, is virtually inexhaustible.

The empirical world would, thus, seem to exchange the predictive power, precision, validity and verifiability of theories. Through the discovery and successive refinements of new tools and techniques of methodology more and more theories are enabled to develop higher order propositions possessing greater predictive power.

(4) **Research Helps in Clarifying Theory:** Empirical research develops and refines concepts current in the discipline. Concepts are the essential building blocks of a theory. Operationalization, construction of indices and formalization of research findings enhance the clarity of theoretic concepts and variables.

Clarification of concepts embodied by theory, commonly considered a province peculiar to the theorist, is a frequent result of empirical research. Research sensitive to its own needs cannot easily escape this pressure for conceptual clarification. This is so because a basic requirement of research is that the concepts, the variables or what are often called the units of theory should be defined with sufficient clarity to enable the research to proceed. Research cannot proceed on the basis of concepts phrased in too vague or general terms; for research purposes, some concrete empirical indicators of the concepts must be found.

Clarification of concepts ordinarily enters into empirical research by way of establishing indices of the variables under consideration. In non-research speculations and discourses, it is possible to talk loosely about such concepts as 'intelligence,' 'morale' or 'social cohesion' without any clear conception of what is entailed by these terms; but these must be clarified if the researcher is to go about his task of systematically observing instances of high or low morale, or high or low intelligence or greater or lesser degree of factionalism or modernization etc. Without devising indices which are observable, fairly precise and meticulously clear, the researcher is bound to be blocked in his venture at the very outset. The movement of thought which was named 'operationalism' is only an instance of the researcher demanding that concepts to defined clearly enough for the research to proceed with its obtained task.

Durkheim, despite the fact that his terminology and indices now appear to be crude and debatable, did perceive the need for devising indices of his concepts. What often appears inn research, as a tendency towards quantification can thus be understood as a special case of inquirers attempting to clarify concepts sufficiently to permit the conduct of empirical inquiry. The development of valid and observable indices is a prerequisite to the use of concepts in any research exercise.

A conception basic to sociology is the 'conflicting social roles.' The conception remains vague and of little value for research until such time as questions such as the following are answered, *viz.*,'on what grounds does one predict the behaviour of persons subject to conflicting roles?, or 'when there is conflict, which role takes precedence, or under which conditions does one or another role prove powerful?' More recently, empirical research has pressed for clarification of the key concepts involved in this problem. Indices of conflicting group pressures have been devised and the resultant behaviour in specified situations observed. Thus, a beginning has been made in this direction and effects of cross-pressures on behaviour have been studied. Lazarsfeld, Berelson and McPhee's study entitled 'Voting' reflects this advance.

It is the experience of researchers that actual testing of any existing theory is likely to redefine it. Often enough, the concepts that have been accepted as simple and obvious turn out to be vague and elusive when we attempt to fit them into facts. such redefinitions or clarifications may in turn lead to the discovery of new hypotheses. So long as theories use general terms and make rough predictions, it is difficult to disprove them. When we look at certain facts we realise that we would have to sharpen our theories considerably to disprove or prove them.

In sum, the goal of science is to model the sensory world of man for the purposes he defines. These may be his need for pragmatic knowledge or simply for comprehension of reality or to grapple with an intellectual challenge. This stance makes of science a never-ending process of data-gathering and of reprocessing old data, of theory-building in areas of curiosity where theories do not already exist and of reconstruction old theories that no longer encompass in their frames, the data they purport to model.

Towards the end, we would like to answer the question which happens to be posed quite often, *viz.*, whether empirical research first or theory - what is the sequence? to this our answer would be that every verified empirical proposition presents theory with an explanatory obligation and every theory must face the facts of its own implication in that it must now imply a proposition that has been found to be wrong and false. Theory may inspire research in that it implies one or more propositions concerning which there is no existing evidence, thus calling for 'tying down the abstract logical structure to concrete empirical contents.' Verified relationships may suggest new theories or modifications in old ones. The significance of empirical research lies, thus, not in the facts taken by themselves but in the theoretical implications that may be read into them.

The interaction between theory and empirical research is a matter of striking a judicious balance between quality and quantity. The hollowness of speculative theory without substantive data and the blindness of the raw empiricism without substantive theory have been repeatedly talked about in methodological writings. Empiricists have sought to measure anything and everything and theorists have shunned empiricism as mere fact gathering. In the meanwhile the model-builders have sought to formalize every theory in mathematical terms. This three-pronged attack has done much hard to our perceptiveness and imagination. The only possible solution seems to be that theory and research interact increasingly with each other in a way that they can mutually enhance usefulness of measurement and formalization. It would have to be accepted that no matter how precise the measurement a quality measured still remains a quality. Quantification is a great asset since it ensures greater reliability and precision in measuring the qualities which are theoretically significant. The indispensable wording partner of quantification procedures is obviously the theory that determines what is to be measured.

Hyman advocates the following with a view to strengthening the mutually rewarding relationship between theory and research.

1. Greater emphasis be laid on theories of middle range rather than on grand theories. The task of codifying all knowledge relevant to a general theory in social sciences seems incompatible with the temperament of general theorists and is also perhaps beyond their reach at the present time. The middle range concepts are specific and concrete enough for the researcher to appreciate their applicability to his specific problem and sense their translation into operations.

2. What is warranted is a shift from theory to theorizing, for, theorizing implies some thing in process and activity of one's mind.
3. An eye for the serendipity component needs to be cultivated. From codification of the middle range theories the researcher may come to learn that there are particular anomalous or paradoxical findings he may follow up. He can, thus, become aware of them and be alert to their occurrence. From his methodological training the researcher can develop skills required to search bodies of data which are likely to yield anomalous findings

It is gratifying to note that the controversy between theorists and the empiricists is cooling off. A growing awareness has dawned upon the scientists, of the need for more intimate interplay between theory and empirical research.

4

DESIGN OF RESEARCH

The present chapter, is concerned with the problems of how the various phases of research can be brought under control. The problem of control can be handled by 'designing' the research. It will be better if the meaning of 'design' and what all is involved in 'designing' is understood .

An architect designs a building. In the process of 'designing', he considers each decision that is required to be made in constricting the building. Bearing well in mind the purpose for which the building is to be used, the architect takes into considerations how large the building will be, how many rooms it will have, how these rooms will be approached, what building materials will be used and so on. The designer engages himself to such an approach making well before the actual construction begins. He proceeds in this manner because he wants to get a clear picture of the whole before starting the construction of building. This plan helps him to visualize clearly the difficulties and inconveniences that its users would face when the building would come up according to the plan. On the basis of this blueprint, he can effect corrections or modifications and make improvements before the actual commencement of construction. It is obvious that the building may inherit many defects and lead to many inconveniences for its users and thus the very purpose for which it is to be constructed may be defeated if careful planning was not done in the matter at the level of 'designing' stage. The professional architects in India often complain, indeed with justification, that people often think it unnecessary wastage of funds to hire the services of an architects. They would better 'utilize' this fund for adding a few more rooms to their building. More often than not, these self-styled architects realize almost immediately that their 'economy' in terms of saving the feeds of a professional architect was misplaced and that it would now cost them a lct more for now they would be required to effect drastic modifications to remove the inconveniences that they had not paused to anticipate. Despite this unnecessary and avoidable expense of money, time and energy, they are lucky who can really 'save' the worth of the building.

Designing forewarns us to the difficulties to come, ensures against wasteful expenditure of money, time and energy, so that we can be armed against them in good time To design is to plan, that is, designing is the process of making decisions before the situation arises in which the decision has to be carried out. Designing is thus a process of deliberate anticipation directed towards bringing an expected situation under control.

If equally applies with equal force to any research If we anticipate before we conduct a research inquiry, the various difficulties that one may have to encounter in the course of this exercise and decide what to do about these, then, we increase to that extent our chances of rationally controlling and articulating the research procedure and avoiding the possibilities of failure.

The research designer understandably cannot hold all his decisions in his head. Even if he could, he would have difficulty in understanding how these are interrelated. Therefore, he records his decisions on paper or in record disc by using relevant symbols or concepts. Such a symbolic construction may be called the research design or model. The model makes it possible an overall evaluation of the total plan. It is on this criteria that the researcher can appreciate the whole study structure as also the operations, the place and importance of the successive steps that are required to be taken in the total scheme.

The research design results, from certain decisions taken and adehered in a certain sequence by the scientists. The major design decisions to be taken, are in reference to the following aspects:

(a) What the study is about purpose and what are the types of data required?

(b) Why the study is being made?

(c) Where the data needed, can be found?

(d) Where or in what area the study will be carried out?

(e) What periods of time the study will take?

(f) How much material or how many cases will be studied?

(g) What criterion will be used for selection of cases?

(h) What techniques of data collection will be adopted?

(i) How will the data be analysed?

(j) How best can these above questions be decided upon and decisions articulated in a manner that the research purpose will be achieved with minimum expenditure of money, time and energy?

As Selltiz, Jahoda, Destsch and Cook describe, "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure".

The decisions in respect of the data to be collected, the sample to be selected, the manner in which the collected data are to be organized etc. which constitute the trunk of the research design, must be based on good grounds. In the interest of science, the design decisions must be based on an accepted, methodology. The researcher must investigate the method of making design-decisions to the extent he does it, he is methodologically designing the research. It must be remembered, how ever, that no inquiry is completely methodological just as none can be completely unmethodological design is a scientific ideal which the researcher may never attain but which he is obliged to constantly try.

3. A scientist owes certain obligations to the institution of science. His right to the title 'scientist' rests in part on the ability to develop better and still better ways of inquiring. This is true of all sciences but particularly so of social sciences to-day. The hope of any future scientists demonstrate how major social problems can be solved effectively in a scientific way. The scientist cannot afford to remain complacent with his method. As a scientist he is obliged to question each and every phase of his method, opening up' in effect, are possibilities of continuous improvement. It cannot be wait for a lucky discovery to improve our methods. It must be improved upon them systematically and must take what luck has to offer as a bonus.

Once the research problem is formulated in clear-cut terms, the researcher is in a position to consider how he will try to solve it. The first step towards obtaining a solution should be in the nature of designing an ideal research procedure; the procedure and the researcher would have linked to adopt for solving a problem if he was completely unrestricted by practical exigencies and limitations. This is the idealized research design. Ackoff defines the idealized research design thus; "The idealized research design is concerned with specifying the optimum research procedure that could be followed were there no practical restrictions."

At a first glance, such a step of designing an idealized plan, might seem very impracticable and even an unnecessary one. The researcher may be inclined to ask why he should bother himself with procedures that cannot be carried out. Why dream of realizing an ideal almost impossible of attainment? The answer to this can be that concern with ideal or optimum research conditions are neither idle dreaming nor wishful thinking. It is quite important, if one wants to know how good the results are that one would eventually obtain. The ideal conditions and procedures act as a standard by reference to which we can evaluate the practical research conditions and determine their shortcomings. If these shortcomings are made explicit, it is possible in many cases to determine their effects on the observed

NEED FOR METHODOLOGICALLY DESIGNED RESEARCH

1. In many a research inquiry, the researcher has no idea as to how accurate the results of his study ought to be in order to be useful. Where such is the case, the researcher has to determine how much error is permissible. In quite a few cases he may be in a position to know how much error in his method of research will produce. In either cases he should design his research if he wants to assure himself of useful results. A researcher gets into trouble not only when he fails to obtain results which are accurate enough but also when he gets results that are much too accurate. If the required degree of accuracy can be obtained with little trouble, and greater accuracy only with very great difficulty, then the researcher would only be wasting time, efforts and funds in working for greater accuracy.

2. In many research projects, the time consumed in trying to ascertain what the data mean after it has been collected is much greater than the time taken to design a research which yields data whose meaning is known when these are collected. Modern research suffers a great deal from a 'lust' for fresh data. researchers rush off to collect data without a concern for what they mean, until they are collected. At that stage it is often very late to improve them. It is true that in some cases the delay produced by research-planning may result in obtaining stale data. But it should be remembered that failure to plan a research may produce more inaccuracy than a designed research project run later. For example, suppose the researcher rushes to make observations before he has developed adequate instruments. The errors produced by his inferior instruments may be greater than the degree of inaccuracy he would have obtained, had he waited to develop better instruments even at the obvious risk of his data getting a bit stale.

results and thus to adjust the results with a view to minimizing the effects of the shortcomings.

The use of idealized research model or the research standard for the adjustment of actual data is common throughout the sciences. For example, the ideal model for determining the acceleration of freely falling bodies requires a perfect vacuum in which the bodies could fall with complete freedom. But in actual practice, the physicist can never create a perfect vacuum. Still he can conduct his experiment in such a way that he can determine how a body would fall if it were in a nearly perfect vacuum. He determines how a body would fall if it were in a perfect vacuum. He determines how acceleration is affected by variations in atmospheric pressure and changes in acceleration. On this basis, he determines what would occur in a complete vacuum and can thus infer the acceleration of the freely falling bodies. The idealized research design then, comprises the specifications of the most efficient conceivable conditions and procedures for conducting the research. But the procedures and conditions specified in the idealized research model can seldom if ever be met in practice.

The next design-job for the researcher is to translate the idealized research model into a practical one. The practical research design has a reference to the translation of idealized design into a realizable working procedure. The practical research design is necessary because certain factors do keep the researcher from meeting the idealized conditions. In a concrete research situation, practically may impose many restrictions on the researcher's activities. The number of subjects or events he may ideally want to study may be much larger than his time, money and energy would allow. In such a case, he can only observe a portion of the whole. Once this restriction is imposed, the use of statistics and sampling becomes necessary. Hence, the translation of the ideal model into a statistical model is a necessary step for the actual conduct of research.

Even where there is only one subject, event or property to be observed, the researcher is aware of the fact that his observations are always subject to error and he will thus require more than one observation for each set of variable-values. He would like to make an infinite number of observations of some single subject. This is obviously impossible and impracticable. Hence, he must deal with a sample of the possible observations. Thus, sampling possible observations requires a translation of the idealize model into a practical statistical model.

Even if situations existed in which the researcher could make an infinite number of observations on each subject, it might be wasteful to do so. He may not even require the degree of accuracy that such a large number of observations would yield. Therefore, if he wants to do just as much work as is necessary to get the amount of accuracy he needs, he will again wish to use only a sample of the possible observations, which means that he will render a statistical translation of the idealized research model.

In many social situations, manipulation of the totality of variables involved is not possible, hence research must be conducted in situations which differ from the idealized one. Thus, we must determine how we can infer from the result obtained in some real concrete situations what we might observe if one had managed to produce the ideal situation. This requires that we make explicit the kind of real situation it will look for, how one will characterize it and how one will adjust the results observed so that assertions about the idealized situation can be made. This too will require the statistical translation of the idealized research design and formulation of the research operations to be actually performed.

The practical research design may be conceived of as comprising the following four phases:

(a) *the sampling design*, which deals with the method of selecting the subjects to be observed for the given study.

(b) *the observational design*, which relates to the conditions under which the observations are to be made or the data are to be secured.

(c) *the statistical design*, which deals with the question of how many subjects are to be observed and how the observations are to be organized with a view to securing answers to the research problem.

(d) *the operational design*, which deals with the specific techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

It must be remembered that non the these sub-designs and the resultant models are autonomous vis-a-vis the others. A decision in respect of any one phase of the design may influence or affect a decision subsumed under any other phase. Consequently, these phases generally overlap.

It should be clear by now, the practical *research design represents* a compromise prompted by a number of practical considerations that are related to the actual conduct of social research. E. A. Schuman puts it, "Research design is not a highly specific plan to be followed without deviations but rather a series of guide-posts to keep one headed in the right direction".

Research designs differ depending on the research purpose just as the plan of a building would differ on the purpose for which it is intended to be used. The research purposes may be grouped broadly under the following four broad categories:

(a) To gain familiarity with the phenomenon or to achieve new insights into it, often in order to formulate more precise research problems or to develop hypotheses. Studies having this purpose are known generally as *Exploratory or Formulative studies*.

(b) To portray accurately the characteristics of a particular situation or group or individual (with or without specific initial hypotheses about the nature of these characteristics). Studies characterised by such aims are known as *Descriptive studies*.

(c) To determine the frequency with which something occurs or with which it is associated with something else (usually but not necessarily, with a specific initial hypothesis). Studies having this purpose are known as *Diagnostic studies*.

(d) To test a hypothesis suggesting a causal relationship between variables. Studies characterised by this purpose are called *Experimental studies*.

It must be remembered that a fixed typology of the studies suggested above is inevitably arbitrary in as much as the different types of studies are not absolutely separable from one another and therefore, for purposes of classification, the 'major intent' of each becomes the basis for assigning them to different categories. In this connection it needs to be recognized that the development of knowledge rarely progresses in a direct step-wise manner. Each step forward in the resolution of a problematic situation is, at the same time, a step in the direction of posing new questions and of reformulating older ones. Max Weber has said: "Every scientific fulfilment raises new questions it asks to be surpassed and outdated".

In the formulative or exploratory studies the premium is on discovery he can borrow from other fields and from common language. He needs to create his own guide-posts and schemes of classification. He must decide what to look for, and what to ignore, what to record and what not to record, which clues to follow and which to abandon, what is of consequence and what is trivial. The explorer has great freedom but the same can so often be terrifying.

It has already been noted that more appropriate the exploratory study should be considered an initial step in a continuous research process rather than an exercise in isolation. The most difficult phase in an inquiry as one has had an occasion to see, is its initiation. The most careful methods during the later stages of enquiry are of little worth if an incorrect or irrelevant start was made. Adequate exploration ensures against such an eventuality. Selltiz, Jahoda, Deutsch and Cook suggest that the following methods are likely to be very fruitful in exploratory research directed toward the search for meaningful hypothesis:

(a) A review of related social science and other pertinent literature.

(b) A survey of people who have had practical experience of the broad problem are to be investigated.

Most exploratory researches utilize these methods. These methods to be used must be flexible. As the initial vaguely defined problem gets transformed gradually into one with more precise meaning and reference, frequent changes in the research procedures become necessary in order to provide for the gathering of data relevant to the evolving hypothesis.

LITERATURE SURVEY

Frequently, an exploratory study is concerned with an area of subject-matter in which *explicit hypothesis have not yet been formulated.* The researcher's task then is to review the available material with an eye on the possibilities of developing hypotheses from it. In some areas of the subject matter, hypotheses may have been formulated by previous research workers. The researcher has to take in to stock of these various hypotheses with a view to evaluating their usefulness for further research and to consider whether they suggest any new hypothesis. A researcher working in the field of sociology will find that such publications as the Sociological Journals, Economic Reviews, the Bulletin of Abstracts of Current Social Science Research, Directory of doctoral dissertations accepted by Universities, etc. afford a rich store of valuable clues. In addition to these general sources, some governmental agencies and voluntary organizations publish listings or summaries of research in their special fields of service. Professional organizations, research groups and voluntary organizations are a constant source of information about unpublished works in their special fields. It could be too narrow an outlook, however, to restrict one's bibliographical survey to studies that are directly relevant to one's area of interest. The most fruitful means of developing hypothesis is an attempt to apply to the typhoid hypothesis, which is tenable. If the post-treatment observations suggest unfavourable response, the typhoid hypothesis is falsified. Such a test of hypothesis does not belong to the realm of explorartory studies.

The above example illustrates the nature of an exploratory study and also how it differs from the problem-solving and hypothesis testing studies. In the initial stages when the doctor was asking the patient all sorts of questions and was examining him, using various instruments, scrutinizing various reports, the doctor was simply exploring the possibility of exploring for conducting some sort of an exploratory study. The end-result of this exploration was the questions that suggested itself to him as an alternative hypothesis.

After this phase of exploration, the doctor proceeded to test the proposed hypothesis by resorting to a more controlled or structured method of investigation. This second phase was the *hypothesis testing* phase of the inquiry. The exploratory study may thus be considered an earlier step consisting of problem finding or hypothesis formulation, to be followed by other steps aimed at problem solving or hypothesis-testing, on a continuum of research process. The flexible nature of the research design characteristic of exploratory studies should be clear from the above example. The doctors questions to the patient were not pre-determined nor was the use of certain instruments. The doctor was continually accommodating newer facts as they were becoming known to him, changing in effect, his tentative idea about the nature of disease from time to time till finally he could put forth his tentative diagnosis (hypothesis).

The relative youth of social science and researches in the realm of social science make it inevitable that much of social science research, for some time to come, will be of an exploratory nature. Few well-trodden paths exist for the investigator of social life to follow. Most existing theories in social sciences are either too general or too specific to provide any clear guidance for empirical research. Under the circumstances, exploratory research is necessary to obtain experience that will be helpful in formulating worthwhile hypothesis for more definitive investigations. For a general area of problems about which little knowledge is available and a general state of ignorance prevails, an exploratory study is most appropriate.

Quite often one sees a tendency to undermine the importance of exploratory research and to regard only experimental research as more scientific. But if experimental work is to have any theoretical or practical value it must be relevant to issues that are much more broader than those posed in the concrete confines of the experiment. Such relevance can result only from adequate explorations of the dimensions of the problem with which the research is attempting to deal.

Path-breaking explorations or formulative researches are particularly complex affairs. One starts from the scratch, without guide-posts or yard sticks. Any intellectual framework and categories within which to classify what one sees, are absent. The researcher's only resource is whatever studies must have enough flexibility to permit consideration of different aspects of a phenomenon.

In the descriptive and diagnostic studies, the major concern is with accuracy. Hence, the research design for such studies must be such that the bias will be minimized and the reliability of the evidence collected maximized. These two studies, namely, descriptive and diagnostic, though somewhat different in their aims, yet present similar requirements with respect to the research design.

Studies which aim at testing causal hypotheses, i.e., the experimental studies, require procedures that will not only minimize bias and increase realiability but also permit inferences about causality. Experiments are particularly suited to this end.

In practice, however, these different types of studies or research are not always sharply separable. Any given research may have in it the elements of two or more types of the functions which have been described above. In a single study, however, the primary emphasis is usually laid on only one of these functions and the study can be thought of as falling into the category corresponding to the major function implied by it.

DESIGN FOR EXPLORATORY OR FORMULATIVE STUDIES

Exploratory studies have, the purpose of formulating a problem for more precise and structured investigation or of developing hypothesis. An exploratory study may, however, have other functions too, e.g., increasing the investigator's familiarity with the phenomena he wishes to study in a subsequent, more structured investigation or with the setting in which he plans to carry out such an investigation. An exploratory study may also serve as a basis for clarifying concepts, establishing priorities for further research, gathering information about practical possibilities for carrying out research in specific real-life settings, etc. "Exploratory studies" says Katz, "represent the earlier stage of science." From its findings it may emanate the knowledge that helps the researcher in formulating a problem for research or in developing hypothesis to be tested subsequently. Let us try to understand to some satisfactory extent the nature of an exploratory study by an analogy. A doctor who is called upon to attend to a patient whose malady he is totally unfamiliar with, will ask him various questions concerning his complaints, will examine the various parts of the patient's pathological reports or records (if any) and so on. On the basis of this exploration, the doctor may find himself in a position to pose a question like, "could it be typhoid?" One of his hypothesis relating to the above question may be, 'It is typhoid'. The doctor's subsequent treatment in the nature of antibiotics will constitute a test of the hypotheses. If the patient responds favourably to the treatment there is room for believing that the area in which one is working, concepts and theories developed in quite different research contexts. Thus, the theory of perception developed in the area of psychological problems may provide stimulating clues for researchers desiring to work on the problems of group morale or group tensions. The sensitive descriptions to be found in the works of creative writers or novelists may also provide a valid ground for the formulation of hypothesis.

AN EXPERIENCE SURVEY

Some people in the course of their day-to-day experience, by virtue of their peculiar placement as officials, social workers, professionals, etc. are in a position to observe the effects of different policy actions and to relate these to problems of human welfare. The block development officer at his village level workers, are likely to develop certain rare insights into the characteristics of the rural people and the estimated effectiveness of various approaches to their welfare. The professionals too may acquire relevant insights in respect of the relevant categories of clients. The administrators are typically and advantageously positioned to obtain fruitful insights into what really works in a practical situation. The specialists acquire in the routine of their work, a rich fund of experience that can be of tremendous value in helping social scientists to develop awareness about the important influences operating in a situation they may be called upon to study. It is purpose of the experience survey to gather and synthesize such experience.

Since the objective of an experience survey is to obtain insights into the nature of the problem and useful leads to the probable hypothesis and since the experience surveyor is looking for provocative ideas and useful insights, the cases are chosen on the basis of the likelihood that they will be able to contribute such ideas and insights. It is indeed a waste of time in an experience that can be of tremendous value in helping social scientists to develop awareness about the important influences operating in a situation they may be called upon to study. it is the purpose of the experience survey to gather and synthesize such experience.

Since the main objective of an experience survey is to obtain insights into the nature of the problem and useful leads to the possible hypothesis and since the experience surveyor is looking for provocative ideas and useful insights. The cases are chosen on the basis of the likelihood that they will be able to contribute such ideas and insights. It will be indeed a waste of time in an experience survey to interview people who have little competence, relevant experience and communicability. The best method of selecting informants will be to ask strategically placed administrators working in the field one desire to study, to point out the most experienced and informative people.

Efforts are made to select informants so as to ensure a representation of different types of experience. Variations in the points of view also need to be given adequate representation in the sample of respondents selected. Thus, in an experience survey of facts likely to resist, say, planned rural development, it may prove advantageous to interview the officials charged with plan-implementation as well as the village leaders. It would be ideal to interview people at different levels in each group.

In an experience survey, the best way to determine the sample size is to identify the point during the process of interviewing informants after which additional interviews do not provide new insights and answers seem to fall into the pattern which has already emerged from the earlier interviews.

Before any systematic attempt is made to collect the insights of experienced persons, it is, of course, necessary to have some preliminary idea of the important issues in the general area of the subject-matter. In the systematic interviewing of the informants, it is necessary to maintain a considerable degree of flexibility. The formulative or the discovery aspects of the experience survey requires that the interviewer allows the respondent to raise issues and questions, that the investigator has not previously thought of.

Even at the cost of repetition, it must be stated that the problem before a person undertaking an exploratory study is that he has not clearly formulated, probable; a vaguely felt 'originating question'. His exploration is directed towards a problem-finding result. Naturally, the researcher does not have any clear-cut idea as to what specific, predetermined set of questions he should put to the informants to be able to extract the 'relevant' information or answers. Since he has no specific problem, every information is relevant, every information, irrelevant. Hence, the investigator cannot frame definite questions in advance from informants. He thus casts his net wide; asks the informant all sorts of general, flexible questions, viz., "what would you say about the people of this area?" On picking up a clue in the course of conversation, for which maximum opportunity and freedom is allowed to the informant, the investigator slowly tightens the net, by asking more pin pointed questions. If this leads to the strengthening of the hunt initiated by the earlier clue, he tightens his net further still, asking very definite and pertinent questions. The culmination of this process, if all goes well, is the discovery of the problem and/or meaningful hypotheses. Thus, in an experience survey, it is the 'non-structured' flexible methods of data collection that are generally used. Of course, as the clues start maturing and insights begin developing, the information-seeking devices also shift toward greater pertinence and structuredness.

An experience survey, in addition to being a source of hypothesis, can also provide information about the practical possibilities or doing different kinds of research, e.g., where can be facilities for research be obtained for study? How ready are the agencies or citizens to co-operate in study of the problem in question? In addition, the experience survey may also provide information about the problems considered urgent by personnel working in a given area. this information may also prove to be useful in establishing priorities in specific research programme. The report of an experience survey also provides a consolidated summary of knowledge of skilled practitioners about the effectiveness of various methods and procedures for achieving these specific goals.

ANALYSIS OF 'INSIGHT-STIMULATING' CASES

Scientists working in relatively unformulated or uncharted problem areas where there is little experience to serve as guide have found intensive study of selected examples an especially fruitful method for stimulating insights for suggesting hypothesis for more structured inquiries. The anthropologian studies of certain 'primitive' cultures have contributed profound insights into the relationship between the individual and society. The famous psychoanalyst Sigmund Freud based many of his theoretical insights about the workings of the human psyche on the findings of his intensive studies of patients.

The following characteristics of this approach which is geared in developing insights are worth mentioning:

(a) The attitude of the researcher must be one of alert receptivity, of seeking significant clues.

His enquiry is in a process of constant reformulation and redirection as new information keeps coming. This implies frequent changes in the focus in relation to data to be obtained and in the criteria for selection of cases proposed to be investigated.

(b) The second feature is intensity of the study of the person, group, culture of situation selected for investigation. In the

(d) Eleviants and pathological cases do throw light on the more common cases. The study of deviants may highlight the normative reference from which they are deviating, as also, the types of pressures to conform and the socio-psychological consequence of non-conformity. The contributions of psychological consequences of non-contributions of the insights that may be gained by a study of pathological cases which frequently serve to underscore the basic processes of the diametrically opposite type of cases, i.e,, non-pathological or normal cases.

(e) The characteristics of individuals who fit well in a given situation, or who do not fit well provide valuable clues about the nature of the situation. The contrast in the characteristics of the two types of individuals provides an insight into the distinct nature of a community or group.

(f) A rounded view of any situation can be had if the individuals intended to be covered by the study are selected in such a manner that they represent different positions in the social structure. Persons occupying different positions are likely to see a given situation from different perspectives and this very diversity is a potent producer of insights.

(g) A review of investigator's own experience and a careful examination of his own reactions as he attempts to project himself into situation of the subjects he is studying, may be valuable source of insights. As one of Freud's biographers states, many of Freud's valuable insights emanated from his efforts to understand himself. This, of course, involves subjective introspection on the part of the investigator. Nevertheless, it must be emphasized that in maintaining a great distance between themselves and the objects of their study, i.e, an overly objective attitudes, the scientists often neglect a very powerful source of ideas. During the specific phase of research when one is, in the main, looking for ideas such objectivity may not be appropriate.

There are many more cases which could have been included in this list; the above list of insight stimulating cases is not exhaustive. Which type of cases will be of most value will depend largely on the problem under investigation. Nevertheless, by way of general statement, it may be said that cases that provide sharp contrasts or engender striking features are the ones that are likely to prove most useful.

In the end, it is important to remind ourselves that the exploratory studies merely lead to insights or hypothesis; they do not test them. An extolled studies are needed to test whether the hypothesis that emerge (from the exploratory study) have a broader applicability and generic significance.

DESIGN FOR DESCRIPTIVE AND DIAGNOSTIC STUDIES

It is already stated that the descriptive studies are the ones that aim at describing accurately the characteristics of a group, community or people A researcher may be interested in studying the people of a community, their age composition, sex composition, caste-wise distribution, occupational distribution and so on.

A researcher may be concerned with estimating the proportion of people in a particular population who hold certain views or attitudes. How many favour lowering the age of voting? How many students favour student representation on university bodies? Quite a few other researches may be concerned with specific predications. What percentage of people will vote for a particular party candidates? What will be the volume of unemployment within a decade?

It is understandable that when one does not know anything at all about a problem, he must attempt to understand it is a general way before beginning to make specific the various aspects of the subject. Explorers and missionaries wrote such descriptions of many exotic lands. They chose to describe what they thought to be important and interesting, unconcerned with any rigid rules of scientific proof. Even such reports had their importance, for anthropologists subsequently rushed to study these 'natives' who were only hinted at in the explorer's reports.

Descriptive studies often provide a jumping pad for the study of new areas in social sciences. It is worthy of mention that Freud's compilation of case histories of patients laid the foundation for clinical psychology. Freud remarked "the true beginning of scientific activity consists:.... describing phenomena and (only) then in proceeding to group, clarify and correlate them........"

Most anthropological research may be characterized as descriptive in as much as the thrust is on portraying a rounded picture of a total culture or some aspect of it. In more mature social sciences, sophisticated theories and statistical techniques of description may also be used. A general description of the situation, rather than nearly narrowing down of the field, helps one grasp the essence of the problem.

It may not be very proper to conceive of descriptive research only as a phase on the evolutionary continuum of researchers. This is so, firstly, because a piece of descriptive research may be of important scientific value for itself, although it cannot be generalized to apply to other situations. It can provide information which is o value in policy formulation and secondly, because the notion of stages assumes that we have knowledge about the various stages in the supposed continuum. There is hardly any firm evidence to substantiate such an evolutionary view of scientific research. Another class of researehers called diagnostic, may be concerned with discovering and testing certain variables are whether associated? e.g., Do more villagers than city dwellers vote for a particular party? Are people who have had co-educational background better adjusted to married life than those who had not this background? It was indicated earlier, both descriptive as well as diagnostic studies share common requirements in regard to the study design. So we may group those two kinds of research interest-descriptive and diagnostic, together, since from the point of view of research procedure both these studies share certain important characteristics. it should be noted that in contrast to the problem (of problem findings) which forms the basis for exploratory studies, the research questions characteristic of the descriptive and diagnostic studies demand much prior knowledge of the problem to be investigated. Here the researcher must be able to define clearly what he wants to measure and must identify adequate methods for measurement. In addition, the researcher must be able to specify who are to be included in the definition of the given population with reference to which conclusions are to be drawn. In collecting evidence for studies of this type, what is needed is not so much the flexibility (as for exploratory studies) as a clear formulation of what is to be measured and the techniques to be adopted for precise, valid and reliable measurements.

The procedures to be used in descriptive/diagnostic study must be carefully planned since here the aim is to obtain complete and accurate information. The research design for these studies must make a much greater provision for protection against bias. Because of the amount of work involved in descriptive/diagnostic studies, concern with economy (of time, money and labour) in the course of research is extremely important. Considerations of economy and protection against bias permeate every stage of the research process.

It is better now to turn to consider some of the ways in which economy and protection against bias are taken into account in the design of a descriptive/diagnostic study.

The first step in a descriptive/diagnostic study, is to define the question that is to be answered. Unless the questions are formulated with sufficient precision to ensure relevance of the data collected to the questions raised, the study will be fruitless. It is necessary to formally define the concepts entering into the question and also to indicate how the concept is to be measured. Considerations of economy would need to be entertained at the stage of specifying the research questions. This restricts the area of the study to the bounds of manageability.

Once the problem has been formulated specifically enough to indicate what data would be required, the methods by which data can be obtained must be selected. Tools for collecting the information must be devised if no suitable ones already exist. Each of the various methods of data collection-observation, interview, questionnaire etc.-

has its peculiar advantages and limitations. The researcher should consider the nature of the problem, the scope of the study, the nature of respondents. types of information needed, the degree of accuracy needed, etc. and in view of these, balancing the gains and losses, should select one or more methods of data collection.

The stage for developing the data-collection procedures is one of the major points at which safeguards against bias and unreliability would need to be introduced. Questions to be asked to the respondents must be carefully examined for the possibility that their wording may suggest one answer rather than another. Interviewers must be instructed not to ask leading questions, observers need to be trained so that all the observers involved in the study record their observations uniformly. Once the data collection instruments are constructed, they must be pre-tested. pre-testing the data-collection instruments before they are used in the study proper, greatly minimizes difficulties of comprehension, ambiguousness and sterility of questions.

In many descriptive/diagnostic studies, the researcher wants to make statements about some specific class of people or objects. However, if is rarely necessary to study all the people comprising the group in order to provide an accurate and reliable description of certain characteristics of its members. Quite often a sample or a fragment of the population about which inferences are to be drawn, affords an adequate basis for making such statements.

Lot of work has been done on the problem of designing the sample in a manner that it would yield accurate information with minimum amount of expenses and research effort. It is important that the study findings based on the sample (a part of the population under study) should be a reasonably accurate indicator of the state of affairs in the total group (population). This means that the sample should be selected in such a way that findings based on it are likely to correspond closely to those that would be obtained if the 'population' were studied. The researcher must select his sample in full consideration of the relative advantages and limitations of different methods of sampling and adopt the one (or a combination of two or more) that will provide the most accurate estimate of the population it represents, with maximum economy.

With a view to obtaining consistent data free from the errors introduced by different interviewers, observers and others working with the project, it is necessary to supervise the staff of field workers closely as they collect and record information. Effective checks must be set up to ensure that the interviewers continue to be honest and that the data they collect are unbiased. As the data are being collected, they should be examined for completeness, comprehensibility, consistency and raliability.

The process of analysing the data after these are in involves coding the responses, i.e. placing each item in the appropriate category, tabulating the data and performing statistical computations. We may simply note that both the considerations, i.e., of economy and need for safeguards against error, enter into each of these steps. The considerations of economy indicate that analysis be planned in detail to the extent possible before work on it is started. Of course, complete and intricate planning of analysis is not always possible nor desirable. But excepting exploratory studies, it is generally feasible and advisable to work out in advance the basic outlines of analysis.

Safeguards against errors in coding ordinarily take the form of checking the reliability of coders through continual supervision. Decision needs to be taken on whether the tabulation is to be done by hand or by machine since mechanical tabulation while more efficient, may prove prohibitive in cost if the responses to be tabulated are not large in number. Accuracy of tabulation must be checked. Statistical computations, e.g., averages, dispersions, correlations etc., must be computed (as and when needed). Statistical operations of another sort are needed to be introduced for the purpose of safeguarding against drawing unjustified conclusions from the findings. These involve such procedures as estimating from the sample findings the probable occurrence of some characteristic in the population which the sample purports to represent and estimating the probability that differences found between the sample sub-groups represent the true differences between the two sub-groups in the total population, etc. We will have more to say about this later.

The coming table attempts to show the salient points of difference between the exploratory and the descriptive/diagnostic study designs. A note of caution, however, is warranted. The table represents only an 'idealtypical' formulation, i.e., exploratory studies. The points of difference highlighted in the table must, therefore, be understood as those between these two 'ideal' models of studies. In practical situations, these differences may not be found in such a clear from.

To consider the study designs necessitated by the class of studies is called as the Experimental studies.

EXPERIMENTAL STUDY DESIGNS

The experimental study designs form a sub-class of the studies which attempt to deal with problems in which we ask how events are related to one another. Experimental studies deal with cause and effect problems, i.e., experimental studies are the ones concerned with testing the causal hypothesis. A hypothesis of casual relationship asserts that a particular characteristic or occurrence (X) is one of the factor that determine another characteristic or occurrence (Y). Before setting out to consider the kinds of research design that can best test the hypothesis of this type, it is necessary to discuss at some length the concept of causality.

The concept of causality is an extremely complex one and it is not possible to present a thorough analysis of this concept here. Indeed, we may not do better than bring out the basic points necessary for a workable conversance with the concept.

What is a 'cause'? The first point that we must be clear about is that in the sciences the causes which are discovered are 'secondary' or 'caused causes'. They are 'efficient' causes; not the 'final' causes. They do not provide an answer to the question, 'ultimately why?' Purpose does exist in human affairs, there may be cosmic purposes also; but in science a final cause does not exist. Francis Bacon decreed that concern for final causes be better

Table showing difference between different types of designs

Study type	*Basic design*	*Observational design*	*Sampling design*	*Statistical design*	*Operational design*
Exploratory	Flexible	Flexible (unstructured) instruments	Flexible (Non-Probability; Judgement)	Flexible. No. Pre-planned design for analysis	Flexible No. fixed decisions about ope rationalizing the study.
Descriptive; Diagnostic	Rigid	Rigid instruments)	Rigid design) Random Samples.	Rigid, Pre-design for analysis.	Rigid. decisions about ope-rationalizing the study.

left to philosophy. Scientists hold that purpose is not a necessary concept in the research for scientific laws. In sciences, the word cause is used in the sense indicated by J.S. Mill, "a cause which is itself a phenomenon without reference to the ultimate cause of anything". As Mill puts it, "causation is simply uniform antecedence."

But even after gaining a clear understanding that science does not concern itself with a first cause or a final cause, great ambiguities still remain. Professor Bergeson has pointed out that even in scientific discourse, three different meanings of the term 'cause' are frequently confused. A cause may act by impelling, by releasing or by unwinding. The billiard ball that strikes another determines its movement by impelling, the spark that explodes the gunpowder acts by releasing or by unwinding. The billiard ball that strikes another determines its movement by impelling, the spark that explodes the gunpowder acts by releasing and the gradual relaxing the spring that makes the gramophone turn or unwind the disc, acts by fact. In the other two cases the effect is more or less given in advance and the antecedent involved is its occasion rather than its cause. In the first case, where the cause acts by impulsion, what is in effect is already in the cause. In the second case where cause acts by releasing, it is an indispensable condition; it pulls the trigger, apart from which the effect would not occur. But it does not explain more then the rate or duration of the effect.

CAUSALITY

In regard to this immensely complex concept of causality we cannot afford to miss out on the Humean view of causality? A central point of the Humean view is that when some one states that X causes Y he only expresses some reflection in his mind of the material objective world and not the material world directly. It is as though he is talking of a moving picture of a landscape rather than of the landscape itself. The moving picture may be very public and most of us might agree on what the picture is of. But this moving picture is man-made just as the association or prediction is a product of human mind for it requires an observer to notice the association or to interpret the association.

David Hume did not, of course , insist that there was no real world in which things happen but what Hume is saying is simply that when a scientist observes an association and abstracts from the real world to make some scientific statement, the statement is not the same thing as what he has been observing. it is a product of his mind or a picture of the world filtered through his preception. This is true of a statement of causality as of every association.

Hume says, "All reasoning concerning matter of fact seem to be founded on relationship of cause and effect. "We judge that the appearance of a table indicates the factual presence of the table on the grounds that presence 'causes' appearances and we judge that the table is there (if in fact, it is) as a result of the earlier causal chain such as growth of a tree and subsequent actions of a carpenter. To know the matter of fact involves for Hume, the necessity of knowing the causal relation which links them to our preceptions or which links one event to another. But when we turn to look for this causal relation among the events which we perceive, we find no trace of it. These are mer events; the pattern of events has a certain regularity but we are never able to dictate a relation between events-certainly not a causal one. We may observer that one event is linked with another through a series of intermediate events or that one event never seems to occur except just before or just after another. Nevertheless they are all events. The most Hume could concede to, was by characterizing causal relation as possessing three elements, viz., contiguity, succession and constant conjuction-these relations themselves being defined by means of pairs of events both of which mus be observed if the relation is to be taken to obtain. But this kind of relation is clearly useless in establishing truths about the matters of fact, since one would have to have the matter of fact as well as the perceptions of them in order to appreciate that the former caused the latter. unfortunately, we can never get directly at the matters of fact but only at the perceptions of them and hence all fallible empirical knowledge is fallible resting as it does on totallv unprovable surmises about the causes or what appears.

The same argument would apply in a slightly different way to the attempts at making predictions about the future on the basis of past observations.

The analysis of causality into contiguity, succession and constant conjuction has been a centerpiece of controversy.

Many philosophers have felt that the internal necessity which compels one state of affairs to give way to another is clearly open to rational to empirical scrutiny. They have thus dismissed Hume's sakeptical conclusion as an unworthy loss of faith in philosophy. But the alternative analyses have brought out that Hume's intentions were not properly understood. Hume did not deny that our idea of causality is derived from regularity in experience nor did he doubt that men have a tendency to expect such regularity in future experiences; he only denied that we can have any knowledge other than the experience of regularity itself to base these expectations which are philosophically groundless. Some other philosophers seem to have felt that logical connections in the realms of thought and of language were so clear that they indicate real connections in the world of preception and the natural world. Hume admitted the plausibility of this argument to the extent of defining causality as the tendency of our mind to produce the idea of what is called the 'effect' when the epistemologcal problem is exactly to discover the grounds on which we may presume the connections and tendencies in the world. Indeed, no theory of causality has succeeded in doing this.

From Aristole's four causes; material, efficient, formal and final to Mill's inductive method of determining which element of some antecedent situation is to be matched with which element of consequent situation as cause to effect, this parallel between the real and ideal relation has been assumed. Some theorists like He get have tried to identify them but even this is of no help since it leaves us with the questions whether our understanding of amalgem of what is actual with what is thought, affords us an accurate representation of it. Mill's methods are no doubt an elegant recipe for detecting constant conjunctions that Hume speaks of. Mill's methods are the method of agreement, the method of difference, the method of residues and the method of concomitant variation. The first three deal with sets of antecedents and consequents.

If some are looking for the cause of some consequent C and suppose a number of sets of antecedents (A) after each of which C is observed, the method of agreement directs us to look for the cause of C among those antecedents which are members of all the sets. Alternatively, suppose the consequent C follows after only one of these sets of antecedents, the method of differences directs us to look for the cause among those members of that set which it does not share with any of the other sets which failed to produce C. The method of residues prompts us to discard from the set of antecedents any elements whose effects are known to be different from the consequent in question and to look for its cause among those which are left out after the operation is completed. Lastly, the method of concomitant variation directs our search towards the cause of any event or process whose intensity varies with time among other phenomena whose contemporaneous of little prior intensity varies in some simple way with respect to the intensity of the first. But all these methods in the light of the rule of constant conjuction (Hume) are obvious; they barely prove helpful in solving the Humean problem.

Hume's answer to his critics was that as an agent he would be quite willing to concede their points but as a philosopher with some share of curiosity he would want to know the foundation of this inference. There may or may not be any internal necessity of linking events in the world and we cannot know whether there is such a linkage or not, but it is only reasonable to behave as if there was.

But then what would an answer to the question of causality come to? The law of the uniformity of nature phrased in causal language says that similar causes are always followed by similar effects and enables us to use the relation past-present as an analogy for present-future. But suppose it was suddenly revealed to us that this law was about to break down and that from tomorrow similar causes may not lead to similar effects. Now, unless we are told in advance what the differences were going to be, we will has to wait for the change in order to be able to base new kinds of prediction of new kinds of observation. But this activity itself would presuppose the same regularity of causal connection to which the change was offered as a counter example. A failure of the principle genuinely would involve complete chaos but one would have no way of knowing about it by the fact that this chaos would extend to our perception and thought. If all that is argued for is the occasional fallibility of the causal principle then this argument does not hold and we are once again driven to a sceptical impasse. hence, the solution would seem to lie not in trying to establish the truth of the principle but rather in asserting it.

It is to be noted that in any particular test, the cause and effect have to be abstracted from a complex setting or background. Thus, a better formulation of the principle would be that "similar causes lead to similar effects if the backgrounds are similar". In other words, if other things are equal (*ceteris paribus*), other things being equal we may resolve to proceed on the assumption that the causal principle holds but at the same time we may treat with courteous scepticism any claim to have decisively established it.

It may be envisaged that the present state of universe as the effect of its previous state and the cause of what will follow. By causal relationship is meant an effectively productive relationship between antecedent conditions and subsequent results. Hume could discover no such relationship, one merely saw the antecedent conditions and then the subsequent results.

The conclusion of the Pristine Humean view is that there is no difference between statement of cause and effect and all other statements of association. But this view is not very satisfactory because social scientists talk and behave as if some associations belong to a different class from other associations. Many attempts have been made to propose an impulsive and realistic definition or causality. M. Bunge and Blalock have defined causality mostly by offering synonyms for it. Causality, says Blalock, is conceived as involving the nation of production that is, causes produce effect. Production is obviously used as a synonym for causation. But giving synonyms can be useful when one is clarifying what a particular word meant in a particular language. Obviously, synonymization does not help solve basic scientific problems of causal labelling.

Definition may be offered by naming some properties of the concept. This type of Definition would aim to state, for instance, what causality is. This is a ontological definition in terms of certain material properties of our world. Such a definition can help us to convey to others a general feeling of what one has in mind. For example, a horse is an animal with four feet used for riding or culture is a grand pattern comprising habits, customs throughways and adaptive skills acquired by members of a society. Such a Definition of causality has been tried by philosophers for centuries now, without any success, Bridgeman criticizing sub-definitions argued that defining words in terms of properties creates wall to understanding. instead, he advocated that definitions should be formulated in terms of operations.

Hume demonstrated typical flaws in ontological Definition of causality without offering a substitute Definition of causality in terms of operations. Instead, he suggested that the term 'causality' was useless and should be dispensed with. This view was one of the most influential ones prevailing among the twentieth century philosophers including Bertrand Russell.

Terms can be defined denotatively, that is, with examples, But one needs more than denotations to clarify the scientific concept of causality .

When there is disagreement among scientists about the application of a term and when they are keen to increase the likelihood that the same operational definitions, i.e, by making sense of a concept by reference to the operations involved.

An operational definition of causality may reasonably be proposed in terms of the following procedure:

(1) The stimulus is varied and variations (if any) in the response observed.

(2) A number of other stimuli are used to observe if same response occurs.

(3) If the above two steps yield appropriate results the relationships between stimulus and response may be called 'causal'.

Defining causality in situations where structured experiments are not feasible is obviously fraught with hazards. However, a worthwhile operational Definition of causality in non-experimental setting would mean that the Definition results in many scientists reaching the same judgement. Secondary, if the proposed operational definition fits closely the hypothetical concept of causality held by most scientists.

It makes sense to say that causal relationship are a sub-class of associations. In other words, all causal relationships are associations but all associations may not be causal relationship. A cause and effect statement may be understood as a type of scientific explanation but not all explanations are causal statements. The questions now is how to effect a distinction between those associations that are not. Quite a few attempts have been made to find a method for deciding whether or not a particular association into causal and non-causal associations.

Many writes have opined that association which can be verified experimentally deserves the title causal, no others. Although this has been a useful rule in much of science it cannot be said to be a perfect rule. In any experiment some hidden third factor rather than changes in the hypothesized independent variable might be responsible for the changes in the dependent variable. Besides, many situations do not allow for experimentation. Since a hidden third factor may turn out to be the real cause, a single experiment understandably fails to provide a comprehensive operational definition of causality. It is necessary under the circumstances to run related experiments varying different parameters of the situation. He is only after the important possibilities are exhausted in the course of the experiment series that he can conclude or can rightfully say that the experimental stimulus causes the response.

Where experimentation is possible the operational Definition causality may be proposed as follows:

If the response follows the experimental stimulus and if this experimental relationship persists even if other elements of the situation subjected to variation, the observed relationship may be called causal.

Situations in which no experiment is possible and hence the test of experimental confirmation cannot operate as a criterion for defining cause statements, throw up a number of questions about causal statements. Sub-situations characterize most social sciences.

Wold attempted to bring non-experimental situations with the reach of the experimental verification principle by asking whether not a non-experimental situation is a fictitious or hbypothetical experiment. That is whether the natural situation has in it many of the elements of actual experiment. But this conceptualization is not without shortcoming. Firstly, the essence of the experiments as an operational definition causality is that it is the actual observed result of a real experiment that ves to determine whether or not the relationship is to be called Secondly, the very act of choosing to label a relationship as causal operation that defines causality. But such an operational definition validity because it hardly goes far toward resolving disagreements a people.

Logicians and philosophers have tried various combinations of conditional statements of the 'if-then' variety. They have attempted to find out some logical formulation that successfully distinguishes between causal and non-causal associations. This quest has, however, failed to reach the goal. yet another type of attempt has recently been made by H. Simon, Blalock and others abstracting from original work by P.Lazarsfeld. This group has investigated how the correlation between and among three or more variables can help the analysis to sort out which of these variables can be said to cause which. This is an implication and formalization of the analysis seeking to investigate whether a third factor is responsible for correlating between two other variables. This kind of a study of casual ordering is quite useful and important but does not achieve the purported results. For instance, if the investigator starts with three variables none of which should really be said to be the cause of another, the analysis can tell us anything about whether or not the relationship between two given variables should be called causal. Schemes of this kind aimed at labelling relationships as causal or non-causal depend heavily upon the use of extraneous knowledge to help us sort out the relationship. For instance, the knowledge that a certain event precedes all the others in time and hence cannot be the effect of these events. Thus, the whole thing boils down to the assertion that a relationship is causal unless proved otherwise by tests for spuriousness. Such a scheme obviously does not afford an operational Definition indicating whether a given relationship should be called causal. At best it can only suggest that within a set of variables one relationship is more causal than another.

The overview of these various attempts leads one to the conclusion, that no definition has been created that fits customary scientific usage, though this is the stated aim of all of them. It is not surprising also that no perfect or near perfect definition has yet been generated. Even the best operational definition does not lead every one to classify all examples of such concepts in exactly the same way. There always are exceptions at the border line. It is, therefore, quite understandable that such a term as a cause and effect which is so very complex and abstract would be much harder to define satisfactorily and would have many more border line cases on which people disagree when classifying situations as causal and non-causal.

Whether or not a situation is closely analogous to a controlled experiment does not provide a complete definition of causality. Furthermore, even in controlled experiment there is often no help for specification error except subject-matter knowledge.

In the light of the above discussion a working definition of causal relationship may be offered as under:

A causal relationship is expressed in a statement that has the following important characteristics: Firstly, it is an association that is strong enough for the observer to believe that it has predictive (explanatory) power that is great enough to be scientifically useful or interesting. For example, if the observed correlation is .06 even if the sample is large enough to justify the correlation as statistically significant. That is, unimportant relationships are not likely to be labelled causal. Secondary, the more tightly a relationship is bound into, that is, compatible with a general theoretical framework, the stronger its claim to be designated as causal. Connections to a theoretical framework afford a support to the belief that the side conditions necessary for the statement to hold true are not restricted and that the changes of spurious correction are not substantial; because a statement tends to stand or fall as the rest of the system stands or falls.

It may be noted that the term causal is more likely to have different meanings to the decision maker and to the scientist. The decision-maker will call a relationship causal if he expects to be able to manipulate it successfully. For example, smoking may be considered causal by a decision-maker wanting to reduce deaths from diseases statistically related to smoking. But to the scientists the word cause is likely to mean that the situation does not require further exploration. In the case of cigarettes perhaps only one ingredient in the cigarette does the damage and the scientists searching for this ingredient may choose to withhold the word cause from smoking itself.

The difference in meaning and use of causal concept between decision-making and pure investigating situation is one example of the general proposition that attribution of causality depends upon one's purpose. The causal concept is perhaps most necessary for a policy-maker especially when he is considering changing one variable in the hope of achieving change in another variable. The classification of causal and non-causal is an attempt to discriminate between situations that he believes allow such control and those that do not. On the other hand, the causal concept is not at all necessary for a person who is expected to forecast for he has no interest in trying to manipulate the independent variables. The causal concept may or may not be necessary for the pure investigator. Bertrand Russell and most contemporary physicists seem to believe that it is neither necessary nor useful in the physical/natural sciences. Many non-policy scholars in the social sciences, however seem to find the concept of causality useful in classifying situations for future research.

The difference among disciplines in respect of the variables to be called causal also illustrates how causal labelling depends upon purpose. He those cases in which variables are complementary, like achievement motivation and investment, it is perhaps unnecessary for the psychologiable or economist to deny the causal label to one variable in order to apply it another variable. But when the variables are hierarchical then they may be causally incompatible and particular investigators. depending upon the disciplines, must choose which label to study and call causal on the basis the label they consider most fruitful.

In regard to the meaning of causality as evidenced in social scientific usage of the term, there appears to be considerable consensus among scientists on which relationships are causal and which are non J.L. Simon proposes an operational definition of causality. "A statement", he says, "shall be called causal if the relationship is close enough to be useful or interesting, if it does not require so many statements of side conditions as to get its generality and importance; if enough... third factor variables have been tried to provide some assurance that the relationship is not spurious; and if the relationship can be deductively connected to a larger body of theory or... be supported by set of auxiliary propositions that explain the mechanism by which the relationship works."

The above definition is more in the nature of a check list of criteria. Whether or not a given relationship meets the criteria sufficiently to be called causal is neither automatic nor objective. The determination requires judgement and substantive knowledge of the entire context.

It should be clear, therefore, that science goes about its ordained business of accounting for the occurrence of events by disclosing their 'efficient causes'. This simply means that the event in question is shown to be determined by the preceding events. The remarks of the philosopher of science, A.E. Taylor, can barely be excelled. He says, "The notion of causation as a transaction between two things is replaced in the experimental sciences by the conception of it as merely the determination of an event by antecedent events. As it becomes more apparent that the antecedent events which condition an occurrence are a complex plurality and include states of what is popularly called the thing acted upon as well as the processes in the so-called agent, science substitutes for the distinction between 'agent' and 'patient' the current scientific conception of a cause (is thus) the 'totality of conditions' in the presence of which an event occurs and in the absence of any member of which it does not occur. More briefly, causation in the current scientific sense means sequence under definitely known conditions."

In modern science the emphasis is on a multiplicity of 'determining conditions' which together make the occurrence of a given event or effect probable. Scientific thinking is concerned with discovering 'necessary' and 'sufficient' condition for an effect. While 'common sense' leads one to expect that one factor may provide a complete explanation, the scientist rarely expects to find a single factor or condition that is both necessary and sufficient to bring about an effect. Rather, he is interested in 'contributory conditions, "alternative conditions' all of which he will expect to find operating to make the occurrence of a given event or effect probable (but not certain). We shall now briefly explain and illustrate the above 'conditions'.

(a) A necessary condition is said to be one that must occur if the phenomenon of which it is a 'cause' is to occur, e.g., if X is a necessary condition of y, then Y will never occur unless X occurs, Such a relationship between X and Y may be denoted as 'producer-product' relationship.[10] Such 'producer-product' relationships are the especial concerns of social and behavioural sciences.

By way of illustration, we may say that differentation is a necessary condition of social stratification, that is, social stratification would never occur if persons in the course of interaction did not get differentiated.

(b) A sufficient condition is one that is always followed by the phenomenon of which it is a 'cause'. If X is a sufficient condition of Y, then wherever X occurs Y will always occur. It must be borne in mind that in this strict sense of 'cause-effect', no object or event can by itself be said to be the cause of another object or event. The effect that an object or event has on another, always depends on this environment, e.g., mere striking the bell will not cause the subsequent sound if the bell is struck in a vacuum. Such a relationship between X and Y is studied primarily in 'mechanistic systems'.

(c) A contributory condition is one that enhances the likelihood that a given phenomenon will occur but does not make its occurrence certain since it is only one of a number of factors that together determine the occurrence of the given phenomenon. Some sociological studies have suggested that the absence of a father-figure from the home during childhood is a contributory condition in the generation of drug-addiction amonadolescents.

(d) A contingent condition is one under which a given factor is a contributory factor in producing a given phenomenon (effect). In the above ample, the contributory condition, i.e., absence of the father-figure, noncontribute to the incidence of drug-addiction among adolescents only neighbourhoods where the use of drugs is quite pervasive. In this case, a neighbourhood is a contingent condition under which the contribution condition, viz, absence of father-figure, contributes to the probability occurrence of the 'effect'.

(e) Alternative conditions are conditions which may all contribute toward the occurrence of a given phenomenon or effect. In the excited above, it may be seen that the absence of the father-figure (contributory condition No. 1) or the father-figure expressing variously tipathy toward children (contributory condition No.2) both contribute toward producing the effect, i.e, drug-addiction. These condition known as the alternative conditions.

It is impossible, as already mentioned, to demonstrate directly given characteristic or event X determines another characteristics or Y, either by itself or in conjunction with other characteristic or event are rather in a position of inferring from the observed data the hypothesis that X is a condition for the occurrence of Y is (or tenable with some particular measure of confidence. let us now what evidence is necessary to justify and inference of causal relationship.

(a) One type of relevant evidence concerns concomitant i.e., the extent to which X and Y occur together or vary together. We wish to test the hypothesis that X is contributory condition of Y, We shall have to find out whether the proportion of cases having the characteristic y is significantly greater among cases having characteristic X that among the cases not having the characteristic X. unless we can get at such an evidence, we will ordinarily conclude that the hypothesis is not tenable. Further, if the hypothesis also specifies that the among of Y is determined by the amount of X, we will have also to find evidence to the effect that, on the whole, those cases that show a higher amount of X also exhibit a higher amount of Y. Other type of causal hypotheses, e.g., that X is necessary or sufficient 'cause' of Y or that X as a contingent cause in association with M and an alternate cause with N, would require identifying particular patterns of association between X and Y.

It will be better understand this with the help of an example. Suppose in a small town a doctor on the basis of his observations, advances the hypothesis that eating of a particular seasonal fruit (X) may lead to severe cold (Y). An inquiry is then conducted with a view to testing the hypothesis. If consequent upon the inquiry it is found that among those who above it, proportion of these who ate the seasonal fruit (X) was almost equal, we would reject the hypothesis that X leads to Y. Of course, before rejecting the hypothesis, a careful investigation would need to be carried out with a view to finding out whether eating the seasonal fruit (X) is a contributory condition of cold (Y) under some contingent condition, e.g., say, general debility. Suppose, the inquiry revealed that the persons who had eaten the fruit and suffered from general weakness were in an overwhelming proportion in the ones suffering from cold, then we can say that seasonal fruit (X) is a contributory condition of severe cold (Y) under the contingent condition of general debility (M).

If, on the other hand, the inquiry indicated that 92% of people suffering from cold had eaten the seasonal fruit and only 25% of the people not suffering from cold and eaten the fruit, we wold conclude that the hypothesis that X is the contributory 'cause' of Y is tenable. It must be remembered that the hypothesis would be simply tenable, not proved, since other possible explanations of the observed relation between X and Y may be invoked and would be equally tenable, viz:

(1) Affliction of cold in some way created a craving for the fruit, which means that eating fruits did not lead to cold; it is rather the other way round i.e. cold (Y) created an urge for eating the fruit (X).

(2) Some other condition (Z) led to both eating the seasonal fruit and having cold.

(3) Yet another condition (W) like impurity which merely happened to be associated with eating the seasonal fruit was responsible for cold, i.e, tap water.

(b) Second type of evidence relevant to inference about causality is the time order of two events X and Y. One event reasonably be considered the cause of the other if it occurs after the other event. By definition, an effect cannot be produced by an event which occurs only after the effect has taken place. In our example, X cannot be considered the 'cause' of Y, if as proposed in the alternative hypothesis No. 1, the condition of however cold (Y) led to a craving for the seasonal fruit (X).

It would be well to remember that time order may not be accepted by some as an automatic test of causality. This argument may be replied by pointing out that just because there is no logical connection, it would not follow that the time lags are no help in establishing causality. We must recognize after all that to use time lag or time order to infer the direction of causality in a particular relationship is to make use of one of the most general inferences based on all the experimentation that has been undertaken, namely, that actions of the present do not appear to modify the past. But this is a statistical empirical hypothesis, not without known exceptions. Therefore, to put this inference to sensible use, one needs to adduce other additional reasons to justify that the hypotheses may be believed to apply in a particular case.

It should, also be noted that the occurrence of a causal event may precede or may be contemporaneous with the occurrence of an effect. It is also possible for each factor in the relationship to be both a 'cause' and an 'effect' or the other factor. This is an instance of the symmetrical causal relationship. George Homans' hypothesis, "The high the rank of a person within a group, the more nearly his activities conform to the norms of the group" typifies the symmetrical causal relationship in as much as the reverse of the hypothesis is also true, i.e., the closer the activities of a person come to the norm, the higher his rank will tend to be.

Although symmetrical causal relationships are frequently found in the realm of social phenomena, yet it will be useful to focus upon the influence of any one factor on the other. In distinguishing between 'cause' and 'effect' it is useful to establish which of the two events came first, assuming they did not occur simultaneously. Knowing that an increase in rank in a specific instance, preceded an increase in conformity to group norms, we understand that the increase in conformity was not the causal factor. However, knowledge of temporal priority is not in itself sufficient for inferring causality. In our example, even if we had established for certain that X preceded Y, this was not enough to say that the eating of seasonal fruit (X) causes severe cold (Y). Two other alternative hypothesis (No. 2 and No.3) need to be considered, i.e., that some other condition led to both (X) and (Y) or some other condition associated with X was responsible for Y.

(c) We must, therefore, get at the evidence which would establish that no other factor save the hypothesized one (X) was the 'cause' of the hypothesized effect (Y). Till such time as the evidence ruling out other factor as possible determining condition of the hypothesized effect is secured, we shall not be able to say that X is the 'cause' of Y. In our example, it may be that some third factor, e.g., glandular secretions led both to a desire the seasonal fruit as also to severe cold. If we can discuss us alternative possibility still remains to be reckoned, i.e., some other which merely happened to be associated with eating of seasonal fruit of cold. Suppose it was found that people who had bought the fruit from a particular shop where the fruit was kept in the open for a long time were the ones who mostly suffered from cold, wheres the few who had brought from other shop where the fruits were kept in a cold storage mostly did not super from cold; then the hypothesis that the seasonal fruit (X) itself was the cause of severe cold (Y) would be discarded and attention would be on to the effects of the storing system which might have brought out a chemical reaction in fruits in one shop but not in the other. Under on use circumstances, the effect Y would properly be attributed to the chemical factor.

It must be stressed that the three kinds of evidence discussed above, concomitant variation, time sequence of variables and evidence ruling at other factor as 'cause' is or is not cause of the effect. It does not, weaver provide any absolute certainty. That is, we may, on the basis of evidence, conclude that it is reasonable to believe that X is the 'cause' of but we can never be certain that the relationship has been conclusively emonstrated.

In the above example, the procedures suggested for testing the hypothesis that X is a cause of Y, called for a number of different studies. None of these separate studies could provided a very secure ground for testing the hypothesis because it left the alternative hypothesis unscathed and demonstrated.

An experimental design provides for the gathering of various kinds of evidence simultaneously so that all the alternative hypotheses can be interested. In an experimental test of the hypothesis in our example, the researcher would arrange for a number of subjects to eat the seasonal fruit (X) and for a number of comparable subjects not to eat the fruit. The groups are to be such that they do not differ from each other except by chance, before eating the seasonal fruit. Now comparison of the incidence of cold (Y) in two groups after one group has eaten the seasonal fruit (X) or a certain period of time and the group which has not eaten it, would provide evidence of whether eating of the fruit (X) and cold (Y) vary together. By keeping a careful record of the time of eating the fruit (X) and the time of the onset of cold (Y) the researcher would get the proof as to which of the variables came first. By introducing 'controls' to protect against the possibility that different exposures or experiences during the experiment (other than eating of seasonal fruit of not eating it) which might affect the occurrence of cold, he would ensure that the two groups different from each other only with respect to (x). The researcher, in addition, could build into his experiment, the provision for testing hypotheses about particular alternative causal factors. For example, the researcher would the hypothesis about the effects of storing system by having some of subjects eat seasonal fruit that had been stored in a cold-storage and he eat other fruit (not the seasonal fruit in question) stored in the open is would help him to ascertain whether the 'open' storing system alone productive of (Y) or whether the 'open storage' interacted with the personal fruit (X) and the product of interaction (V) produced (Y).

Thus, we see that experimental design wherever it is feasible is the most effective device for testing a causal hypothesis. But then, experiments are not possible to be set up in certain situations. Suppose a researcher is interested in studying the effects of different methods of child-rearing on the personality structure of a person. He cannot conceivably assign certain children to be brought up in one way, others in another. In such a case he would have no other alternative but to proceed by locating children who have been brought up in different ways and then assessing their personalities. Hypothesis about the effect of attributes of the individuals are not often amenable to experimental investigation since the manipulation of the 'independent' variable (experimental variable or the factor which has been hypothesized as the 'cause') is either extremely difficult or impossible. Let us say, we want to see the effect of feeble-mindedness (X)) on perception (Y). it would not be possible in this case to manipulate (increase or decreased) feeble-mindedness. The only alternative open to us will be to achieve this variation by selecting individuals in whom this variable is present or absent; more or less. Occasionally, natural situations may provide the desired contrasting condition (e.g. very high I.Q.) and thus the opportunity for sufficiently rigorous procedures to make possible a reasonably sound basis for inference. Ordinarily, however, the natural situations are complicated and do not admit of an assumption on the part of the researcher that two or more groups that he has chosen for the purpose of experimentation are equal in all respects except in respect of the experimental variable. It is understandable that without a sound basis for such an assumption which a created artificial situation affords, the results of the experiment can have only doubtful reliability.

Of course, there is no way to be absolutely certain about the validity of inference. No matter how carefully controlled the experiment, there always lurks a possibility that the influence of some factor was not taken into account. Especially, in social sciences, where there is little knowledge about what factors to control and where many of the relevant factors (e.g., attributes of the individual) are not quite amenable to control, this possibility has to be contended with.

BASIC OUTLINE OF EXPERIMENT

Fro a start, two groups are chosen such that they do not differ from each other in significant respects (which might affect the hypothesized relationship among variables) except by chance. Any one of these groups may be chosen as the 'experimental' group and the other chosen as the group. The 'experimental' group is exposed to the assumed causal able while the 'control' group is not. The two groups are then compared in terms of the assumed effect (dependent variable). The structure makes possible the securing of three types of evidence required for testing causal hypotheses.

Evidence of the first type, i.e., of concomitant variation, is provided very simply in an experiment since the investigator can easily see or determine whether the assumed effect occurs more frequently among subjects who have been exposed to the assumed cause than among those who have not been exposed to it.

Evidence of the second type, i.e. (Y) did not occur before (X), is also easily obtained because the experimental group are chosen in such a way that there is reason to believe that the two groups do not differ from each other, in terms of a referent of (Y) before exposure to (X). Alteratively, the actual before measurements of these two groups afford the basis for saying that the groups did to differ in respect of (Y) before exposure to (X). This being the case, the difference in these two groups after exposure of one of them to (X) can be said to have decisively followed the experimental variables, i.e., (X).

Evidence of the third type, that which rules out other factors as the possible determining conditions of (Y) may be secured in several ways in an experiment. Such possible causal conditions may be:

(a) factors that have occurred in the past or are more or less enduring characteristics of the subjects;

(b) contemporaneous events other than the exposure to the experimental variables:

(c) maturational or developmental changes (or changes due to inertia as in physics) in subject of the experiment during the period of the experiment; and

(d) the influence of the measurement process itself.

Different procedures have been evolved to eliminate each of the above type of factors as the possible determining conditions of the effect (Y). These shall be discussed at length when we consider the basic types of experimental design and its ramifications.

The entire design of an experiment has the function of providing for collection of evidence in such a way that influences of causal relationship between the independent and the dependent variables can be legitimately drawn. However, certain aspects are especially important in this regard, viz., the method of selecting experimental and control groups, the points in time when the dependent variable is measured, the pattern of control groups used and number of possible causal variables systematically included in the study.

Let us turn to consider the issue relating to the selection of experimental and control groups when designing an experiment

In any research design that involves comparison of two or more groups of subjects who have been exposed to different experimental treatments, there is an underlying assumption that the groups being compared were equivalent before the introduction of the experimental treatment.

Clearly, the goal of creating groups that are equivalent in all respects impossible of attainment. Before considering how this problem can be ackled in a practical and satisfactory way, we should be able to appreciate the rationale behind having such equivalent gropes. The first reason is to provide a basis for inferring that the differences which may be found on the dependent variable (assumed effect) do not result from or reflect initial differences between the two groups. This second reason is that of increasing the sensitivity of the experiment by making it possible that small effects of the experimental variables are registered which might possibly be dimmed by the effect of other factors.

The goal of protecting the validity of the experiment by ensuring that the experimental and control groups differ initially only by chance, is achieved by a procedure termed 'randomization'. The other goal, i.e., increasing the sensitivity of the experiment so that the effects of the assumed causal variable will be clearly discrenible even if they are reactively small and when there are relatively few subjects, is achieved by the 'matching' procedures.

RANDOMIZATION

It involves .random assignment of members of a group of subject to experimental and control groups. The assignment procedures must give each subject the same chance of being assigned to any of the alternative groups. This can be achieved by flicking a coin for each subject; e.g., if it falls 'heads' the subject may be assigned to the control gropes. Thus, the procedure is such that in any selection of the subject, researcher's personal judgement is inconsequential. This does not, of course, mean that the experimental and control gropes will be exactly alike but that whatever differences exist between them prior to exposure to the experimental variable are solely due to chance or the operation of the probability principle. If after one of the groups is exposed to the experimental treatment the two groups are found to differ by more than what could be expected by chance , the researcher may infer that the experimental variable has led to this difference. it must be remembered, however, that this inference can be made only tentatively, subject to the possibility that some other factor may have led to it.

MATCHING

Matching, simply stated, involves pairing the subjects for assignment to the experimental or control group in a manner that a particular types of subject assigned to, say the experimental group, is balanced by assigning its exact counterpart to the control group. For example, a male, 25 years old, living in city and of average intelligence in the experimental group is paired with a city dwelling male of the same age and intelligence in the control group. Matching is typically effective in increasing the sensitivity of the experiment. Matching ensures that the experiment will reveal true differences brought about by the experimental variable, although these (differences) may be small as compared to those produced by other variables.

The matching of individuals is understandably a very difficult task for the following reasons:

1. if matching is to be precise and subjects are to be matched

on several criteria, like, age, sex, nativity, educational status, there must be a large number of cases to select from, in order to achieve an adequate pairing. All of these cases will have to be measured in relevant respects, but only a few can be used. The more precise the matching, greater the number of cases for which no match may be available.

2. It is often quite difficult to know exactly which factors are the most important ones for purposes of matching. Matching with some degree of precision on more than two or three factors is hardly possible.
3. it is often difficult to obtain adequate measure of the covert and intangible factors on which matching is necessary, e.g., attitudes, intelligence, aspirations, morale, etc. It is obvious that if adequate measures of the assumed relevant factors are not available, matching is likely to be inaccurate.

It is worthy of note that matching is not a substitute for randomization; it is rather a supplement to it. Matching can take account of only a few variables; therefore, those that are unaccounted for but, nevertheless make up the complexion of a group, should be randomly distributed between the experimental and control groups.

Should the research interest be in a functioning collectivity (family, clique, class room, etc.), it is appropriate to match group with group rather than individual with individual.

One method or matching, technically called the frequency distribution control, is an attempt to match an experimental with a control group in terms of the overall distribution of a given factor or factors within the two groups. Fro example, if age was relevant to the effects being studies, frequency distribution control would ensure that the average ages in these two groups (i.e., experimental and control) are alike and the distribution of ages in the two groups is similar. This method is thus an attempt to get some of the advantages of matching case by case without having to incur the cost of losing many cases (unmatched) as we do in the precision control matching.

The frequency distribution control method, however, is not without its disadvantages. Although distributions on single factors are equated, the groups may actually be badly mismatched on a constellation of these factors. It would be wrong to assume that distributions in two groups are similar simply because their averages are similar. Secondary, even though a statistical test indicates that the distributions in two groups do not differ significantly, the researcher is not justified in concluding that they are equivalent.

Now will be better to consider the different types of experimental design.

If the researcher wishes to test the hypothesis that X is the cause of Y, by comparing a group that has been exposed to X with one that has not been so exposed, it is obviously essential to measure the two groups with respect to Y, either during or after their exposure to X. Sometimes, it is desirable or even necessary to have in addition, measures of their position with respect to Y before they have been exposed to X. The point of time at which the dependent variable, i.e, assumed effect, is measured provides a basis for classifying experiments into two main groupings.

The control groups instituted provide a basis for further sub-classifications.

Experiments

- THE 'AFTER-ONLY' TYPE (Measurement only of the dependent variables after exposure to experimental variable)
- THE 'BEFORE-AFTER' TYPE (Measurement of the dependent variable before and after the group is exposed to the experimental/ independent variable)
  - Before-After (Single group)
  - Before After (with one control group)
  - Before After (with two control groups)
  - Before-After (with three control groups)

The After-Only' Experimental Design:

The After -only experiment in its basic outlines may be represented by the following procedure:

Condition	*Experimental Group*	*Control Group*
Before Measurement	No	No
Exposure to Experimental Variables	Yes	No
Exposure to uncontrolled factors	Yes	Yes
After Measurement	Yes (Y2)	Yes (Y2)

$$\text{Change} = Y_2 - Y'_2$$

The procedure characteristic of the After-only experiments may be described as follows:

(1) Two equivalent groups are selected. Any one may be used as the experimental group and the other as the control group. As said earlier, the two groups are selected by randomization procedures with or without supplementary 'matching'.

(2) None of these two groups is measured in respect of the characteristic which is likely to register change, consequent to the effect of the experimental variable. The two groups are assumed to be equal in respect of this characteristic.

(3) The experimental group is exposed to the experimental variable (X) for a specified period of time.

(4) There are certain events or factors whose effects on the dependent variables are beyond the control of the experimenter. Try as hard as he might, he cannot control them. So these factors may be called uncontrolled events. Needless to say, both the experimental as well as control groups are equally subject to their influence.

(5) The experimental and control groups are observed or measured with respect to the dependent variable (Y) after (sometimes, during) the exposure of the experimental group to the assumed causal variable (X).

(6) The conclusion whether the hypothesis, 'X produces Y' is tenable is arrived at simply by comparing the occurrences

of Y (or its extent or nature) in the experimental group after exposure to variable X with the occurrence of y in the control group which has not been exposed to X.

In the tabular representation above, Y_2 and Y'_2 (after measures) are compared to ascertain whether X and Y vary concomitantly. The evidence that X preceded Y in time, is acquired from the very method of setting up the two groups. The two groups are selected in such a manner that there is reason to assume that they do not differ from each other except by chance in respect of the dependent variable Y.

The final problem of eliminating the effect of other factors, such as contemporaneous events or maturational process is dealt with on the basis of the assumption that both groups are exposed to the same external events and hence undergo similar maturational or natural developmental changes between the time of selection and the time at which Y is measured. if this assumption is justified, the position of the control group on the dependent variable Y'2 at the close of the experiment includes the influence of external uncontrolled events and natural development processes that have affected both groups. Thus, the difference between Y_2 and Y'_2 may be taken as an indication of the effect of the experimental variable. It must be borne in mind, however, that the external events and the developmental processes may interact with the experimental variable to change what would otherwise have been its effect operating singly. For example, the effect of a medicine M may be different when the atmospheric conditions or climate interacts with the medicine. Thus, babies may register a greater increase of weight when medicine and climate interact with each other as compared to the increase that may be attributed to medicine (M) and climatic conditions (A) operating on the babies independently.

The major weakness of the After-only experimental design is obvious that the 'before' measurements are not taken. Both groups are assumed to be similar in respect of the before measure on the dependent variables. Unless the selection of the experimental and control groups is done in such a meticulous manner that it warrants such an assumption, it is quite likely that the effect the researcher attributes to the experimental variable may really be due to the initial differences between the two groups. begain, as we shall shortly see, 'before-measurements' are desirable or advisable for a variety of reasons. This facility is lacking in the After-only design.

We cannot afford to overlook the possibility that in certain experimental situations, 'before measurements' are not feasible owing to certain practical difficulties. Again in certain situations, as we shall have an occasion to appreciate, 'before measurements' may not be advisable and the safeguards quite prohibitive in cost. Under such circumstances the After-only design may be a reasonably good choice provided, of course, that meticulous care is exercised in selecting the groups as equivalents.

THE BEFORE-AFTER EXPERIMENTS

As their very name would indicate, the 'before-after' experiments share a common characteristic, namely, the group or groups are observed or measured before the exposure to the experimental variable. A 'before' measurement of the dependent variable that characterizes the before-After experiments may be desirable for various reasons such as the following.

(a) A 'before' measurement of the dependent variable is necessary for matching the cases in the experimental and the control groups. This measure greatly enhances the sensitivity of the experiment.

(b) A 'before' measurement makes it possible to determine the incidences of change in the dependent variable and to take these into consideration in evaluating the effects of the experimental or independent variable.

(c) If the hypothesis of the study specifies the initial position on the dependent variable as one of the determining conditions, then obviously, the before measurement is required to test the hypothesis. For example, the hypothesis may state that an educational programme will have greater effect on person who have a set of specific characteristics than those who do not have these particular characteristics. In such a case, an initial measure of such characteristics as well as the 'after' measure is required by the hypothesis.

(d) If the experimenter is interested in finding out whether the experimental treatment has different effect on cases who were initially at different positions on the dependent variable, he must, understandably have a 'before' measure of position on the dependent variable.

(e) In the real life settings, the ideal requirement of selecting the experimental and control groups on a purely random basis is often hard to fulfil and certain compromises are called for. In such cases the evidence from a 'before' measure that the experimental and control groups were initially equal in respect of the dependent variable helps to increase the confidence that a difference found on the 'after' measure is due to the effect of the experimental variable.

The 'Before-After' experiments may characterize various arrangements and permutations with reference to control groups:

(1) Only one group may be used in the study, with the 'before' measure serving as a control, i.e., representing the position of the dependent variable in the absence of the experimental treatment.

(2) The 'before' measurement may be on the one group and 'after' measure on a different one which is assumed to be an equivalent group.

(3) The 'before' and 'after' measures may be taken both on experimental groups as well as on one control group.

Whatever the pattern of control groups, the 'Before-After' experiment provides evidence of concomitant variations amongst X and Y, by comparing the occurrence of y in the group exposed to X with the occurrence of Y in the group not exposed to X. The second evidence of causality, i.e., that X came before Y in time, is inferred from the assurance provided by randomization that the groups are likely to be equivalent with respect of there referents of

Y. This initial equivalence with respect to the referents of Y can be checked by comparison of 'before' measures of the two groups.

The 'before-after' experiments may involve two or more control groups. The variations in control group arrangements relate to the attempts to take account of and segregate effects of contemporaneous events, maturational or natural development processes and of 'before' measurement on the experiment.

The possibility of the effects of the 'before' measurements on the dependent variable must be reckoned with. The 'before' measurement may crystallize the attitudes or views of the subjects of it may exhaust the good will of the subjects. The subjects may mentally connect the 'before' measurement with the experimental treatment as also with the 'after' measurement. The 'before' measure may thus, distort the true effect of the experimental variable. The second (i.e., the 'after') measurement may introduce other problems. The subject may be bored or he may try to give responses which are consistent with his previous responses (elicited during the 'before' measurement) may also try to vary the responses just to make them more interesting or just to 'co-operate' with the experimenter in his 'intended' purpose of being able to show a certain change. The process of repeated measurement, i.e., 'before' and 'after' may also affect the measuring instrument, e.g., the observer himself may get fatigued, prejudiced or grow more or less sensitive to the phenomena he is recording.

With this general outline of the 'before-after' experiments as a back drop, let us now discuss the specific types of experiments of this class.

The 'Before-After' Experiment with a Single Group

The tabular representation of this type of experiment is given below:

Conditions	*Experimental Groups*
Before Measurement	Yes (Y_1)
Exposure to experimental factor	Yes
Exposure to uncontrolled events	Yes
After Measurement	Yes (Y_2)

$$\text{Change} = Y_2 - Y_1$$

It is clear that in this design, the difference between the subject's positions on the dependent variable before and after the exposure to the independent variable (experimental factor) is taken as a measure of the effect of experimental variable. the subject is made to serve as his own control.

But is understandable that external factors unrelated to the experimental treatment may have been in operation, leading in turn to a change in the subject's position on the dependent variable. Thus, the major weakness of this rudimentary experimental design is that it does not make possible the segregation of such effects (i.e., external, contemporaneous, developmental processes and the effects of 'before' measurements) from those of the experimental treatment.

The design may, therefore, be used only when the researcher can assume on just grounds that the 'before' measurement does not in any way affect (a) the subjects' exposure to the experimental variable and (b) the 'after' measure. In addition, the use of this design is justified if the researcher has a sound basis for believing that there are not likely to be any other influences, besides the experimental variable, during the period of experimentation which might have affected the subjects' response at the time of second measurement.

The 'Before-After' Experiment with One Control Group

The inclusion of one control group in this design is aimed at taking account of the effects both of the initial measurement and of contemporaneous, external factors. In such a design, experimental and the control group are both measured at the beginning and also at the end of the experimental period.

Conditions	*Experimental Group*	*Control Group*
Before-measurement	Yes (Y_1)	Yes (Y'_1)
Exposure to experimental variable	Yes	No
Exposure to uncontrolled events	Yes	Yes
After measurement	Yes (Y_2)	Yes (Y'_2)

Change = $Y_2 - Y_1$ (Experimental Group) $Y'_2 - Y'_1$ (Control Group)

The experimental variable is introduced in the experimental group only. Since both the experimental and control group are subject to the 'before' measurement and the uncontrolled factors, the difference between the two groups is taken as the effect of the experimental variable alone.

In view of its typical limitations, this design should be used only in cases where the 'before' measure and the uncontrolled events affect the experimental and control groups in the same way. But it is quite possible that the 'before' measure or uncontrolled factors may interact with the experimental variable in such a way that its effect is changed. When such a possibility is present, the 'Before-After' study with one control group does not afford a basis for inferring the effects of the experimental variable since it cannot segregate or draw apart the singular effect of experimental variable. R.L. Solomon has devised more elaborate designs to take account of such interactions. These involve use of additional control groups.

The 'Before-After' Experiment with Two control Groups

The design makes it possible to segregate the influence of the experimental variable from that of the 'before' measurement even if there is a likely interaction between them (i.e., experimental factor and 'before' measurement). This design may be represented as under;

Condition	*Experimental Group*	*Control Group I*	*Control Group II*
Before measurement	Yes (Y_1)	Yes (Y'_1)	No (Y'_1) = ($Y_1 + Y'_1$)/2
Exposure to	Yes	No	Yes
Experimental factor Exposure to uncontrolled events	Yes	Yes	Yes
After measurement	Yes (Y_2)	Yes (Y'_2)	Yes (Y'_2)
Change	$d_1 = (Y_2 - Y_1)$	$d_2 = (Y'_2 - Y'_1)$	$d_3 = (Y''_2 - Y''_1)$

Interaction = $d_1 - (d_2 + d_3)$

This design involves an addition of one more control group to the previous design, i.e., 'Before-After' study with one control group. This second control group is not pre-measured but is exposed to the experimental variable and subjected, of course, to after measurement. The 'before' measure of the second control group is assumed to be similar to the 'before' measures of the experimental and the first control group, i.e, equal to the average of the 'before' measures of the experimental group and control group I. Thus, in control group II, there is exposure to experimental variable but no possibility of interaction between the 'before' measure and the experimental variable.

In case it is assumed, for a moment, that contemporaneous events or maturational processes are not likely to have significant effect on the dependent variable in this design, the change in control group II, i.e, d_3 may be taken as the effect of experimental variable alone. Again, the change in control group I may be taken as the effect of 'before' measurement alone. Further d_1 and the sum of change scorers of two control groups, i.e., (d_2+d_3) may be taken as the effect of interaction between the 'before' measurement and the experimental variable. This interaction may have the effect of enhancing or reducing (in varying degrees) the effects of the experimental variable.

Let us try to understand this by an example. Suppose the researcher wants to test the hypothesis that a new system of instruction

(X) has the effect of improving the performance of students at the examination. Should he decide to use the 'Before-After' design with two control groups, he would need to follow the procedure shown in the above representation. He administers a test to two out of the three equivalent groups, i.e., the experimental group and the control group I, to know the 'before' measure on the performance of the students. The 'before' measure of the control group II is assumed to be the average of the 'before' measures of the two groups, subjected to 'before' measurement. Suppose this measure was 50 marks in both the groups and therefore, control group II is also assumed to measure 50 marks. Next, the experimental group and the control group II are exposed to the experimental variable, i.e, those groups are exposed to the way. Of course, during the time that the groups are subjected to the experimental variable, say for a fortnight, all the groups are equally subject to the effect of factors external to the experiment and beyond the control of the experimenter. Lastly, the 'After' measures are taken for all the group and the changes, i.e, difference between the 'After' measures are taken for all the group and the changes, i.e, difference between the 'After measures and 'Before' measures, are recorded.

It is clear that the change in the control group II (d_3) is due to experimental variable, i.e., the new method of instruction, and the uncontrolled events. Now assuming that the uncontrolled contemporaneous events did not have any significant effect on the dependent variable (i.e. performance in terms of marks), this change, let us say(60-50 = 10) of terms of marks, may be attributed to the new method of instruction alone. The change in control group I may be attributed to the effects of 'before' measurement, i.e., the awareness in the subjects about the experiment and second examination. Let us say, the change amounts to (54 - 50 = 4) four mark experimental variable, assuming the effect of the uncontrolled events as total to fourteen (10 + 4).

Now, the experimental group registers, let us say, a change of (65-50 = 15) fifteen marks. This change is the integrated effect of the 'before' measurement, plus the effect of experimental variable, plus the effects uncontrolled factors, plus the effects of the interactions between (a) 'before' measurement and experimental variable, (b) that between the experimental variable and the uncontrolled factors and (c) that between 'before' measurement and the uncontrolled factors. But since there reason to believe (in our example), that the uncontrolled factors have no or very negligible effect, the interaction in this experiment would really occur only between the 'before' measurement and experimental variable and may make subjects respond to the experimental variable differently than they would have, if they were not pre-measured. Thus, the change, i.e., 15 marks, is the cumulative effect of (1) the 'before' measurement (2) the experimental variable and the interaction between I|(I) and (II). From our control groups (I) and (II) it is found that the individual effects of (I), the 'before' measurement and (II) it is found that the individual effects of (I), the 'before' measurement and (II) the experimental variable, adds up to 14 marks ($d_2 + d_3$). But for the interaction the change in the experimental group, i.e. d1 would be equal to ($d_2 + d_3$), i.e. 14 marks. We find however, that d1 (=15) exceeds ($d_2 + d_3$) by 1 mark.

This means that the instructional effect of (I) and (II) is equal to +1. (The instructional effect might be negative also). It is clear now that this experimental design is useful and efficient only in situations where there is a sound reason to believe that the uncontrolled contemporaneous events or maturational processes are not likely to have significant effects. 'How would we proceed in a situation where such uncontrolled factors are quite likely to have important influences on the dependent variable?' is the question that we now turn to answer.

R.L. Solomon has provided an answer to this question by proposing a further elaboration of the above design with a view to installing safeguards when contemporaneous events or developments changes may be expected to influence experimental results. This involves the addition of a third control group.

Condition	*Experimental Group*	*Control Group I*	*Control Group II*	*Control Group III*
Before Measurement	Yes (Y_1)	Yes(Y'_1)	Yes (Y''_1) $=\left(\frac{Y_1 + Y'_1}{2}\right)$	Yes (Y'''_1) $=\left(\frac{Y_1 + Y'_1}{2}\right)$
Exposure to Experimental fact	Yes	Yes	Yes	No
Exposure to Uncontrolled event	Yes	Yes	Yes	Yes
after measurement	Yes (Y_2)	(Y'_2)	(Y''_2)	(Y'''_3)
Change	$d_1 = Y_2 - Y_1$	$d_2 = Y''_2 - Y''_1$	$d_3 = Y''_2 - Y'''_1$	$d_4 = Y'''_2 - Y'''_1$

Interaction = d1 ($d_2 + d_3 + d_4$)

'Before-After' Study with Three Control Groups

As should be clear from the above representation, the experimental group and control group I are subjected to 'before' measurement. As with the previous design (with two control groups), the control groups II and III to the average of such scores in the experimental and control group I. The experimental variable is introduced to the experimental group and control group II. Al the four groups are assumed to be equally subject to the effects of external contemporaneous events, let us say, some national event or some campaign, etc. during the period of experiment. All the four groups are measured after the experiment.

In such a design, the change in control group III i.e. d_4, represents the effect of contemporaneous events beyond the experimenter since this happens to be the only factor operative on this group. The change in control group II, i.e., d_3 represents the effect of the experimental variable and of the contemporaneous events. Change in the control group I, i.e., d_2 represents the effects of 'before' measurement and of the contemporaneous factors. The effect of the experimental variable alone, i.e, of the new method of instruction, can be assessed by subtracting the change in control group III from the change in control group II, i.e,, d_3-d_4. The change in the experimental group i.e., d_1 reflects the cumulative effects of 'before' measurement, of the experimental variable, of uncontrolled events and of interaction between these factors. Now this design affords us the individual measures of the effects of uncontrolled factor, i.e., d_4, (the effect of say, some national campaign which keeps subjects more informed about certain) and of the effect of experimental variable a one (d_3-d_4) and finally the effect of 'before' measurement (d_2 - d_4). Hence, we can easily calculate the instructional effect of the three factors, i.e, (a) 'before' measurement, (b) experimental variable and (c) the uncontrolled factors, on the dependent variable, i.e,, the examination score by subtracting the total of the individual effects of the three factors, on the dependent variable, i.e. the examination score by subtracting the total of the individual effects of the three factors (a), (b) and (c) from the total change registered in the experimental group. Thus, instructional effect would be equal to d1 - $(d_2 + d_3 - d_4)$.

it may be observed that this experimental design with three control groups is tantamount to doing the experiment twice, i.e., once with a 'before-after' design with one control group (experimental group and control group I) and the second time, with an 'after only' design (control groups II and III).

In the context of the discussion on the various types of experimental designs, it must be remember that these experiments suffer from a general limitation of a practical nature, i.e. ,the researcher is not always in a position to test a casual hypothesis by assigning subjects to different conditions in which he directly controls the causal (experimental) variable. For example, if the hypothesis was concerned with the relation between smoking and cancer, the researcher would hardly be in a position to control the extent of smoking as per the ideal requirement of the experimental procedure by assigning different persons to smoke a different number of cigarettes. All that the researcher can get at is a record of how much an individual has smoked and of whether he has cancer. The correlation between smoking and cancer may be computed.

But the existence of a correlation between smoking and cancer does not mean necessarily that one is the cause of the other. The researcher must contend with the possibility expressed by the correlation that people who smoke heavily are for some as yet unknown reason, also the kind of people who develop cancer. If, therefore, a non-experimental study (since 'experimental' control as in this example, is not possible) was to provide a test of 'causal' hypothesis, it must provide grounds for making inferences about causality and safeguards against unwarranted inferences. But the non-experimental studies cannot provide such safeguards as adequately as the experimental studies do. Certain substitute safeguards are available. These safeguards involve comparison of people subjected to contrasting experiences in the real life-setting, determination of the time-order of variables (supposed 'cause' and 'effect') and examination of the relationship between the variables in terms of pattern of relationships that might be anticipated if one or the other were to be the causal condition.

(a) Comparison of groups exposed to contrasting experiences: If an investigator is not in a position to assign subjects to different groups, one which will be exposed to a given treatment and one of which will not be so exposed, then the only alternate solution is to locate groups of people in the natural setting who are about to be or have been exposed to experiences that differ with respect to the assumed causal variable in which the researcher is interested. For example, if the researcher was interested in the effect of community development (C. D.) programme on tribal communities, he would select two similar communities differing only in respect of their exposure to the community development programme, i.e, one of these would be the one exposed to the C.D. programme and the other equivalent community would have to be the one that did not get exposed to the C.D. programme. Such a study approximates an experiment in the sense that the community in which the C.D. programmes have been in operation represents the 'experimental' group and the other community represents the 'control' group. The difference between the two communities in terms of certain pertinent characteristic may be attributed to the causal variable, i.e., the C.d. programme. Of course, we must be aware of the various difficulty involved in selecting those groups (communities) that are equivalent in all respects and differ only in respect of the exposure to the assumed causal variable. In the real life-settings, it would be a stroke of good luck to come across such comparable groups differing only in respect of the causal variable.

The type of design we have just discussed may be called the 'ex-post facto' design. Studies using the 'ex-post facto' pattern suffer from a serious limitation, namely, that the subjects cannot be randomly assigned to different conditions and there is no possibility of prior measurements to check whether the two groups were initially similar in their position on the assumed dependent variable or in respect of certain other characteristics believed to be relevant to it.

As suggested earlier, the researcher may sometimes be in a position to locate two groups of comparable people one of which is about to be exposed to certain experiences (assumed causal variable) and the other, not likely to be so exposed. Such a study approximates a 'before-after' experiment with one control group. The group of subjects about to undergo a particular experience, e.g., those selected to undergo a particular orientation course, represents the 'experimental' group and those not selected represents the 'control' group.

Let us now discuss how one can get at the second kind of evidence necessary to establish causality, i.e, evidence of the time-order or variables in a non-experimental study design. In some cases, the evidence that X preceded Y and not vice versa, is so clear that no supplementary evidence is needed. often, however, the time relationship between two variables is not so clear. Even though one appears to be prior to the other, this may not really be the case. For example, in a study of the effect of early experiences on the typical response pattern during adulthood, a researcher may have to rely on his adult subjects' accounts of their childhood. What he would get out of the adults is actually likely to be statements (about childhood) that have been heavily coloured by the subjects' personal interpretations based on their personal 'theories' and their prospective reflections as adults.

The researcher may utilize various procedures to secure evidence of the time-relationship between the variables. We shall discus two of them.

(1) The investigator may ask the subjects how they felt about some thing before a certain event took place or whether there have been any changes in their feelings. For example, a question such as this may be asked. "Can you remember what you thought about life in an industrial complex before you moved into it?" But one cannot afford to overlook the danger in this case, that replies to such questions may be inaccurate. The researcher may sometime devise indirect checks on the incidence of distortion.

(2) Gathering evidence through studies extended over time: **Panel Studies**: The panel study is a special type of long view technique that measures certain attributes of a given sample of persons at different points in time. The panel study, however, differs from other long view studies in at lest two significant ways. Firstly, the panel study is more likely to have a real historical interest as compared to other long view studies in that it is generally concerned with what happened at particular times. It is understandable why a study at a single point in time can hardly be used to find out how people of a certain community changes their attitudes and view-points about say, a certain programme of development or a certain campaign. Thus, there is no substitute for data on different points of time.

It is well worth noting that a panel study is not a only way to obtain this type of historical information. Alternatively it may be possible to take separate simples at various points of time and on this basis to attempt a historical documentation. Suppose we wanted to know in absolute terms what proportion of votes a particular political party has obtained at different times before a particular election, then it hardly matters, in conceptual parlance, whether the poll is taken on a sample of people just about a fortnight before the election or whether a poll is taken on the same sample of the above size (panel) twice. Major cost differences between these two strategies are not quite substantial.

Secondary, the panel study may be distinguished from other long view techniques in that the panel is much more efficient when charges are brought to be measured from period to period rather than on the absolute levels. For example, a manufacturer may want to know whether or not more people are shifting towards his brand of produce than moving away from it. the panel study typically grapples with such comparative problems with great statistical efficiency.

It is obvious that the panel method in comparison to non-panel long view method reveals much back and forth shifting behaviour that otherwise fails to meet the eye.

Studies limited to a single observation or single interview or other measurement of each respondent, and in which the researcher does not have supplementary information about individual's experiences, there is little possibility of securing evidence about time sequences except by asking the respondents to recall when events took place. But in studies that focus on the same people over a period of time, the investigator may secure direct evidence of time relationships among variables. Such longitudinal studies may take the form of repeated observations or interviews with the same subjects; the common group of informants subjected to repeated observations or measurements over a period of time constitute the 'panel' for the researcher. The 'panel' is subjected to a 'multiphased study'. The American Soldier Studies' conducted by Stouffer and associates provide an example of utilizing different kinds of data about the same subjects at different times.

Samuel Stouffer and associates were interested in the relation between the acceptance of the official value system of the Army and promotion. They interviewed a group of newly-inducted soldiers and ascertained their position on the scale of acceptance of the Army value system.

Four months later, they examined the Army records of these very men and found that a higher proportion of those who had a higher position on the scale of value acceptance, had got promotion. this led them to the conclusion that positive commitment to the Army value system was conducive to promotion.

We may point out the typical advantages of the panel techniques as under:

(a) If mini-samples of a given population are studied by a single contacts and differences in the results noted from one period to another, one cannot know whether these differences are due to differences in the samples or to the true shifts in the phenomena being measured. But, if the sample surveyed during each period includes the same persons or groups, as in the panel technique, the variations or shifts in the results may be attributed with certitude to a real change in the phenomena studied. For example, full effect of a campaign cannot be ascertained through sequence of polls taken on different people. They show only majority changes. They conceal minor changes if these are nullified by opposing trends. Most impotently, they do not indicate who is changing nor do they follow the vagaries of the individual voter along the path of his vote, to discover the relative effects of various other influencial factors on his final voting verdict.

(b) Data secured from the same persons over a period of time, affording a detailed picture of the factors involved in bringing about shifts in opinions or attitudes, can be secured for everyone in the panel. An analysis of the chartered profile of individuals in a panel may afford the researcher an insight into the causal relationships.

(c) The information collected about each person from time to time tends to be deeper and more voluminous than that obtained in single contacts. it is possible, despite certain limitations to build up an inclusive case history of each panel member.

(d) Provided, of course, that the group constituting the panel is cooperative, it may well be possible to set up experimental situations which expose all members of the panel to a certain influence and thus enable the effectiveness of this influence to be measured.

(e) It has been the experience of researchers that the members of a panel learn to open out and unload their feelings in the course of frequentative interviews and so valuable comments and elaboration of points made by them can be secured. Whereas the first interview may elicit only 'yes' or 'no' responses from the respondents, the repeated interviews or measurements spread over a continuum of time may elicit from them elaborate responses in so far as they might have thought deeply about the problem after the first administration.

On first contact, the informants may be suspicious of the investigator and may have little familiarity with the problem.

The problems raised by the panel procedure are often sufficient to of-set the gains attendant upon it. We may briefly discuss the limitations of the panel techniques.

(a) The loss of panel members presents a formidable problem for the researcher. People change their locate, become ill, or die or are subjected to other influences which make it necessary for them to drop out of the panel. Thus, the panel that was initially intended as a representative sample of the population may subsequently become unrepresentative. The losses in the membership of the panel may be occasioned by the loss of interest among the panel members or a change in attitude toward the panel idea. Not infrequently, the enthusiasm of the panel members dies down after the first or the second interview.

(b) Paul Lazarsfeld has pointed out that the members of a panel develop a 'critical set' and hence cease to be representatives of the general public. The panel invariably has an educational effect. It tends to dramatize and increase one's interest in otherwise unobserved elements and to heighten one's awareness of things and events around him. Hence the mere fact of participation in the panel may change a person's attitude and opinions.

(c) Once the members of a panel have expressed an attitude or opinion they tend to try to be consistent and stick to it. Thus, panel members as compared to the general public are less likely to change. Thus, the panel may misrepresent the population.

(d) The detailed records are available for the most stationary elements of the population. Of course, the mobile groups of a community belong to the panel for a much shorter time. Panels composed of the same persons for many years will gradually become panels of old people and eventually die out.

A panel study, however, is not always feasible. One of the difficulties is the events or thoughts may already be long past by the time the researcher beings. Occasionally, memory is not always reliable and the respondents may be inclined to 'construct' these past events not so much from their fading memories but from their personalised theory about their past.

Lastly, let us consider the problem of how to search for competing causal assumptions (whether Y to X is the cause) in a non-experimental situation. It is often reasonable to expect that if X were the cause it would affect Y cumulatively, i.e., people who have been exposed to X for a longer time would show a higher degree of Y. But this would not be so if Y were the causal factor.

Klineberg had hypothesized that the comparatively low Intelligence Quotients of Negroes in the southern part of U.S.A. might be attributed to their poor environments. This led him to expect that the I.Q. of Negro children will increase with the length of residence in a city such as New York. His hypothesis was borne out by investigation of Negro children in New York.

In this reference we would do well to remember that the mere fact of scores on Y differing with different lengths of exposure to X does not provide a clear-cut basis for an inference of causality. The possible that other factors may be associated with differences in length of exposure to the independent variable (X) and it may be these other factors which really account for differences in the dependent variable (Y). In Klimeberg's study the possibility that the more intelligent Negroes had moved to New York Much earlier might really be a reflection of this characteristic (high I.Q.) of their parents.

A variety of checks for such possibilities have been used, viz:

(a) Repetition of the study at another time might provide a basis for scrutinizing whether some factor other than the assumed one could have caused the changes in the dependent variable.

(b) Controlling factors that may be confounded with the length of exposure to the assumed causal variable. For example, the researcher controls the 'age' factor if it is likely to affect the dependent variable in conjunction with the independent variable, i.e., he compares individuals of the same age who differ in length of exposure to the causal variable.

5

Literature Search Through The Use of Library

An important part of the preparation for research work consists in learning how to use the resources of libraries. It is important because all research inevitably involves the use of the book, pamphlet, periodical, and documentary materials in libraries. This applies to studies based upon original data gathered in a field study as well as to those based entirely upon documentary sources. In both types of studies there is the same need for using certain basic kinds of published materials. On the one hand, general source materials have to be investigated. Obviously, no research project can be undertaken without this preliminary orientation. Nor should one be undertaken without knowledge of the research that has already been done in the field. It provides further orientation to the problem, and at the same time eliminates the possibility of unnecessary duplication of effort. In addition, valuable information on research techniques may be gained from reports of previous research.

In studies based upon original data gathered in the field, the use of library materials is seldom limited to this preliminary purpose. The specific needs that may have to be met by data already collected and available in a library collection are numerous and varied. They may be of importance-the information necessary to make a selection of a representative community for a sociological study; or the needs may be peripheral-the definition of a sociological term or the publication date of a book that is to be listed in a bibliography.

In selecting a topic for research, the student need not confine himself to considering only those problems which require field investigation. Not all research has to be of this kind in order to be significant; sound research studies can be developed from the materials available in library collections. An example is the historical study, which has to depend upon published and manuscript materials for its data. A biographical dictionary, such as the *Who's Who in India,* provides enough information for a meaningful study of the question of social mobility. There are many economic, political, and social statistics gathered by agencies, both governmental and private, which can serve as the raw data for analysis of a specific problem. A *demographic* study, for example, could be made on the basis of the different types of population statistics gathered and published by such agencies. A *synthesis* of the findings of research studies can be a useful kind of study, particularly when it draws upon the research of several disciplines and relates them to the same social phenomenon. *Content analysis* studies represent yet another type of research which can be based entirely upon materials available in a library collection. The analysis of the characteristics of the content of communication has been used for a variety of purposes, from that of exposing propaganda techniques to that of measuring the readability of materials.

Ability to do library research begins with an understanding of the ways in which libraries organize their collections and with a knowledge of basic bibliographic and reference materials. The general procedure followed in doing library research is the same in any library because all libraries organize their collections on the same general principles and provide similar resources for research. This means that they all have a system of subject classification, a card catalogue, and certain bibliographic and reference materials. There are local variations, of course, in the arrangement and location of certain types of materials, and in the extent and quality of the research materials that are provided. Therefore, orientation to the peculiarities of these kinds in the library being used is an essential preliminary to the efficient use of its resources. In spite of these variations, however, the same general procedure is followed and certain basic bibliographic and reference tools are commonly used in finding materials in libraries.

CARD CATALOGUE

In general, the first source to check for finding materials in a library is the library's card catalogue. it is an index which lists all the publications in the library collection, by author, by subject, and often by title. These three types of headings represent the ways in which one may need to look for publications. Does the library have any materials on this subject, or by this author? Does it have this book by this author? Does it have a book with this title?

The catalogue is arranged like a dictionary, with the cards filed alphabetically according to the first word on the card. The first word may be the name of the author, the subject heading, or the title of the publication. This kind of arrangement brings together in the catalogue the cards for all the books by a specific author, and the cards for all the publication in the library on a given subject. All the works of an author are filed alphabetically by title under his surname. When the title begins with an article, the *second* word is used for filing purposes. Under a given subject, publications are listed alphabetically according to author.

To find a publication by author in the card catalogue, it is advisable and often essential to know the given names as well as the surname of the author. There may be several authors with identical or similar names, and it sometimes happens that some of them have written books in the same subject field. The name 'Sharma' appears in the card catalogue as often as it does in the telephone directory of a large metropolitan area. Unless 'Sharma' can be identified more specifically, he will not be found easily. In addition, there should be enough information about the title of the publication to distinguish it from titles of other books in the library written by the same author.

If the information on the author's name and title is incomplete, it may be easier to find the publication under its subject heading.

In looking up materials by subject, it is necessary to look under the heading which describes the subject most specifically. Public administration is a subject in the field of political science, but materials on it are listed under the heading "Public Administration," not under the heading "Political Science." A subject for which there are many books is sub-divided to indicate its specific aspects. Thus, a book concerned only with the question of agriculture, Primitive society is listed under the heading "Agriculture, Primitive," not under " Agriculture"; and a book on the colonial period of Indian history is listed under "India History, Colonial Period."

There are two types of cross-reference cards filed in the catalogue to assist the catalogue user in finding the heading under which materials on a subject are listed. One is a "see" card, which refers from a heading that is not used for a subject to one that is. A card reading

Primitive Society

see

Society, Primitive

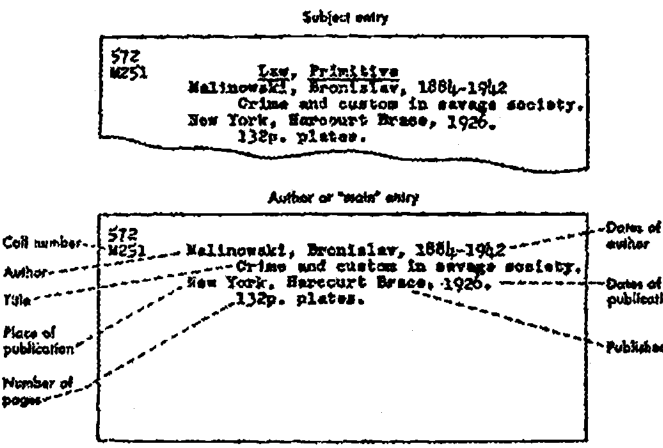


Fig. 5.1: Sample card

Indicates that the materials in the library on the subject are listed under the second heading indicated. A second type of cross-reference card is the "see also" reference. It is always filed *behind* all the other cards on a given subject to direct the user to headings under which the materials on related subjects are listed. After the last reference listed under the heading "Political Science, see also Elections, Political Conventions, Political Parties" (and other headings under which the library has listed materials that are related in subject content).

The information appearing on the face of the cards identifies specifically each publication in the library by author, title, place of publication, publisher, date of publication, number of pages, and other distinguishing characteristics. This information may be helpful in the selection of publications which may best meet a particular need. The *publication date* is a useful index to the *recency* of information contained in a book; the *number of pages* sometimes is an indication of the *comprehensiveness* of treatment; the *name* of the author or the name of the publisher may indicate the *authoritativeness* of the treatment of a subject or the special point of view which may be expressed in the publication. A book published by the National Association of Manufacturers, for example, would probably have a different approach to a subject than one published by the Congress of Industrial Organizations.

In addition to identifying a publication, the catalogue card supplies the information needed to locate it. It does this by giving the "call number" which appears in the upper left corner of the card. This number consists of (1) a classification symbol, which is the top line of the number and designates the subject of a publication (572 in the illustration); and (2) a "Cutter number" which is the second line and designates the author or title (M251 in the illustration).

The classification symbol is derived from the particular scheme of subject classification used by a library. It may consist of numbers, or letters, or a combination of the two, depending on the classification system used.

The Dewey decimal classification system, which is used by most libraries, has numbers only. The Colon Classification Scheme, another system used by Indian libraries, has both letters and numbers to designate subject classes. The purpose of using a classification system as the basis for arranging materials is to bring publications on one subject together in one location and near publications on related subjects. How this is achieved is illustrated on the next page following brief outline of classes in the Dewey system.

The Cutter number consists of the first letter of the author's name, and a number which is a code for the combination of litters in the name. If there is no author, the Cutter number is derived from the title of the publication. This number serves to alphabetize publications within a subject classification and to bring together within each subject classification all the books of one author and all the volumes of a periodical. All the volumes of *Harper's* magazine, for example, would have the same Cutter number, H295, as well as an identical classification number.

The whole call number is the key to the location of a publication on the library shelves because no two publications can ever be assigned the same combination of symbols. Books within a subject classification are differentiated by the Cutter number, and books with identical classification and Cutter numbers are differentiated by additional symbols to indicate volume or edition.

INDEXES AND BIBLIOGRAPHIES

The main use of the classification number is to locate a given publication. For research purposes, it is at best only a rough guide to materials in the library on a particular subject. It is inadequate as a subject guide mainly because a publication can be assigned only one classification number while its contents may be pertinent to several different subjects.

The card catalogue also has its limitations as a guide to materials in the library. On the one hand, it is an index to the collection of only one library. In research, it is often necessary to use the resources of several libraries. At the same time, the catalogue does not index

Table showing out line of DDC to locate near publication on related subjects

Main class	*Sociology*		*Political Science*		
000	General works	300	Sociology	320	General
100	Philosophy	310	Statistics	321	Form of state
200	Religion	320	Political science	321.1	Family
300	Sociology	330	Economics	321.2	Tribes
400	Philology	340	Law	321.3	Feudalism
500	Pure science	350	Government	321.4	Democracy
600	Useful arts	360	Charities and corrections	322	Church and state
700	Fine arts			323	Internal relations with groups and individuals
800	Literature	370	Education		
900	History	380	Commerce		
		390	Customs, folklore	324	Suffrage

all the materials that are available in the library. Periodical articles, which form a large and important segment of published literature, are not indexed in the catalogue, nor, in general, are parts of books. There are some types of materials that libraries tend to organize in special collections which will not be listed in the card catalogue. Government documents, for example, are often organized separately, with special documents indexes used exclusively as guides to them. Most libraries maintain separate pamphlet collections, also, and do not attempt to prepare any detailed indexes to them.

To find all the materials which may be needed and which cannot be found through the card catalogue, it is necessary to use published indexes, bibliographies, and various types of reference books. Some of the more important of these are listed and described briefly in the following sections.

Periodical indexes

To locate periodical articles on a specific subject it is necessary to consult one or more of a group of publications known as periodical indexes. One of the best known and most used of these is the *Guide to Indian Periodical Literature*, which has been published since 1964. The articles appearing in about 400 periodicals of general interest. *The International Index to Periodical Literature* (1907 to date) indexes more scholarly periodicals and includes many foreign publications. It is especially strong in science and in the humanities, but it also indexes periodicals in the social sciences. Besides, there is another general periodical index, named Reader's Guide to Periodical Literature.

In addition to these general indexes, there are indexes that are limited to special fields of interest or to special types of publications. A very useful index to materials in economics, political science, and sociology is the *Public Affairs Information Service* (1915 to date). It is a subject guide to books, pamphlets, and government documents as well as to periodical articles. Other special publications which index materials pertinent to the social sciences are the *Agriculture Index* (1906 to date), which is of special value because it indexes many materials pertaining to rural sociology; the *Education Index* (1929 to date), which covers all aspects of the subject of education and indexes books, pamphlets, government documents, and periodical articles; the *Index to Legal Periodicals* (1908 to date); *Psychological Abstracts* (1927 to date), which abstracts as well as indexes the book and periodical Literature in the field of Psychology; and the *Writings in American History* (1906 to 1939-1940), a comprehensive annual bibliography of books and periodical articles.

A useful index to current affairs is the *New York Times Index* (1913 to date), which is a detailed index to the contents of the *New York Times* newspaper. Because the coverage of this newspaper is so complete, and events tend to be reported at the same time in most newspapers, this index is also a useful guide to materials appearing in other newspapers. *Facts on File* (1940 to date), a weekly summary of current events, serves a similar purpose. *Keesing's Record of World Events*, published from London is a monthly publication which provides a unique contemporary record of modern history and currernt affairs.

National and trade bibliographies

National and trade bibliographies are comprehensive lists of publications issued in a given country. They are indispensable to anyone compiling a comprehensive bibliography on a specific subject. They are useful, also, for verifying a reference to a publication which has been listed incompletely or inaccurately in some other source. Probably one of the most common problems in library research is this need for verification of a reference. It often means the difference between finding and not finding a publication that is needed. Indian National Bibliography, which is kept up to date by the *Cumulative Book Index*, is the bibliography for materials published in the India. It is an index to publications issued in this country since 1957.

Subject Bibliographies

The indexes and bibliographies described in the preceding sections consist of many volumes and cover many subjects. A considerable amount of searching through them is required to find materials on a specific subject. It is often advisable, therefore, to determine whether a special bibliography on the subject has already been prepared and published. If there is one, and if it has been carefully compiled, using it may save many steps in the process of bibliographical searching. There are, for example, bibliographies such as the *Guide to Indian Periodical Literature* (Gurgaon: Indian Documentation Service, 1964), an annotated bibliography of basic works and source materials in there are many good bibliographies that are published in pamphlet and mimeographed form, as parts of books, or in periodicals. *The Public Opinion Quarterly,* includes a bibliography of materials on propaganda, communication, and public opinion; and organizations such as the Russell Sage Foundation and the Reference Division of the Library of Congress issue many useful bibliographies on subjects pertinent to the social sciences.

Library Catalogues

Several major libraries of the world, including the Bibliotheque Nationale in Paris, the British Museum In London, and the U.S. Library of Congress, have published author catalogues of materials in their collections. Because they represent some of the largest collections in the world, these catalogues are one of the best sources for verifying references. And because they are catalogues of existing libraries, they are useful for locating publications which it may be necessary to consult. If the person needing a publication in another library cannot go directly to that library, he can often get a copy of it through interlibrary loan if he is engaged in serious research. Should the publication be unavailable on interlibrary loan, a microfilm or photostatic copy can sometimes be obtained.

Union lists

Union lists are publications whose major purpose is to locate and list the actual holdings of specific publications in the libraries of a region. One of the most important of these is the *Union List of Serials in Libraries of the United States and Canada,* edited by Winifred Gregory (New York: H. W. Wilson, 2d ed., 1943; and supplement, 1941 to 1943), which lists all the periodicals to be found in a large number of libraries. A similar lists for newspapers is *American Newspapers, A Union List of Files Available in the United States and Canada,* edited by Winifred Gregory (New York: H. H.. Wilson, 1947). In India, there also exists union catalogues of special collection in a particular region, for example, National Union Catalogue of Scientific Serials in India published from INSDOC, Dehli contains a list of 35,000 serials available in more than 800 institutions.

REFERENCE BOOKS

General and special dictionaries, encyclopedias, yearbooks, directories and biographical dictionaries are types of reference materials that are constantly useful in research. Because of their general character, these reference materials cannot be indexed in any specific way in the card catalogue or in indexes and bibliographies. The purposes they serve and the specific types of information they contain become apparent only with experience in using them; but the person doing research work should be familiar with at least the types of reference books and their potentialities as source materials. In using any of them, he must be alert to their individual peculiarities in scope, purpose, and arrangement. The need for a careful reading of *explanatory notes* in these publications cannot be overemphasized, since it is essential for correct interpretation of the data presented and for quick and efficient use of the publication. The following are representative titles among the types of reference books:

Dictionaries

In addition to the standard unabridged dictionaries of the English language, there are dictionaries that serve special purposes or interests. They include dictionaries of synonyms, which are useful writing aids, and dictionaries of terms and phrases in particular fields of knowledge. Some of those concerned with fields within the social sciences are the *Dictionary of Sociology,* edited by Henry P. Fairchild (New York: Philosophical Library, 1944); *Dictionary of Modern Economics*, by Byrne J. Horton (Washington, D.C.: Public Affairs Press, 1948); *New Dictionary of American Politics*, edited by E.

C. Smith and A. J. Zurcher (New York: Barnes and Noble, Inc., 1949); *Dictionary of Education*, edited by Carter V. Good (New York: McGraw-Hill, 1945); and the *Dictionary of Psychology, edited by Howard C. Warren (Boston: Houghton Mifflin, 1934).* These dictionaries often include information about events and names important to the field, as well as definitions of terms and phrases.

Encyclopedias

An article in an encyclopedia can be useful for quick orientation to a subject and for specific items of information. If it includes a bibliography, as many encyclopedia articles do, it can be useful as a guide to general sources of information on a subject. There are several special encyclopedias of particular interest and value to the person working in the social sciences. One of the most important is the *Encyclopedia of the Social Sciences* (New York: Macmillan, 1930 to 1935, 15 vols.), which includes biographies of men whose work has been significant to the social sciences and articles on all the important topics in the field. Capitalism, Christian labor unions, coal industry, democracy, land tenure, law, League of Nation, legislative assemblies, libel and slander are typical of the subjects covered. The articles, which have been written by specialists, are long and include good bibliographies of source materials. Some of the more specialized encyclopedias pertinent to the social sciences are Walter S. Monroe, *Encyclopedia of Educational Research* (New York: Macmillan, 1950); A. C. McLaughlin and A.B. Hart, *Cyclopedia of American Government* (New York: Appleton-Century-Crofts, 1914, 3 vols.); and Glenn G. Munn, *Encyclopedia of Banking and Finance* (Cambridge, Mass.: Bankers, 1931). As far as Library and Information science field is concerned, there is an internationally known "*Encyclopaedia of library and Information Science*" by Allen •Kent et. al. published from Dekker, New York, covers all aspects of Library Science.

Yearbooks

Many of the needs for specific and current information are met by yearbooks of various types. Since the information they contain is gathered from a wide variety of sources, yearbooks are useful indexes to the kinds of information that are available. Of special value are their references to the primary sources of the statistics included in them. The references are guides to source materials in which more detailed statistics can be found and which should be checked to assure getting accurate, authoritative information. One of the most useful and most comprehensive sources of miscellaneous information is the *World Almanac* (New York: New York World-Telegram, 1868 to date). *The American Yearbook*, issued since 1911 by various publishers, is an excellent review of events of the year, with statistics and bibliographies. The material is presented in articles grouped under broad subjects. The U.S. Bureau of the Census, *Statistical Abstract of the United States* (Washington, D.C.: Government Printing Office, 1879 to date) is representative of official yearbooks of national governments. It is an authoritative and useful summary of statistics gathered by government agencies and, in some cases, by private organizations. The original sources from which the statistics are obtained are always indicated. A supplement to the *Statistical Abstract*, which was published in 1949 under the title *Historical Statistics of the United States, 1789-1945*, is a brief summary of statistics which show the economic, political, and social development of the country. But this volume is more important for the information contained in its descriptive notes than for the statistics it includes. The notes indicate the extent to which historical statistics in each subject covered are available, and the source materials in which they can be found. For political, economic, and social data for the countries of the world, the *Statesman's Yearbook* (London: Macmillan and Co., Ltd., 1864 to date) is practically indispensable. In addition, its bibliographies are one of the most useful and complete guides to official and unofficial national yearbooks. Another source of detailed international statistics is the United Nations Statistical Office, *Statistical Yearbook* (Lake Success, N.Y.: 1949 to date), first issued for the year 1948.

Useful yearbooks more restricted in scope than those just described include the *Municipal Yearbook* (Chicago: International

City Managers' Association, 1934 to date), a detailed review of economic, political, and social statistics relating to municipal governments. The bibliographies at the end of each section list sources of statistics, a selection of standard references, and new book and periodical materials. *The Book of the States* (Chicago: Council of State Governments, 1935 to date, biennial) is a summary of information on the organization and administration of state governments, with a selected bibliography of materials on problems of state government. Other examples of special yearbooks are the *Social Work Yearbook* (New York: Russell Sage, 1929 to date); the *Social Security Yearbook* (Washington, D.C.: Government Printing Office, 1939 to date (which is issued as a supplement to the *Social Security Bulletin*; and the United nations Statistical Office, *Demographic Yearbook* (Lake Success, N.Y.: 1949 to date), first issued for the year 1948, and presenting in detail the demographic statistics presented in summary form in the *Statistical Yearbook* of the United Nations. In India census, "Census of India", published from Registrar General of Census, India, is a good source. It is revised every after ten years. The latest one is of 1991. It is mainly used to obtain census data.

Directories

When information cannot be found in available published sources, it can sometimes be obtained from an organization. All organizations maintain files and records which relate to their particular interests and which may yield information invaluable to a research study. Directories which lists organizations by their area of interest are, therefore, important types of reference books.

The classified telephone directory is always a helpful guide to organizations in a specific community. The most useful general directories are the U.S. Bureau of Foreign and Domestic Commerce, *National Associations of the United States* (Washington, D.C.: government Printing Office, 1949), a classified directory of trade and professional associations in the country; *American Foundations and Their fields, VI* (New York: rich, 1948); and the *Handbook of Scientific and Technical Societies and Institutions of the United*

States and Canada (Washington, D.C..: National Research Council, 5th ed., 1948). Examples of more specialized directories are *Public Administration Organizations* (Chicago: Public Administration Clearing House, 1948); M. M.. Chambers, *Youth Serving Organizations* (Washington, D.C.: American Council on Education, (1948); the New York City Welfare Council, *Directory of Social Agencies in the City of New York, 1948-49* (New York: 1948); and the directory of national and state agencies in social welfare work and related fields which appears in the *Social Work Yearbook*. Some of these include brief notes on the history, purpose, organization, and publications of the organizations listed. For University Education in India "University Handbook" is published by, A.I.U., New Delhi which gives information on university education along with its constituents colleges including distance education courses.

Biographical Dictionaries

There are two general types of biographical dictionaries-historical and contemporary. In the first category, the authoritative reference work for persons notable i American history is the *Dictionary of American Biography* (New York: Scribner, 1928 to 1944, 22 vols.); for English historical biography, the important reference work is the *Dictionary of National Biography* (London: Smith, Elder, 1885 to 1901, 63 vols., and supplements). Both dictionaries are useful for their bibliographical as well as their biographical information.

Biographies of contemporaries are covered in international and regional "who's who's," and biographical dictionaries devoted to special subject fields. *World Biography* (New York: Institute for Research in Biography, 4th ed., 1948) is the most comprehensive of the international dictionaries. *Who's Who in America* (Chicago: Marquis, 1899 to date, biennial), the British *Who's Who* (London: A. and C. Black, 1849 to date, annual), and the *Who's Who in the Midwest* (Chicago: marquis, 1949), are examples of national and regional biographical dictionaries of contemporaries. In the subject fields, there are publications such as *Leaders in Education*, edited by Jacques Cattell (Lancaster, Pa.: Science Press, 1948); the American Political Science Association *Directory* (Columbus, Ohio: 1948); and *American Men in Government* (Washington, D.C.: Public Affairs Press, 1949). The *Biography Index* (1946 to date) is a comprehensive guide to biographical information in other types of book materials and in periodicals. *Directory of National Biography* edited by S.P. Sen in 4 volumes has been published from Institute of Historical Studies, Calcutta contains information on important personalities from all walk of life. Besides, *India who's who,* an annual publication of INFA, Delhi gives information of present time people.

SPECIAL MATERIALS

Periodicals

A group of publications with which the student should become familiar are the learned journals and periodicals which have materials related to his field of interest. They usually contain the most current information on a subject, and they are often the only sources for reports of research studies. In addition, their book-review sections provide a means of keeping up with the important book publication in a field. The following are a few of the important periodicals in the social science fields:

Business And Commerce

Commercial and Financial Chronicle, Federal Reserve Bulletin, Harvard Business Review, nation's Business, Survey of Current Business, Revue des etudes cooperatives, Wirtschaft und Statistik.

Cultural Anthropology

American Anthropologist, Human Organization, Journal of American Folklore, Yale University Publications in Anthropology, L'Anthropologie, Zeitschrift fur Ethnologie.

Economics

American Economic Review, Economic Journal, International Monetary Fund Staff Papers, Journal of Political

Economy, Oxford Economic Papers, Quarterly Journal of Economics, Economica.

Education

Journal of Educational Research, Journal of Educational Sociology, School Review, Review of Educational Research.

Geography

Annals of the Association of American Geographers, Economic Geography, Geographical Review.

History

American Historical Review, Current History, Bulletin of the Institute of Historical Research, Mississippi Valley Historical Review, Revue historique.

International Relations

American Journal of International Law, Foreign Affairs, Foreign Policy Reports, International Affairs, Revue d'histoire diplomatique.

Jurisprudence

Journal of the American Bar Association, Lawyer's Guide Review, Law and Contemporary Problems, Journal du droit international, Journal of Comparative Legislation and International Law.

Labour

International Labor Review, Monthly Labor Review, Personnel Journal.

Library Science

Annals of Library Science and Documentation, DESIDOC Bulletin of Information Technology, IASLICB, Libri, SRELS Journal of Information Studies. LISA is also there which is an internationally known abstracting journal in the field of library science.

Political Science

Annals of the American Academy of Political and Social Science, American Political Science Review, Journal of Politics, Journal of Public Administration, Political Science Quarterly, Revue Politique et parlementaire.

Psychology

Journal of Abnormal and Social Psychology, Journal of General Psychology, Journal of Social Psychology, Psychological Monographs, Psychological Bulletin.

Social Work and Social Medicine

Social Service Review, Survey, British Journal of Social Medicine, Journal of Social Hygiene.

Sociology

American Journal of Sociology, American Sociological Review, British Journal of Sociology, Sociology and Social Research, Rural Sociology, Register of Research in the Social Sciences, Social Forces, Jahrbuch der Sozialwissenschaft, Sociological Review (England), *L'Anne'e sociologique.*

Statistics

Biometrics, Journal of the American Statistical Association, Econometrica.

Among the many general periodicals which contain materials pertinent to the social sciences are *Atlantic Monthly, Commentary, Harper's Magazine, Nation, New Republic, twentieth Century, Virginia Quarterly Review,* and *Yale Review.*

It is worth to mention here that many of the sources mentioned above are available on CD-ROMs now-a-days in electronic form which a reader can use for reference with the help of computers. Besides, lot of information is also available on Internet which can be viewed with the help of search engines like altvista.com and yahoo.com etc.

EVALUATION OF SOURCES

Here emphasis is given upon the value of library resources to research, but it should not be inferred that all published materials are appropriate or reliable sources of information. Because of the errors they may contain as a result of the bias or incompetence of the compiler or the carelessness of the proofreader, secondary compilations should be used primarily as guides to original sources, and the original sources themselves checked whenever possible for the required data. Any secondary source that is used must be analyzed for any factors that might affect the accuracy or the validity of its information. Information about the compiler should be obtained to ascertain his competence, his interests, and his prejudices. The kinds of sources used and the purpose in gathering the material should also be determined if the data are to be evaluated properly. In using any published sources, whether primary or secondary in character, the data to be used must be analyzed within the limitations of the collection methods. Unless these are clearly understood, it is impossible to determine whether the data are applicable to the particular problem for which it is being considered. The student should, therefore, develop a critical attitude toward all published sources and analyze and evaluate carefully any source that is being consulted.

It is noteworthy to mention here that some of other documents and sources from where the data for developing research problems cab be picked up are dealt in details again in chapter 'Data Collection'.

6

Formulation of Problem in Social Research

Research really begins when the researcher experiences some difficulty, i.e., a problem demanding a solution within the subject-area of his discipline. This general area of interest, however, defines only the range of subject-matter within which the researcher would see and pose a specific problem for research. In other words, the subject-area only indicates where to look for a problem without specifying what the problem is like. In its diffuse form, the subject-area simply represents a broad zone of issue within which the researcher expects to find his specific problem.

The general area or topic of a study may be either suggested or known. He may also be interested in phenomena that have already been studied to a certain extent, in which case, the researcher may be interested in identifying more exactly the conditions that affect the given phenomena in a particular way. If the researcher is working in a field in which there has developed a well articulated theoretical system, he may want to test specific predictions or expectations based on that theory.

A wide variety of practical concerns also may suggest a topic for research. Need for a factual evaluation of a programme, information pertinent to policy-making or social planning or need for finding out a practical solution to a certain problem facing a community etc., may suggest certain topics as worth selecting for research.

Personal values play an important role in the selection of a topic for research. Social scientists with different values tend to choose different topics for investigation. Of course, personal values are not the only determinants in selecting a topic for inquiry; social conditions do often shape the preference of investigators in a subtle and imperceptible way. There are also a number of powerful inducements to selection of one topic rather than another. Societies differ in respect of the premium they place on the work in different fields. These differential premia affect the choice of research topics. In a given society, it may bring greater prestige-to do research on a deadly disease rather than, to say, the patterns of child socialization.

More research funds are available for research in a particular area, e.g., on the less controversial topics rather than on controversial ones relating to politics and religion. Better paid positions may be available to the researchers working in certain areas than in certain others. Needless to say, few social scientists would be indifferent to such considerations as income, personal prestige, research funds and public or state co-operation.

The selection of a topic for research is only half a step forward. This general topic does not help a researcher to see what data are relevant to his purpose, what methods he would employ in securing them and how he would organize these. Before he can consider these asoects he needs to formulate a specific problems. The problem defines the goal of the researcher in clear terms. It is obvious that without a clear-cut idea of the goal to be reached, research activities would only become a meaningless exercise. A research like any other human activity is goal-directed. If the goal itself is unknown or ill-defined, the whole rigmarole of research operation will lead us no where. Thus, without a problem research cannot proceed because there is nothing to proceed from and proceed toward. There is nothing but wisdom in the saying; "If you start from no where you will generally reach there."

This is not to deny that sometimes a researcher's problem or difficulty consists in not perceiving a problem at all; he faces the problem of problemlessness. In social sciences especially, quite a number of researchers may be faced with this problem,i.e., the problem of not being able to see a problem. But being a particular kind of problem in itself, it guides the researcher in exploration of a process that involves a progressive narrowing of the scope and sharpening the focus of questions till the specific challenging questions are finally posed.

The formulation of the topic into a research problem is, really speaking, the first step in a scientific enquiry. A problem in simple words is some difficulty experienced by the researcher in a theoretical or practical situation. Solving this difficulty is the task of research.

Let us now appreciate what is meant by experiencing a difficulty in theoretical situation. Observations not fitting in the theoretical expectation e.g., a theory may predict that particular type of societies, will have a low rate of suicide but observations do not substantiate this prediction. This gives rise to a problem faced in theoretical situation. A difficulty in a pratical situation may be felt, for instance, when there is a decline in production in spite of improvement in wages.

R. L. Ackoffs analysis affords considerable guidance in identifying a problem for research. He visualizes five components of a problem.

1 Research-consumer

There must be an individual or a group which experiences some difficulty. The individual may be the researcher himself and the group could be a group of researchers or scientists. For most problems, there are also other participants. The researcher, if he is different from the research-consumer, is a participant in the problem. So are individuals or groups who may be affected by a decision taken by the research-consumer.

2 Research-consumer's Objectives

The research-consumer must have something he wants to get at or some ends he seeks to achieve. Obviously, a person who wants nothing cannot have a problem.

3 Alternative Means to Meet the Objectives

The research-consumer must have available and alternative means for achieving the objectives he desires. Means are courses of action open to the research-consumer. A course of action may involve use of various objects. Objects used thus are the instruments. A scale may be an instrument, but the use of a scale may be conceived of as a means. An instrument refers to any object, concept or idea which can be effectively incorporated in the pursuit of the objective.

It needs to be remembered that their must be at least two means available to the research-consumer. If he has no choice of means, he can have no problem. His problem, however, may consist of how to make the alternative means available for himself.

4 Doubt Regarding Selection of Alternatives

The existence of alternative courses of action is not enough; in order to experience a problem, the research consumer must have some doubts as to which alternative to select. Without such a doubt there can be no problem. The research-consumer must have a question concerning the relative efficiency of the alternative means and he must want to answer it.

All problems understandbly get reduced ultimately to the evaluation of efficiency of the alternative means for a given set of objectives. It may be a bit difficult to appreciate this, particularly in reference to a pure research directed toward knowledge for the sake of knowledge. Since information is an instruments and its use a means, the inquiry directed toward identifying and securing efficient instruments. Since instruments cannot be separated from their use, such inquiry also reduces to determination of relative efficiency of alternative means.

5. Presence of One or More Environments to which the Difficulty of Problem Pertains

A change in environment may produce or remove a problem.

A research consumer may have doubts as to which will be the most efficient means in one environment but would have no such doubt in another. For example, a person may have a problem involving a decision as to what kind of coat to wear on a clear day. But should it rain, he would have no doubt about the propriety of wearing his raincoat.

The range of environments over which a problem may be said to exist varies from one to many. Some problems are specific to only one environment while others are quite general.

The formulation of the problem consists in making various components or the problem explicit.

John Dewey says "It is a familiar and significant saying that a problem well put is half solved. To find out what the problem or problems are which a problematic situation presents, is to be well along in inquiry. To mistake the problem involved is to cause subsequent inquiry to be irrelevant. Without a problem there is blind groping in the dark."

If we go merely by appearances, it would seem fairly easy to pose a problem for research. But this is not so in reality. Even so great a scientist as Drawin has testified to the difficulty in posing a problem. In his Origin of Species, he wrote, "Looking back, I think it was more difficult to see what the problems were than to solve them... ." This is so, explains Merton, because "in science, the questions that matter are of a particular kind. They are questions so formulated that the answers to them will confirm, amplify, or variously revise some part of what is currently taken as knowledge in the field. In short, although every problem in science involves a question or a series of questions, not .every question qualifies as a scientific problem."

Merton has presented a powerful case for investigating the process of problem-finding. Although the process of problem solving has been subjected to intensive investigation, inquiries into the process of problem finding, Merton points out, have suffered a relative neglect. He makes an attempt to identify some of-what is involved in seeking and formulating a problem for social research. Merton distinguishes three principal components in the progressive formulation of a problem for social research. These are :

(1) The originating questions

(2) The rationale

(3) The specifying questions

1. Originating Questions

The originating questions represent the beginnings of certain difficulties or challenges which, formulated in much specific terms as would indicate where exactly the answers to them can be searched for, attain the status of a research problem. Thus, the originating questions constitute the initial phase in the process of problem formulation.

Originating questions are of different types. One class of originating questions calls for discovering a particular body of social facts. Such questions may express a doubt as to whether the alleged social facts are really facts. Needless to say that before social facts can be explained, it is advisable to ensure that they are actually facts. It is not unusual for scientists to provide explanations for things that never were. It is to see that,"if the facts used as a basis for reasoning are ill-established or erroneous. Everything will crumble or befalsified;...errors .inscientific theories most often originate in errors of fact."

A recognition that social facts are not always what they appear to be, leads the researcher to raise questions aimed at discovering a particular body of facts. These questions, do not yet constitute the problem, although they do constitute.an essential step in that direction. Such questions are typically prompted by efforts to 'explain' social patterns which the researchers feel have not yet been established as genuine pattern. Such questions, sometimes called as fact finding questions, hold a particular significance for social sciences. This is so because men are apt to assume that they know the facts about the working of society or polity without hard investigation, because society and polity areafterall their native habitat. Contrary to this assumption, not all, plausible belief about our native habitat are essentially true.

Another type, of originating questions directs attention to the search for uniformities of relations between classes of social variables.. "An example of such a 'question' is what is there about the structure of societies that determines the kinds of deviant acts that occur within their confines?"

Such questions, it, would seem, are formulated in terms of broadly delimited categories of social variables but they do not indicate specifically which particular variables in each class may be germane to the issue. Such questions usually derive from a general theoretical orientation rather than from a well-articulated theory.

It is quite evident that the originating questions differ in their scope as well as their degree of specificity. For example, in the discipline of sociology, a large number of originating questions are addressed to sociological variables within one or another institutional sphere of society. 'Does the degree to which management takes the teacher's views into account in their decision-making process affect the degree to which the teacher takes the students' views into accout, in the class room?" would be a question of this type? But such relatively specific questions concerned with a particular institutional sphere (e.g., the school system) may have a potential bearing on comparable organizations in which role incumbents may reproduce in their behaviour vis-a-vis a subordinate his experience in relation to his/her superior.

Originatirig questions of another kind are put in such a form that they can be addressed to a variety of institutional spheres; e.g the question, 'Do the diverse social roles that members of different social classes are called upon to' play have consequences more important for their personalities than have their class positions'?, is one of this kind. It should be borne in mind that neither the more general nor the more specific versions of the originating questions claim an exclusive value; each has its own value in augmenting knowledge of particular kinds.

Summarily, the originating questions are of different kinds and emanate from different sources. Some are the questions of descriptive fact, about observed empirical generalizations, some enquire into the sources of the observed patterns of social organization and others are concerned with their consequences, and so on.

2 RATIONALE OF QUESTIONS

The originating question is just one component of the problem. Another is the rationale of the question. Rationale is the statement of reasons why a particular question is worth putting across. The rationale states what will happen to other parts of knowledge or practice if the question is answered, i.e., how the answer to the question will contribute to theory and/or practice. In this way, the rationale helps to effect a distinction between the scientifically consequential and trivial questions. In short, the rationale states the case for the question in the court of scientific opinion." The requirement of a rationale arrests the flux of scientifically trivial questions and enlarges the volume of important ones.

As a rationale for science as a whole, it refers simply to knowledge as a self-contained end. It ignores rather than denies, the possibility that a new bit of knowledge will contribute to practical concerns, viz. power, comfort, safety, prestige, etc. The scientist may regard his deep interest in a question-as a strong enough reason for pursuing it. But sooner or later, if the question and its answers are to become a part of the corpus of science, they must be shown to be relevant to other ideas and facts in the discipline.

The practical rationale makes out a case for the question by pointing out that its answers will help people to achieve practical values, i.e., health, comfort and productivity, etc. This is not to deny that a question raised mainly with an eye on the practical value of its answer may have important consequences for the theoretical system. It is evident that a particular question may have import both for systematic knowledge and for practical uses largely, because the inquiry undertaken with an eye on any one has unintended consequences for the other.

(a) Theoretical rationale of a question may be considered as one worth asking because its answer would enlarge the scope of,an existing theory or conceptual scheme. Such a question would ask whether the existing ideas or concepts could be instructively used to understand aspects of phenomena that have not yet been subjected to examination in terms of these concepts or ideas, e.g., an examination óf a particular rebellious 'cult' or movement within the theoretical frame of Anomie'. If the observations fit in the conceptual scheme, it in effect gets enlarged or extended, This is precisely what is meant by bringing new set of facts within the grasp of an old one.

(b) Theoretical rationale of a question may direct the scientist's attention to observed inconsistencies in currently- accepted ideas or findings and may prompt him to ask whether these in consistencies are spurious or apparent rather than real. Such questions invite re-examination of the ideas that initially led to the expectation. Are the ideas faulty or the inferences drawn from 'them faulty? These questions about inconsistencies lead to the posing of new problems for research.' In so far as such inconsistencies set the stage for instituting new problems, researchers are expected to be on the look out for 'deviant cases' i.e., cases that depart from the prevailing pattern.The deviant cases are then examined with a view to arriving at a single unified interpretation of the prevailing regularity and of departures from it. Properly investigated, the exception can improve the rule.

(c) question may be considered well worth asking because its answer will be expected by bridging the gaps in the existing ideas or theory that do not account for aspects of phenomena to which they should in principle apply. In some cases, the gap may be bridged by ideas that are consistent with the exisiting theory, which is then seen as incomplete but not-wrong. In other cases, the new theoretical proposal might require some revision of the earlier theory. Merton cites as an illustration, the question of accounting for regularities of social behaviour that are not prescribed by cultural-norms or that may even be at odds with these. The question expresses doubt on the familiar assumption that uniformities of social behaviour necessarily represent conformity to norms. That is, it identifies a gap in the narrowly cultural theory of behaviour which considers social regularities as culturally mandated. Yet as anyone would agree, many social regularities need not be cultural prescribed, e.g., men tend to have higher suicide rates than women, even though cultural norms do not invite males to put an.end to themselves, Durkheim's work on suicide partly bridged this gap. It was his contention that the designated properties of, groups (e.g., the degree of their social, cohesion) determine the rates of behaviour which is either not prescribed by culture or tabooed.

Once the theoretic gap is identified, it may spark off further question, each with its distinctive rationale. There is no doubt, for instance that much of patterned Social behaviour is culturally prescribed. This is after all, what we mean by institutionalized behaviour. When his fact is made to confront the theory that social regularities are the indirect properties of social structure, we are at once in a position to pose a series of new questions such as, "How does a social structure produce new cultural norms prescribing behaviour that was previously an unprescribed resultant of it? With this, the inquiry gets focused on the formation of norms in groups similarly situated in the social structure.

Questions having a rationale consequent upon a gap in theory being identified, have a particular force and significance when the gap is such as can be bridged simply by recasting the earlier assumptions. For example, a question may be raised about the assumption that "Group equilibrium is a function of the extent to which group members conform to each others, a sequence of identical conforming acts will yield the same or increasing degree of appreciation or satisfaction to the actor and to other participants in the interaction system. These assumptions are put to question. It can be argued in this reference that the same act will have different consequences according to the phase of the system of interaction in which it occurs. That is, longer the sequence in which one person conforms to another's expectation, the more will his conformity be taken for granted and the less will be the other's reward for his conformity. On this view, the successive acts of conformity will yield smaller increments of reward.

It is observed that in the course of its evolution, any particular discipline and its specialized fields have given vent to distinctive problems at each of its stages of development. When for example, early modern sociologists were zealously engaged in trying to establish a distinct intellectual identity, they placed a heavy premium upon the autonomy of the field and largely ignored the methods, ideas and data from related disciplines. Durkheim, for instance, objected to and bred a school of objectors to the systematic use of psychological explanations of social phenomena. Similar has been the case with special branches of the discipline of sociology, e.g., sociology of law, sociology of science or sociology of medicine, etc. In each branch of sociology, sustained emphasis on one range of problems has evoked after a time, corrective emphasis upon problems that had so far come to be neglected. On occasions, this calls for the revision of analytical models or schemes that have led sociologists to concentrate on a restricted range of problems at the expense of other problems that the model tends to neglect.

As corrective emphasis of theory develop, attention is redirected toward problems under temporary neglect. For examples, the relation of population growth to human welfare, one of the oldest problems of population theory, has been periodically reformulated to accord with new concepts and to make it amenable to new methods of investigation. Investigation of a range of problems has gone as far as it can with the use of existing concepts. The concepts useful for a time in the past, may now prove to be inadequately differentiated, typically introducing the problem of devising appropriate classifications. The concept of role, for example, proves inadequate to deal with many problems so long as it has to depend on the vernacular for depicting social positions, e.g., father, leader, physician, etc. Such inadequacies give rise to the problem of devising a standard set of concepts or categories which can be used to describe any role or set of roles in a way that does adequate justice to its complexity and permits systematic comparison with other roles. The solution of an inadequency is a precondition to getting on with a broader programme of research.

SPECIFYING QUESTIONS

This is the stage of culmination in the process of formulating a research problem. The originating questions, as we have seen, differ in, their degree of specificity. "Some may be quite diffuse; some relatively more specific. In their most diffuse form, they simply register a dimly felt sense of ignorance, a general concern with 'something' that seems to be in need of solution but this "something" is not clearly or sharply identical. Some what more focused form of the originating questions point to class of variables that may be, involved in bringing about an observed state, without specifying the pertinent variables in that class. At this stage, the problem has yet to be fully instituted. The originating question must still be recast to indicate clearly the observations that will provide an answer to it.

This objective of transforming the originating question specifying question with an eye on a series of observations in particular concrete situations warrants a search for empirical materials in reference to which the problem can be investigated fruitfully. Although, sometimes, the investigator stumbles upon these materials by some lucky coincidence, quite often; he selects them by deliberate design realizing their strategic character in arriving at the answer or the solution to the problem. In sociology, we may cite cases where answers to certain antiquated problems were attempted by investigating them in concrete situations that strategically exhibited the nature of the problem. Inquiry into the modes of interdependence among various social institutions was greatly advanced by Max Weber's decision to study this general problem in the specific instance of the connections between ascetic protestantism and modern capitalism. He realised that the concrete phenomena, i.e. protestant ethic and modern capitalism, has a strategic character in as much as these afforded in a miniature but representative form of an essential understanding of the general nature of inter-institutional dependence.

No concrete situation or observation, however, is strategic in itself. It is a certain insight the researcher brings to the situation that makes it strategic. The signal importance of the phase in the definition of a problem has been widely recognized, but it presents difficulties all its own. We can only illustrate here how as final phase in the formulation of a problem, a general originating question can be transformed into specific one so as to indicate the types of situations that will afford the strategic observations to answer them. It is well known that social organizations have latent functions. The originating question may ask; "What are the latent functions or the unintended consequences —positive and negative — of the present "rational" organization, would afford a strategic site for investigating this question. The question in its more specific form may be phrased thus as "What are the unintended consequences of the rationally organized hospital system for the care of the patients?"

It should be clear that not even a beginning of the solution can be found so long as the questions remain in such an undifferentiated or fused form. The question must, therefore, be broken down into several specifying questions related to particular aspects or organization of hospitals and their consequences for the care of patients (e.g., hierarchy of statuses and formal rules etc.). These simple, pointed, focused and empirically verifiable questions are the final resultant of the phased process, which we call the formulation of a research problem. It is only such specific questions that provide answers, which in their synthesized form afford the solution to the problem.

We may here consider the social determinants of sociological problems. Many problems in social sciences are brought into focus by influences external to a specific discipline itself. Changes in the patterns of social life may give a new or renewed significance to a broad subject or sociological inquiry.

A renewed interest in the study of face groups, for instance, is attributed mainly to the preponderance of formal organizations in a contemporary society and a growing need for such to face 'primary' groups in modern society characterized by instrumental orientations.

It can hardly be assumed, however, that all social and cultural changes will automatically induce or reinforce interest in a particular sphere of inquiry. When changes in a society come to be defined as a social problem and are occasions for acute social conflict, then only do such spheres begin to attract interest. For example, sociologists paid scant attention to the insitution of science although it was recognized as a major dynamic force. A limited renaissance of interest in this field occurred only when a spate of historical events subjected the institution of science to stress, e.g., in Nazi Germany. Also, the state imposition of secrecy upon scientific work in many societies had the result of violating the values and moral convictions of men of science and of curbing the flow of scientific information.

Historical events can affect the value-commitments of sociologists and lead them to work on a restricted range of problems. Merton suggests that the great depression and the social strains it created in its wake, led many American sociologists to study problems of social disorganization. The social organization of the inquiry itself may affect the selection of problems. The choice of subject-matter as also the ways in which problems are constructed has been demonstrated to be related to the recruitment pattern and working conditions of researchers.

Thus far, we were engaged in considering the steps involved in the formulation of a problem for research within the general area of a discipline, drawing the illustrative materials from the discipline of sociology. We have also seen how difficult it is to be able to pose a significant problem for research. This is really speaking the first and perhaps the most crucial in the research process. Many a researcher is stuck at this point and looks guidance in the matter of posing the problem. This perhaps is the where others can help him least.

A question so often asked is, "where to look for a problem?" The answer can only be, "your own mind, where else?" It is a sensitive mind that alone experiences a problem or a difficulty, in a particular situation. This difficulty or curiosity as we have seen, arises because some new observation does not fit into the person's scheme of ideas about the true nature of being and becoming or because the diverse bits of knowledge acquired by him do not fit together meaningfully or, something cannot be explained, on the, basis of what he knows or finally, because there is some element of challenge in a practical situation. It is quite understandable, therefore, that the problem is something that the researcher has to experience from within. It arises, in a way, from what one already knows, and what, on this basis, one would like to know if he were to satisfy his creative impulse. One who does not know much will hardly have problems. It is in this sense that 'ignorance is bliss.' A person may have acquired wrong ideas, but on this very basis, he may, experience problems, which will ultimately change his initial ideas.

Systematic knowledge acquired by the individual, his training and personal talents, all contribute towards sensitizing him to see the difficulties and pose pertinent questions of real import. Cohen and Nagel rightly point out, that "the ability to perceive in some brute experience the occasion for a problem and especially a problem whose solution has a bearing on the solution of other problems, is not a common talent among men. It is a mark of scientific genius to be sensitive to difficulties, where less gifted people pass untroubled by doubt." Raising new questions, new possibilities or regarding old problems from new angles requires a creative imagination and reflects a real advance in science. The mythical tale about Newton testifies to this, Apples have been falling and must also have fallen on the heads of people before Newton's time but it was the sensitive Newton alone who raised that strategic question which sounded the beginnings of the law of gravitation.

We may now list of the conditions that experience has proved to be conducive to formulation of significant research problems.

1. Systematic Immersion in the Subject through First-hand Observation

The researcher must immerse, himself thoroughly in he subject-area within which he wishes to pose a specific problem. For example, if the researcher was interested in the broad problem of juvenile delinquency, it would serve him well if he visited remand homes, juvenile centres, juvenile courts, the families of the delinquent is?

Arid the localities where the incidence is high. He should try to know at first-hand the various aspects of the life of delinquents by. .interviewing them, their family members and supervisors, etc., by observation; no experience is more rewarding in terms of getting a deep feel of the situation. This exercise helps a great deal in testing to the researcher the specific questions that may be posed for the study to answer. This process is known by various names, e.g., pilot survey, preliminary survey or exploration.

2. Study of Relevant Literature on the Subject

We have already seen that to be able to pose a problem, the researcher must be well-equipped to experience some difficulty or challenge. This in turn would depend upon researcher being well conversant with the relevant theories in the field, reports and records, etc.; this would help the researcher to know if there are certain gaps in the theories or whether the prevailing theories applicable to the problem are inconsistent with each other or whether the findings of different studies do not follow a pattern consistent with theoretical expectations and so on. All these will afford occasions for institution of research problems. This is also an aspect of exploration.

3. Discussion with Persons with Practical Experience in the Field of Study

This is often known as an experience survey, which again is an exercise at exploration. Administrators, social workers, community leaders, etc., are the persons who have a rich practical experience in different fields of social life. These persons, therefore, are in an effective position to enlighten the researcher on different aspects of the fields of his proposed study. Such persons represent in a nutshell, years of experience, hence their advice, comments, information and judgements are usually invaluable to the researcher. They can help and guide him to sharpen his focus of attention on specific aspects within the broader field.

In social science as elsewhere, habits of thought may interfere with the discovery of the new or the unexpected, unless the preliminary observations, readings and discussions are conducted in a constantly critical, curious and imaginative frame of mind.

We now know that research begins with a problem or a difficulty. The purpose of the inquiry is to find a solution to this difficulty. It is advantageous and desirable that the researcher should propose a set of suggested solutions .or explanations of the difficulty which research purport to solve. Such tentative solutions or explanation, formulated as proposition are called hypothesis. The suggested solutions may or may not be correct solutions to the problem, whether or not they are in the task of inquiry to test and establish.

7

General Problems of Measurement

In as much as measurement of things, their properties, over or covert, and their responses to certain stimuli, etc. are essential engagements of scientific research it hardly needs to be emphasized that the quality of research will depend on the fruitfulness of the measurement procedures employed. It is understandable that basic to any meaningful measurement is an adequate formulation of the research questions and explicit definition of the concepts utilized in the course of the study. In other words, the researcher must know besides why he wants to measure, what it is that he wants to measure. Measurement in the realms of human behaviour or social phenomena is typically hazardous since a substantial part of what is intended to be measured is covert or of an inferential nature.

It has been stressed that the researcher must have a clear notion of what is to be measured. Failing this, he would not be in a position to decide how he will measure it. *A measurement procedure consists of the techniques for collecting data and a set of rules of using these data*. The purpose of various data collection techniques that is to produce trustworthy evidence that is germane to the research problem. The accompanying rules facilitate the use of these data in making specific statements about the characteristics of the phenomena to which the data purport to be relevant.

Data may be collected in many different ways, e.g., by observation, questionnaire or interviews, examination of records or available statistics and/or by projective techniques. The data collection techniques and the rules for utilizing the data must produce if they are to be useful, information that besides being relevant to the research problems is valid, reliable and precise. Let us briefly understand what type of a measuring instruments, procedure and information that is (a) valid, (b) reliable and (c) precise.

(a) An instrument is valid to the extent it measures what it purports to measure. If the researcher was interested in measuring a person's I.Q. (intelligence quotient) and adopt as a measuring instrument a test that measures only general knowledge or memory, then the measuring instrument cannot be said to be valid. As Selltiz, Jahoda and associates state, "A measuring procedure is valid to the extent to which scores reflect true differences among individuals, groups or situations in the characteristics it seeks to measure......" A thermometer, for instance, cannot be valid instrument for measuring pressure.

(b) An instrument of measurement is reliable to the extent that measures it independently and comparatively the same, objects give similar results (provided, of course, that object being subjected to measurements does not undergo changes during the measurements). For instance, a measuring tape made of elastic would be an extremely unreliable instrument since the same object may yield different measures (values) depending upon how much the elastic is stretched. Similarly, an instrument, measuring an I.Q. test, would be considered unreliable if person who was classified on the basis of the first measurement as 'genius was classified as 'below average' on a second measurement taken after a month of the first measurement.

(c) The measuring instrument should precise to an extent that it is capable of making distinctions between certain characteristics of persons situations fine enough for the purpose it is expected to measure. A precise scale for attitude measurement will be able to distinguish between fine shades e.g. strongly favourable, neutral, unfavourable and strongly unfavourable of people's attitudes and not register just crude differences.

Different factors which may contribute to variations among scores registered on a measuring instrument administered to a group of subjects. This consideration is very relevant (especially, in the context of human behaviour) because the results of measurement may reflect not only the characteristic being measured but the process of measurement itself. Following are the possible sources of variation sin scores among a group of subjects subjected to a measuring instrument.

(a) Of course, the variations in scores in the ideal measuring situation would reflect the true differences in the characteristic which the researcher is attempting to measure. This is as it should be.

(b) Conceivability, true differences in other relatively stable characteristics of the subject may affect his score. Few techniques available to the social, scientist can provide 'pure' measures of any given characteristic. Hence, the scores of individuals in a group may reflect not only differences in the characteristic being measured but also the differences in other characteristics intertwined with the one being measured.

(c) Variations in the situations in which measurement takes place often play a major role in contributing to the difference in scores among a group of subjects; for example, the interview, results of a subordinate may be markedly affected by the presence of his superior office. Comparatively, the presence of his co-workers would not affect them so substantially.

(d) Various personal factors such as hidden motive , state of health, fatigue, mood, etc. may contribute to variations in scores of the subjects in a group.

(e) Lack of uniformity and inadequacies in the method of administering the measuring instrument, e.g., administration of an interview schedule to subjects, may contribute to variations in scores among subjects.

(f) Any measuring instrument, taps only a sample of items relevant to the characteristic being measured. If a measuring instrument comprises mostly items to which the subjects are likely to respond in one way rather than the other, that is, if the items did not represent the entire universe of possible aspects then the scores may vary owing to the sampling of items.

(g) The subjects will quite understandably respond to the items or questions on the basis of how they understand them. Therefore, if the subjects' understanding of the items in a measuring instrument is un-uniform, variations in their responses may reflect the differences in inter ûpretations or understanding rather than the true differences (in the characteristics).

(h) An instrument of measurement may not function effectively in reference to its purport owing to such circumstances as poorly-printed instructions, wrong check marks, lack of space for recording responses fully, etc. It is not improbable that these factors might contribute to variations in the scores of subjects.

(i) The phase of analysis of data involves many sub-processes such as coding, tabulation, statistical computation, etc. Errors entering at this stage may contribute to variations in scores of individuals.

Some of the major factors contributing to variations in results obtained from any measurement procedure may be seen. The errors introduced into the data by such factors (from (b) to (i) may be grouped into two broad categories:

We have seen some of the major factors contributing to variations in results obtained from any measurement procedure. The errors introduced into the data by such factors may be grouped into two broad categories:

1. Constant or systematic errors which are introduced into the measurement by some factor which systematically affects the characteristics being measured in the course of measurement itself (for example, stable characteristics like intelligence, education, social status etc.).
2. Random errors are introduced into the measurement by factors likely to vary from one measurement to the next, although the characteristic that the researcher wants to measure has not changed. For example, transient aspects of the person, situation of measurement of the measurement procedure, etc. are factors that might introduce such consistency in reported or equivalent measurements of the same person, group, object or event.

THE PROBLEM INVOLVING VALIDITY OF MEASUREMENTS

The validity of a measuring instrument as suggested earlier has a reference to the extent to which differences in scores on it reflect the true differences among individuals or groups, etc. in respect of the characteristic it seeks to measure, or the true difference in the same person or group from one occasions to another. We have seen how the constant errors and the random errors may get introduced into the measure. Estimates or validity are thus affected by both types of errors.

In brief, validity concerns the extent to which an instrument is measuring what it is intended to measure. The formulation can be interpreted in various directions. 'Realism' could be a term to be used as a label for this goal. Realism is not the same as truth, a realistic description need not be literally true, but it must help us to get an adequate or realistic picture of the world either by telling us straight forward truths or by affording us points of view, concepts and the like, which are faithful in relation to this purpose.

Example of the thermometer might be taken. What does it measure, which variables it is assigning values to? The answer to this is minimal realism-a measurement is anchored in reality in the sense that it pertains to significant aspects of the world. But then one can go on to ask the further question of how it measures temperature correctly and thus measures nothing but temperature. This is maximal realism.

One may distinguish among three different interpretations of the requirement that the result of a measurement should be about 'what it is intended', that is, three different meanings of 'realism'.

1. The realism of a certain set of data consists of its correspondence to some facts, i.e., its truth.
2. The realism of a certain set of data consists of its connection with some significant problem or with the purpose of the study, i.e., its relevance.
3. The realism of a certain set of data consists of its correspondence with precisely those facts that are connected with some real problem or the purpose of the study-i.e., truth and relevance. The meaning of the term validity oscillates between (2) and (3). Krippendorf observes, "Generally, validity designates a quality that compels one to accept scientific results as evidence. Its closest relative is objective truth."

Since one does not know an individual's true position on the variable or characteristic we seek to measure, there is no direct way of determining its validity. In the absence of such direct knowledge of the individual's true position in respect of the variable being measured, the validity of an instrument is judged by the extent to which its results are compatible with other relevant evidence. What constitutes relevant evidence depends, of course, on the nature and purpose of the measuring instrument. An objective of certain tests is to provide a basis for specific predictions about individuals, e.g., whether certain individuals will be successful in a particular type of career, profession or in solving a certain individuals will be successful in a particular type of career, profession or in solving a certain type of problem. Other tests, although they are designed to measure specific characteristics of individuals, do not afford predictions about how individuals will respond to function in given situations. In the case of the former type of tests, evidence as to whether the individual actually conforms to the predictions, provides a basis for estimating the validity of the test. Investigation of validity in these terms may be described as pragmatic, i.e., validity judged in terms of accuracy of predictions made on the basis of the test results. The latter type of tests which are designed to measure characteristics that do not lead to specific predictions cannot naturally be evaluated so directly. Certain other evidence is necessary and is sought to provide a basis for judging whether the test or instrument measures the concept it is charged with measuring. The approach has been designed as construct validation.

(a) Pragmatic Validity

In the pragmatic approach to estimation of validity the interest is in the usefulness of the measuring instrument as an indicator or a predictor of some other behaviour or characteristics of the individual. The investigator is not interested in the performance of the subject on the test per se; rather he is interested in the person's performance on the test only as an indication of a certain characteristic of the person.

What is essential in this approach is that there be a reasonably valid and reliable criterion with which the scores on the measuring instrument can be compared. In general, the nature of the predictions and the techniques available for checking them will determine what criteria are relevant. For example, if the purpose of a test is to predict success in school, one very relevant criterion could be the school grades.

Ideally, the criterion with which the scores on the measuring instrument are compared should itself be perfectly valid and reliable. But in practice the investigator rarely, if at all, finds a thoroughly tested criterion and usually selects the one that seems most adequate despite its limitations. The reliability and validity of the available criteria may be improved upon by careful defining of the various dimensions of the criterion and getting information relevant to these.

(b) Construct Validity

Many of the measures in social sciences deal with or relate to complex constructs, e.g., measures of intelligence, of attitudes, of modernization, of group morale, etc. Cronbach and Meehl point out that the definition of such constructs consists, in part, of sets of propositions about their relationship to other variable constructs or directly observable behavior. Thus, in examining construct validity one would ask such questions as, "what predictions would one make on the basis of these sets of propositions about the relationships among variable scores based on a measure of this construct?" or "are the measurements obtained by using this instrument consistent with these predictions?"

It is evident that the predictions in respect of the construct validity are of a different order and have a somewhat different function from those involved in determining the pragmatic validity. For example, let us consider a prediction relating to how individuals will vote at the national elections. Since this prediction relates to examining the construct validity, such prediction about voting maybe made with a view to evaluating the construct validity of a test of, say, 'progressive attitudes'. The researcher may reason out that since this test measures persons with progressive orientation, people who get rated as less "progressive" on this test will be more likely to vote for a particular party which has a particular ideological bias or slant. But there may not always be a high degree of correlation between "progressive" orientation and voting behaviour, since many other conceivable influences such as family tradition, socio-economic status, religion etc., may also influence his vote. In construct validation, all the predictions that would be made on the basis of a set of propositions involving the construct enter into the consideration of validity (ideally). For example, the researcher in the above illustration may specify voting preferences for candidates within a particular political party. He may also make and test predictions about relations between voting and socio-economic status, religion, education, etc.

If any one of these predictions is not borne out, the validity either of the measure or of the underlying hypotheses would come into doubt.

It should be remembered that examination of construct validity involves validation not only of the measuring instrument but also of the theory or perspective underlying it. If the researcher's predictions are not borne out, the researcher may not get a clear clue as to whether the shortcoming is in the measuring instrument or in the theory on which the predictions were grouped. For example, a prediction or hypothesis that greater interaction between people leads to greater liking for each other amongst them.

If the findings do not suggest the predicted or hypothesized relationship, it may mean either that measure of 'liking' or of 'interaction' is not valid or that the hypothesis is incorrect. the researcher may under the circumstances, be led to re-examine the constructs as 'interaction' or 'liking', and the entire network of propositions that led to this prediction. The outcome or result of this quest may be the refinement of the constructs.

Campbell and Fiske have suggested that the investigation of construct validity can be made more rigorous by increased attention being paid to the adequacy of the measure of the construct in question, before its relationships to other variables are considered. They propose that two kinds or evidence about a measure are needed before one as really justified in examining relationships with other variables:

(a) evidence that different measures of the construct yield similar results; and

(b) proof that the construct thus measured can be differentiated from other constructs.

In order to secure such evidence, the researcher must measure the characteristics from which he wishes to differentiate or segregate his construct, using the same general methods he has applied to his central construct.

In the light of the above discussion, it is clear that construct validity cannot be adequately tested by a single procedure. Evidence derived from a number of sources is relevant, i.e. correlation with other tests, internal consistency of items, stability of pattern over time, etc. How the evidence from each of these sources bears on the estimation of the validity of the test depends on the relationship predicted in the theoretic system in which the construct has been employed. To the extent more and more different relationships are tested and confirmed, the greater is the support marshaled both for the measuring instrument and for the underlying theory.

It has been discussed thus far two aspects of validation. It shall do well to bear in mind that these aspects are not mutually exclusive. Estimates of pragmatic validity may enter into the evaluation of construct validity and principally, the construct validity of the measure shown to have pragmatic validity should be investigated.

To conclude, constructive validity does not lie in the correspondence between reality and results but in the relationship between results of a measurement or investigation and some theory supposed to shed light on the problems or questions behind the investigation.

It is suggested that the measures shown to have pragmatic validity are usually arrived at by a trial and error method. the ideal requirement of science lays down that the constructs involved in these measures and their relation to the criterion variables be thoroughly considered. Such investigations typically lead to clarification of concepts and eventually to construct validation of these measures. The scientists should not, advisedly, remain content with a measurement procedure which has been validated only pragmatically. So long as the scientist cannot understand the reason behind its working, i.e. why a particular prediction comes out to be true, he has no assurance that the 'mysterious' conditions of its working still hold with reference to a particular application. It is quite understandable that so long as a particular prediction ignores any concern for an underlying theoretical explanation as to its working, it does not afford any basis for generalization to other problems.

The Problem of Reliability of Measurements

The formulation of the requirement of reliability is often impaired by a certain vagueness. By the reliability of a measurement with respect to a given variable is meant the constancy of its results as that variable assumes different values. The variables usually considered are; the measuring event (e.g., the same person using the same ruler in successive measurement "forms" of an intelligence test); the person doing the measuring (e.g., different eye witnesses of the same event).

Holsti says : "If research is to satisfy the requirement of objectivity, measures and procedures must be reliable; i.e., repeated measures with the same instrument on given sample of data should yield similar results."

Here one finds a connection between he concepts of objectivity and of reliability. This is only as it should be. It is natural to assume that an objective result is independent of the subject who conducted the investigation. Here, however, we must distinguish between the factual or ontological problem, i.e, what makes the result true and the epistemic or methodological problem-how do we come to know that a result is true?

Ontological independence is a two-place relation. a datum is ontologically independent of its produce (for example, scorer) when it is not about the producer.

The question of epistemic independence is, however, more complicated and controversial. Epistemic independence is a three place relation; it is a relation between a produce, P, a result, r, and a set of possible producer, S. If a certain result R1, produced by P1 is epistemically independent in relation to a population of scores, S1 to the extent that it is possible for the members of S1 to know R1 without first acquiring mental characteristics that P1 already has. A datum is thus maximally independent, in this sense, in a certain population of scorers if every member of this population would produce it. The epistemic independence is a matter of degree, in so far as more or less of specific capabilities and knowledge of the scorer can be made use of in the process of measuring a phenomenon.

Krippendorf distinguishes between three kinds of reliability as follows :

1. Stability is the degree to which a process is invariant over time, i.e., yields the same results at different points of time.
2. Reproducibility is the degree to which a process can be recreated under varying circumstances, different locations involving different materials, forms, i.e., yields the same results despite different implementations.
3. Accuracy is the degree to which a process conforms in effect to a known standard, i.e, yields the desired results in a variety of circumstances.

Reliability is regarded to be one of the constituent elements of validity. A measurement procedure or an operational definition (of a construct) is reliable to the extent that independent applications of it yield consistent results. Julian L. Simon remarks, "reliability is roughly the same as consistency and repeatability". He further elaborates that if one knows that a measuring instrument or an operational definition has satisfactory validity, he need not bother about its reliability. It an instrument is valid, it means in essence that it is reflecting primarily the characteristic which it is supposed to measure, thus there would be little reason to investigate its reliability, i.e., the extent to which it is influenced by extraneous factors.

Methodologists would not, however, be inclined to subscribe to the view that reliability is presupposed by validity. They would point out instances in support of contention that there are no logical and internal relations between these two concepts and that reliability is a necessary but not a sufficient condition for validity or in other words that validity implies reliability but is not implied by it.

Rarely a researcher is in a position to say in advance whether his instrument has a satisfactory validity. Hence, it is generally necessary to determine the extent of variable error in the measuring instrument. This applies with particular force to construct validity where simple determination of validity directly is impossible of realization.

Till such time as a satisfactory measure of validity and reliability of a measuring instrument has been demonstrated already, its reliability should be determined before it is used in a study. We now consider some of the methods of determining the reliability of measurements.

Evaluation of reliability of a measuring instrument requires determination of the consistency of independent but comparable measure of the same individual or situation. It would be desirable, therefore, to have many repeated observations or measurements of the same individual or situation as a basis for estimating errors of measurement . But in the area of human behaviour this is often not possible. apart from other things, such oft repeated measurements may create annoyance, fatigue and may also affect the characteristics one wishes to study. When this is likely, reliability may be estimated on the basis of as few measures as possible (even two) for each individual in a sample of the 'universe' or even on the basis of one measure if it can be subjected to internal analysis. Enough measurements to provide a basis for evaluation of reliability may also be obtained by increasing the number of individuals measured rather than the number of measurements of the same individual.

Different methods of estimating reliability are focused on different sources of variation in scores: (a) some are concerned with 'stability' of individual's position form one administration of the measure to another; (b) others are concerned with the 'equivalence' of the individual's position on different instruments expected to measure the same characteristic. They essentially focus on unreliability due to sampling of items or to substantive variations in administration, and (c) still other methods are concerned both with 'stability' and 'equivalence'.

Stability

The stability of results of a measuring instrument is determined on the basis of consistency of measures on repeated applications. Of course, where the characteristic being measured is likely to fluctuate between the subsequent measurement, e.g., attitudes, morale, etc., inconsistency in measurements would be evidenced.

This should not, however, be interpreted as unreliability of the measuring instrument. What should bother us is the effect of extraneous factors. The appropriate method for determining stability is to compare the result of repeated measurements with a view to identify whether the source of instability is genuine fluctuations in the characteristic being measured or a random error due to inadequacies contained in the measuring instrument. When the measuring instrument is an interview schedule, questionnaire or a projective test, involving subjects' cooperation, usually, only two administrations are used. In case the measuring device is observation in a natural setting, the number or observations may be repeated.

A restricted number of administrations (usually two) in case of identical repeat-interview, questionnaire or projective test is advisable because these measuring procedures require a great deal of participation by the individual subject and interest, curiosity, and motivation may get substantially dampened during the second application of the test. Consequently, the test though objectively identical to the earlier one, may actually represent a substantially different test situation on second administration. Secondly, the subject may artificially try to maintain consistency in his responses at the second application as he may remember his responses to the first one. There is, of course, the possibility that the initial measurement has actually changed the characteristics being measured (as in the 'before-after' experiment). Lastly, there is the possibility of a genuine change occurring between two administrations of the test. When there is the possibility of initial measure having affected the results of the second measurement and also of genuine changes having been brought about by extraneous factors, the common practice is to strike a mean between waiting long enough for the effects of the first testing to fade off but not long enough for a significant amount of change to take place.

The method of 'alternate' measurement procedures administered at different times is a well-thumbed design to take account of the combined effect of these various sources of unreliability and thus ensure both 'stability' and 'equivalence'. A group of subjects receive one form of test at one time and after a lapse of time receive a different form of the test. Alternatively, the group of subjects may be rated by one observer in a particular situation and by a different observer after the stipulated lapse of time in another situation. Correlation between scores or ratings at these two points of time provides an overall index of the reliability.

As in the repeated-observation method, there is the possibility that genuine changes in the characteristic being measured might have occurred in the interval between two test administrations. But again, provided that the results of two testing are reasonably independent, the effect of this possibility is to make the obtained coefficient an estimate of the minimal reliability of the measuring instrument.

Since the method of alternate measurement procedure administered at different times takes into account more sources of variation than the other methods described earlier, it ordinarily gives a lower but a more accurate estimate of reliability that either a coefficient of stability or a coefficient of equivalence.

Which method or testing reliability a researcher will use in a given research depends not only on the intrinsic worth of different techniques but also on the practical facilities available to him and the resources that can be procured to develop the measuring procedures. Sometimes, it may not be possible for him to reach the same group of subjects for the second or subsequent measurements or the cost of so doing may be prohibitive. In such a case, he has no choice but to base his estimate of reliability on the equivalence of scores. Sometimes, the measuring instrument does not lend itself to internal analysis that may be warranted as a test of equivalence.

The reliability of measuring instruments can often be increased by taking appropriate steps with respect to the sources of error. For example, the conditions under which the measurement procedure is applied can be standardized to effect a similarity between conditions in which subsequent measurements are taken. Adequately trained, instructed and motivated personnel greatly help to minimize the possibility of variations during the administration of procedures.

There are two methods of increasing the reliability of a measurement procedure. These involve the selection and accumulation of measurement operations themselves rather than any change in the conditions of the measurement operations. The first method of increasing reliability is to add measurement operations of the type with which the researcher started in the first place and to assign to the subject as score based on the sum of the results of all measurement operations. In the testing situation parlance, this means increasing the length of the test and in the observational situation it means increasing the number of observations or of observers or both. We can make the reliability of a measuring procedure approach the point of perfection (i.e., 1) provided we are able to add measurement operations indefinitely without changing their nature in any major way.

The second method of increasing reliability is to increased the internal consistency of the measurement operations of the test items. This method is mostly used in the field of psychological testing. The researcher begins with a large collection of test items. This method is mostly used in the field of psychological testing. The researcher begins with a large collection of test items, calculates a score based on each, and another score based on responses .to the total set of items. Then the score for each item is correlated with the total score. Only those items (e.g., statements) are retained in the test which correlate most highly with the total score of the test. The items which are retained are then divided into two equivalent groups. New scores are calculated on these two groups and these scores are correlated to provide a measure of reliability of the 'purified' test.

The internal consistency of the test items may also be increased by dropping from the test items as cannot distinguish sharply between the high and low scorers, i.e., that have a low discriminatory power, those items which yield the largest differences in the direction of response, in other words, those items which have a high 'discriminatory power', are identified as the ones most consistent with the total set (test). We shall have an occasion to discuss the internal consistency of items in the chapter on scaling techniques.

It is well-worth remembering that the method of internal consistency can reduce unreliability resulting from lack of equivalence of items but it cannot do much to reduce unreliability resulting from instability of a subject's responses or variations in the conditions of measurement. The method of increasing the number of measurement operations can be used to reduce these sources of unreliability if it is possible to spread the measurement operations out over a period of time or to distribute them over a number of different conditions of measurement.

Precision: We now turn to consider the problem relating to precision of the measuring instruments. In the interest of both accuracy of judgment as well as the discovery of constant relationship among characteristics that vary in amount as well as in kind, statements that merely affirm or deny differences have to be replaced by more precise statements indicating the degree of difference.

In social sciences, many of the distinctions are qualitative in nature, e.g., we distinguish different races, languages, cultures and communities. But is often necessary and desirable to make distinctions of degree rather than of mere kind. Suppose, a researcher was interested in studying people's attitude toward the ceiling on urban property. Should he wan to assert that two persons differ in their attitudes toward ceiling on urban property, he must at least be able to distinguish among different shades of attitude, that is, he must be able to identify certain persons as equivalent, or others as unequal or different. If the researcher wishes to state that the attitude of one person is more favourable than that of the other, he must be able to identify and rank different attitudinal positions as more favourable or less favourable. If he wishes to make a statement that Mr. X is much more favourable than Mr. Y as compared to Mr. Z, then he must be able to determine whether the difference between the former two attitudinal positions. And going a step further, if the researcher wants to make some such assertion as "Mr. X is twice as favourable as Mr. Y", then he must be able to identify the existence of an absolute zero point. The above four types of statements correspond respectively to four levels of measurement or as these are mediated through four types of scales, i.e., the nominal scale, ordinal scale, interval scale and ratio scale are the most powerful as devices for comparison.

Nominal Scales: The basic requirement for a nominal scale is that the researcher be able to distinguish two or more categories relevant to the attribute under study and specify the criteria for placing individuals or groups etc., in one or the other category. The categories are merely different from each other; they do not represent the more or less degree of the attitude or characteristic being measured. Classification of individuals according to race, for instance, constitutes a nominal scale. The use of nominal scales is characteristic of exploratory research where the emphasis is on uncovering relationship between certain characteristics rather than on specifying the mathematical form of relationship.

Ordinal Scales: An Ordinal scale defines the relative position of objects or persons with respect to a characteristic with no implication of the distances between positions. The basic requirement for an ordinal scale is that one be able to determine the order of positions of objects or persons in terms of the characteristic under study, i.e., whether an individual has more of given characteristic than another individual or the same amount of it or less. This presupposes that one must be able to place each individual at a single point with respect to the characteristic in question. Of course, this is a requirement for the more powerful scales as well. In an ordinal scale, the scale-positions are in a clearly defined order but there is no definite indication of the distance between any two points. That is, distance between 7 and 8 may be equal to, greater than or lesser than the distance between 2 and 3 or 1 and 2. Thus, with ordinal scales, we are constrained to make statements of greater, equal or less, but we cannot articulately specify how much greater or how much less.

Interval Scales: On an interval scale, not only are the positions arranged in terms of greater, equal or less, but the units or intervals on scale are also equal. In other words, the distance between the scale positions 7 and 8 is equal to the distance between positions 2 and 3, 2 and 1. The thermometer is an example of the interval scale. The basic requirement for such a scale is a procedure for determining that the intervals are equal. It should be remembered that for many of the attributes that social sciences typically deal with, procedures affording reasonable certainty about equality of intervals are yet to be devised.

On the interval scale, the zero point is arbitrary (as in the nominal and ordinal scale); for example, in the centigrade thermometer the zero point is much below the freezing point of water. Thus, in the interval scale one cannot state, for instance, that a person's attitude is twice as favourable as that of another person just as one cannot say that 20 degrees Fahrenheit is twice as hot as 10 degrees Fahrenheit.

Ratio Scale: A ratio scale contains in addition to the characteristic of an interval scale, an absolute zero. The operations necessary to establish a ratio scale include methods for determining not only equivalence (as in the nominal scale) or rank order (as in the ordinal scale) and the equality of intervals (as in the interval scales) but also the equality of ratios. Since ratios are meaningless unless there is an absolute zero point, it is only the ratio scale that warrants assertions such as "Mr. X is twice as favourable towards the nationalization of Banks as Mr. Y is." If one's data conform to the criteria for a ratio scale, all relations between numbers in the conventional system of mathematics obtain between the correspondingly numbered positions on the scale. With such a scale, all types of statistical procedures become amenable.

It should be conceded that for most of the subject-matter dealt with by the social sciences, the researchers have not been able to develop procedures that satisfy the requirements of a ratio scale. For most part, the scale construction uses the judgments of people (judges) as the basis for the subjects' positions on the scale.

We close this chapter with a few comments on the statements made and opinions often expressed that social sciences can never hope to reach the precision of measurements achieved in the physical sciences because the very nature of the materials with which the social scientists deal do not permit the establishment of an absolute zero point. No doubt, much of social science measurement will always be indirect and will depend upon the knowledge, in turn, is partly dependent upon the development of fundamental measurement.

The gloomy prediction that the social sciences may never reach the precision of measurements characteristic of physical sciences may well prove to be correct. But such an assertion seems premature at this stage. We can only express the hope that measurement of social and psychological characteristics or properties will, given time, progress from a lower scale to a higher one as it happened in the case of many physical properties. As Stevens has pointed out, "when people (in the olden times) knew temperature only by sensations as 'warmer' or 'colder', temperature belonged to the ordinal class of scales. It became an interval scale with the development of thermometry, and after thermodynamicsà. It became a ratio scale."

Long ago a foot-racer would race only against another runner. Now he races against a clock and achieves a time record. Of course, the runner usually also races against other runners but his time score has a meaning all by itself, which was not possible before the chronometer (clock) was invented.

8

Different Techniques of Research : Observation

Science begins with observation and must ultimately return to observation for its final validation. The sociologist must, then, train himself to observe carefully. If he can become a good observer, he will start his investigation with more data at his disposal, be less likely to forget that his object of study is social behavior, and be able to maintain a continual check on his conclusions more easily.

Observation may take many forms and is at once the most primitive and the most modern of research techniques. It includes the most casual, uncontrolled experiences as will as the most exact film records of laboratory experimentation. There are many observational techniques, and each has its uses. Since the student should be able to choose which tools are most suitable for his research project, it is worth while to discuss these procedures, from the least to the most formal.

All of us notice some things and fail to see others. Our preferences and alertness, the range and depth of our knowledge, and the goals we seek all go to determine our pattern of selective observation. Few students take conscious note of social behavior. To illustrate this point, the student may use the following test either alone or as a member of a group. In the latter case, a study of the differences between individuals will be profitable. Take a field trip to a factory, a department store, a library, or even to a club meeting. During the period of observation take notes on what you see, writing a complete report on the trip. Now, analyze the report carefully to discover how much of it is concerned with *social* behavior. Many students will record the articulation of various processes in the assembly line, or the window display in the department store, and social behavior will receive scant attention. Others will respond emotionally to the gloominess of the factory, its noise, and the speed of the work pace; still others will comment on the vulgarity of the merchandise in the store, or the absurdity of proposals put forward by members of the club Perhaps there will be some students who record the anomalous or striking social behavior, *i.e.,* the items of literary interest: the derelict who was sleeping in the library, the worker who seemed to be cursing the student group as it passed, the salesclerk who chewed her gum while explaining the advantages the perfume being sold, or the near fight between two club members.

Relatively few, however, will record the items which are likely to be of even more sociological importance, such as the techniques of communication used by workers when they are spatially separated in a noisy factory; the deferential behavior of workmen toward the foreman; the swift change in role behavior when the salesclerk turns from her fellow clerk to the customer; the age and sex distributions of workers in different kinds of work units; the value assumptions implicit in the discussions at the club meetings the varied social activities apparently being served by the library; or the informal hierarchical pattern of power which is evident among the club member. In short, we are not likely to be conscious of "obvious" social behavior, and few of us deliberately record the social interaction which goes on around us.

If the student finds, in the test just suggested, that he has mainly jotted down items which relate mostly to the physical situation, engineering relationships, or economic patterns, a first, obvious procedure for improving his power of observation is simply to develop an alertness to social phenomena. The student may smile at such advice, for it sounds like pulling oneself up by one's bootstraps. However, we do notice some social phenomena, since we are adjusting constantly to new social situations. We are aware of differences in status and changes in roles, for we act differently toward people of different social strata and occupations, or even toward different members of our own families (father, grandfather, brother, distant cousin, etc.). It may be true, on the other hand, that we have not consciously formulated these differences. We may " sense" antagonism between friends, or we may suspect the intention of a stranger, without attempting to record the cues which led us to this feeling. Simply becoming aware of this failure may, therefore, cause us to see many items of social behavior to which we had given little previous thought.

SIMPLE OBSERVATION: UNCONTROLLED, PARTICIPANT AND NON PARTICIPANT

Most of the knowledge which people have about social relations id derived from uncontrolled observation, whether participant or nonparticipant. The controls on this case refer to the standardization of observational techniques or, in some cases, controls over the variables in an experimental situation. That is, we have learned about social behavior from the situations which we have witnessed or participated in, and our observation were not checked by other observers, by a set of specific items to be noted down, or by a detailed outline of experimental expectations. Scientific observation develops, however, from the most casual experience with a subject to the most formalized, abstract measurement of variables the use of precision instruments. Even when a science has had a considerable growth, the simple forms of looking and listening are not superseded. Not only do they contribute to the basic, varied stock of knowledge about social relations with which we all begin our study, but they are the principal data-gathering techniques for many modern investigations.

First discuss the uses and problems of uncontrolled, participant observation. This procedure is used when the investigator can so disguise himself as to be accepted as a member of the group. In his study of hobos, for instance, Nels Anderson often traveled and lived with these men without revealing that he was a social scientist. A recent study of professional dance musicians was carried out by a student who was accepted as a young piano player[1] The English Polling group Mass Observation has utilized various camouflage techniques. One observer may mingle as a laborer with other laborers or work as a porter in a barber shop.

The sociologist need not carry out exactly the same activities as others, in order to be a participant observer. He may, instead, attempt to find some other role which is acceptable to the group, while not divulging his real purpose. That is, he may find a role in the group, which will not disturb the usual patterns of behavior. Thus, he may enter the community as a local historian or a botanist in order to record its informal social relations. The anthropologist also follows this pattern in part, since he usually participates in tribal activities if this is permitted. We see, then, that participant observation may vary from complete membership in the group to a part-time membership in the group.

It can be taken for granted that if the members are *unaware* of the scientist's purpose, their behavior is least likely to be affected. Thus, we may be able to record the "natural" behavior of the group. Furthermore, to the extent that the student actually participates, many of his emotional reactions will be similar to that of true members. Thus he has access to a body of information which could not easily be obtained by merely looking on in a disinterested fashion. He will feel the exhaustion and exhilaration of a tribal dance, the cold and hunger of the hobo, the bitterness of the steelworker who is bullied by the foreman. He thus obtains a greater depth of experience, while being able to record the actual behavior of other participants. Since his period of participation may continue for months, the range of materials collected will be much wider than that gained from a series of even lengthy interview schedules. He is able, further, to record the context which gives meaning to expressions of opinion, thus surpassing the richness of the usual questionnaire. He can also check the truth of statements made by members of the group.

However, this tool has equally obvious disadvantages to be weighed before it is used in field research. Paradoxically, to the extent that the investigator actually becomes a participant, he narrows his range of experience. He takes on a particular position within the group, with a definite clique or friendship circle. He learns and follows a pattern of activity which is characteristic of its members, and thus is less able to find out what fringe individuals are doing. If there is a hierarchy of power, or a stratification of prestige, he comes to occupy one position within it, and thus many avenues of information are closed to him. Further, the role he comes to occupy may be important, so that he actually changes the group behavior.

Similarly, to the extent that he participates emotionally, he comes to lose the objectivity which is his single greatest asset. He reacts in anger instead of recording. He seeks prestige or ego satisfaction within the group, rather than observing this behavior in others. He sympathizes with tragedy and may not record its impact upon his fellow members. Moreover, as he learns the "correct" modes of behavior, he comes to take them so much for granted that they seem perfectly natural. As a consequence, he frequently well fail to note these details. They are so commonplace as not to seem worthy of any attention.

Finally, of course, it is clear that in both participant and nonparticipant observation the problem of observation control is not solved. To the degree that the investigator becomes a participant, his experience becomes unique, peculiarly his own, so that a second researcher would not be able to record the same facts. There is, then, less standardization of the data. Moreover, because the behavior of the group is bot affected much be the investigator, the latter must passively wait for occurrences. He cannot set up a deliberate experiment, and he may not upset the social situation in order to change his position (to overhear an exchange of words, to see better, etc.) or leave it in order to observe a more important occurrence somewhere else. In short, his role of observer is handicapped somewhat by his being a participant.

Nonparticipant observation answers some of these objections.

The anthropologist actually moves from one role to the other while in the field. He may, for example, go on a fishing trip as a participant, but during the preparations for an important religious ceremony he will interview formally the important participant, or record the ritual chants during the ceremony. This shift is made easier by the fact that the patterns of the society are not likely to be changed in important ways by the presence of an outsider, if the role of the latter is properly defined.

As the student can understand, purely nonparticipant observation is difficult. There is no standard set of relationships or role.patterns for the nonmember who is always present but never participating. Both the group and the outsider are likely to feel uncomfortable. And, naturally, for many search situations it is almost impossible for the outsider to be a genuine participant in all ways. The sociologist cannot, for example, become a criminal in order to study a criminal gang, without running the risk of completing his report in prison. Neither can he be a true member of a juvenile gang, a spiritualist sect, a police squad, and so on.

On the other hand, it is not necessary that his role playing be complete. It is possible to take part in a great many activities of the group, so as to avoid the awkwardness of complete nonparticipation, while taking on the role of the observer and interviewer for other activities. This has been a classic pattern in social research. It was used by Le play a century ago in his study of European working-class families, and by Lynds in their modern studies of Middletown. In such surveys, the investigators have lived as members of the family, as participants in community activities, taking part in games and dances, or even in study groups. They nevertheless made clear that their purpose was to gather facts.

Nonparticipant observation is, then, usually "quasi-participant" observation. Carrying out both roles is simpler than attempting to disguise oneself completely. What is necessary, on the other hand, is a good plan for entering the group. In Merton`s housing study, the research team developed a careful plan for dual entry into the community-privately at the higher administrative level of the housing project manager, and publicly at the level of community organizations. Thus, they avoided the problem of being identified with the manager, while obtaining the official permission which was necessary for effective field work. Whyte, in his study of "corner boys: in an Italian slum, entered as a local historian under the auspices of Doc, a key member of a gang. Similarly, a nonparticipant study of a self-determined selling group utilized the procedure of approaching a union representative first, but also obtaining permission from management before actual entrance.

It is the experience of most field researchers that after the initial period of introductions and explanations, the members of the community or group accept the presence of the field workers as legitimate. If the first interview contacts are satisfactory, the succeeding contacts are facilitated. Although the role of social researcher is not a clear one in our society, it is sufficiently known to require no elaborate justification. And, as is discussed at length in the chapter on interviewing, the capable student explains his activities best by carrying them out with some competence.

The investigator then has several roles from which to select. He is a stranger, and thus less involved emotionally with the social situation. True members may thus feel relatively free to talk over tensions and delicate matters which they would not discus with their own intimates. The researcher is also a listener. Further, he is a pupil, eager to learn, and by that eagerness indicating his belief that the community or the community or group is a significant one. In addition, of course, for most interaction he may shift into his role of participant, so that he does not remain a mere alien.

AIDS IN SIMPLE OBSERVATION

As there are relatively few controls on the observer in the use of this technique, he must self-conciously apply a range of tools for systematizing and recording the data which are part of his experience. Of course, the prime organizational factor for any research must be the research problem itself. from the hypothesis and the basic plan of the investigation will be drawn the categories of facts to be observed. Many facts must be ignored. Others will be ignored unless they are integrated into a system of recording phenomena which are significant for the project.

The basic document will be, of course, some type of field-experience log. This may take the form of a diary, or it may be a diary record of each item, written under appropriate subheadings. Thus, there might be a set of subheadings dealing with "socialization": crisis situations involving mother and child, scolding by mother, aggression by siblings of various ages, weaning, toilet training, etc. Since social action is swift and the day long, in many cases it will be profitable to deep running notes. These may be scribblings on small cards, key words written in a notebook. or typed notes written at odd moments during period of interviewing. In any event, the record must be relatively complete, and almost certainly will not be complete without the use of notes taken during the day, and a conscientious attempt to make a full log at the end of the day. It is a frequent failing to believe that a comment or occurrence is so striking that it will not be forgotten. The student will find, when he reads over hes complete record several weeks later, that many items will seem novel and possessed of greater meaning than was obvious at the time of note taking. It is particularly important to write out details during the early phases of the field work, for later many of these details will have faded into the expected and taken for granted.

Whether or not the original notes are recorded under subheadings, they must later be reanalyzed and placed under the appropriate categories. The reasons are fairly obvious. If the study has been properly focused, certain types of data are more important than others. Analysis of the notes may show, however, that emphasis has been placed upon other types of data. Thus, the presumed purpose may be to study socialization, but the notes may be concentrated upon their "interesting" occurrences, such as conflicts and gossip, extramarital sexual behavior, or food habits. "These may be relevant to sociolization, but whether or not they have been chosen for that purpose, to for an extraneous purpose, can be seen when he notes are organized. Further, it is then possible to correct the error while field work is in progress. Otherwise, much time and money will be wasted. Moreover, by a continuing attempt to organize these observations, new categories will not have time to carry out systematic coding and indexing operations, but even preliminary categorization is useful if it is done each day.

The investigation may find it profitable to record both observation and interpretation of the observation. In general, this cannot be done methodically, and too often the temptation exists to record the interpretation merely because it seems more meaningful. However, it is better research practice to separate the two, and to connect them by cross-indexing. If there is limited time, and this seems always to be the case, then a record of the item without the interpretation is more useful.

On the other hand, it is absolutely essential that continuing analyses or reports be made while the field work is under way. Ideally, these should be sent to colleagues who are not in the field, so that their added perspective may be used in the gathering of further data. Often, the researcher has failed to see or record items which the outsider believes are crucial. Such suggestions may, furthermore, lead to a restructuring of the research aims, or demand proof of tentative conclusions. If the field work is being done by a team, periodic analyses and reports will be discussed for the same purposes. However, for maximum fruitfulness, such reports should also be subjected to criticism form those not in the field. When possible, the field worker may find it useful to leave the field from time to time, in order to think over the problems encountered and the data gathered, as well as to gain perspective on the research as a whole.

It is also the practice in such field work to supplement uncontrolled observation by schedules of information. These will have been drawn up in outline before beginning the work, and will be revised in the field. Often, these will contain such basic organizing data as age, sex, and cumber of individuals; occupational structure; religion; income; hierarchy of power; family pattern; etc. Even when these items are not the principal focus of the research, they will be essential for any description his of the group, community, or organization. Sometimes a family schedule will be used, with detailed questions about this institutional area, to be asked of all families or a sample of them. The point of such schedules is simply that recording only what is seen may dim the background against which those occurrences were seen. Everything seems so familiar to the investigator that he must be reminded to record the self-evident. For this reason, again, other aids may be used. For rural groups or for most communities, various maps may be used so as to report accurately the movements of people, their proximity to one another, or to set the detailed data in their physical context. Sociometric diagrams may be drawn, to develop with some precision the neighboring patterns, the likes and dislikes, or the structure of influence between individuals. Finally, of course, there are increasing attempts to use the modern tools of the film and the wire recorder.

Although uncontrolled participant and nonparticipant observation are often used as the exploratory phases of a research project, yet to ascertain whether a more sharply drawn hypothesis could be tested in the field, it should be kept in mind that there is no opposition between these techniques and any tools of quantification that may be useful. Informal methods may be supplemented by highly structured observation, by detailed questionnaires, and by psychological of sociological tests. Furthermore, it is possible to quantify the protocols of case histories and field observation by the techniques of qualitative coding. Thus, what the sociologist or social anthropologist does in an unsystematic fashion, in order to arrive at any conclusion at all, can be carried out by more reliable procedures. For a discussion of qualitative coding, the student should read the chapter on qualitative analysis.

SYSTEMATIC OBSERVATION: CONTROLS OVER THE OBSERVER AND THE OBSERVED

It is clear, however, that as the precision of the hypothesis increases, so must the precision of the concepts and the data. Simple observation is most useful in exploratory studies, but the investigator gradually sees the need to supplement his notes with more carefully drawn schedules and questionnaires, with tests, and with better controls over the techniques of observation. It is the universal experience of every science that the perception of the individual observer must be corrected in various ways. Checks on his biases, his selective perception, and the vagueness of his senses must be built into the research. There must be objective standards against which to correct his measurements. Otherwise, it is difficult for other scientists to find the same facts. Vague impressions of body build are replaced by anthropometrical measurements. Guesses about distance can be corrected by exact maps. Casual hunches about friendship patterns can checked by deficit counts, cross tabulations, or sociometric diagrams. We can think of systematic observation, then, as being a later stage in the development of a project. As our ideas grow in depth and sharpness, we wish to rely much less upon uncontrolled observation. Since the sociologist is often in the position of the astronomer, the vulcanologist, or the comparative psychologist attempting to study the lives of animals in their natural habitat, in that it is rather difficult to control the *object* under investigation, he must at least put controls *on himself*. Thus he increases precision, and at the same time he protects his work from later attack. By reporting how he made his observations, under what conditions, when, and so on, he makes it possible for other scientists to know the limitations of his data, and to repeat the observations .

In these terms, the formal interview, the inventory or schedule, and maps are controls over the observer. They guide him to certain types of observations, and the instructions for using these tools are also instructions for other investigators. However, it is useful at this point to concentrate upon systematic controlled observation in the more usual sense, i.e., the witnessing of social interaction.

In uncontrolled observation, the researcher is ordinarily not limiting the activities of the observed individuals to any great degree. Rather, he is trying to systematize the process of observation. However, as a consequence, in both these types he may be unprepared for new situations, and they may not be useful for his problem. Further, the role of the observer remains as a problem to be taken into account when the design of research is planned. The observer always affects the resulting observations in some fashion. What the scientist can do, however, is to reduce this effect, limit it to minor areas, or at least measure it.

Thus, we must consider (1) whether the situation is to be a "natural" one or a contrived one, and (2) whether those observed are to be aware or unaware of the observation. in most uncontrolled observation, the situation is natural, and those observed are aware that there is a witness. This may also be true for controlled observations. but variations are possible. A common tool for the observation of children in nursery situation, for example, is the one-way visual screen. Study of aggression, leadership, communication, patterns of play, etc., is thereby facilitated. Often this is carried out with a team of observers, each of whom is recording particular types of behavior. These may be synchronized through the use of time units, marked off on the recording paper. Either wire recordings or handwritten notes on language may be made. It is often the practice to integrate the observations further by having one student record the major patterns and movements, with which to compare the detailed notes. In this type of observation, of course, the children are in a natural situation, and they are unaware of the observation. As we shall note in the next section, the investigator may actually create new situations by introducing stimuli, again without the knowledge of the children.

Controlled observation may all be directed toward situations which are natural, but in which the subjects are aware that they are being observed. This has been done most successfully with "small-group research," a rather loose term used to refer to studies of the interaction between members of both formal and informal groups meeting face to face. When groups have been brought together for this purpose, the situation is contrived, but often the groups being studied are carrying out their usual activities. In either case, it is usually found that after an initial period of restraint due to the presence of observers, or awareness of their presence, the participants act naturally. Thus it is possible to achieve some quantification of the data being gathered, even though the subjects have not changed their behavior in any fundamental way. It is almost unnecessary to comment that the use of precise observing observation techniques, including mechanical aids, films, etc., is fruitful only when the categories of data and the tentative hypotheses are clearly developed. Otherwise, the analysis of the resulting mass of material is likely to bog down in trivial tabulations, and the expense will not be justified by the result.

Systematic observation limits the bias of the individual observer partly by making the subjects feel the situation as natural, but far more through the applications of controls on the observer in the form of mechanical synchronizing devices, team observation, films and recordings, schedules coding observed behavior quickly. It is but a step from highly refined observational situations to the genuine laboratory situation, in which controls are applied to both observer and observed. That is, the situation is a contrived or manipulated one, in which definite stimuli are introduced, while the observations themselves are standardized as far as possible. As the student can note in the chapters on the design of proof, many of these studies are "quasi experiments" in that some element of the proof is missing, such as a control group. Thus, observation of nursery school children at play may be varied by introducing a single desirable toy in order to create rivalry situations, by changing the role of the nursery teacher, and so on.

However, the introduction of experimental variables into the situation creates no new observational problems. Whether the subjects are aware or unaware of the nature of the experiment, the role of the observer must be taken into account when planning the study. It is no great advantage to the result that the subjects are unaware, if the observational techniques are nevertheless loose, unstandardized, or with an unknown amount of distortion. The observer is a mediator between the actual situation and the data. Thus, he may affect the actual situation by interfering actively, or he may affect the data by either his skill at observation or his recording procedures. In any case, the final research is changed. Consequently, the researcher must keep in mind that "role of the observer" does not only mean the myriad ways in which the investigator may change the behavior of the group or persons being studied; it can also refer to all the ways by which the observer can affect the final results of the research. Within such a meaning must also fall the process of interviewing, which is discussed in later sections of this volume.

Social relations in factory situations have been the object of study in several studies which approximated experimental designs, as noted earlier. A good illustration of the complex ways by which the observer affects the data nay be taken from the Hawthorne study. Its earlier phases were occupied with the psychophysical problem of work output under varying conditions of illumination. The investigators carried out elaborate precautions to ensure standardization was increased, but also increased when it was decreased to almost the level of a bright moonlight might. However. analysis of this illumination research indicated that none of these controls, and perhaps none of the variables to be measured, was so crucial as the *fact* of being observed. The subjects responded to the changed social situation, in which they and their work were given attention, consideration, and prestige which had not previously been part of their factory experience.

On the other hand, various studies in the social structuring of perception have contrived quasi-experimental situations in which the subjects or meaning of the variables. Perhaps the classic case is Sherif's work on the autokinetic effect. Subjects were placed in a room which was completely dark except for a pinpoint of light. They were told that the light would soon begin to move and were asked to estimate the amount of movement. Various social situations were then contrived so as to measure group influences upon influences upon individual measurement, differences between groups, etc. The subjects were misinformed, however, in that the light did not move, and of course they were told nothing about the interest in social influences. This design, then, maximized control over the observer and the even though the subjects were aware that they were under study.

9

Different Techniques of Research : The Interview

As sampling procedures have developed in complexity and precision far beyond common-sense mental operations, yet are still based on activities common to all men, so is interviewing the development of precision, focus, reliability, and validity in another common social act-conversation. When parents attempt to find out what "really happened in school" by questioning children, they are carrying out an interview. Perhaps most readers of this book have been through a "job interview," in which they were asked an embarrassing series of questions designed to find out "What can you do?" Almost everyone has seen a "whodunit" film, in which the master detective carries out a number of interviews with the murder suspects. He "probes" more deeply if he believes the answer does not tell the whole story. He asks a series of questions, designed to cross-check a set of earlier answers. He may ask innocent questions, in order to make the murder suspect relax his guard. The prospective purchaser of real estate becomes an interviewer, also, when he questions the salesman about the property, or returns to the neighborhood later in order to question other residents of the area.

Everyone, then, has been interviewer and interviewee at some time or another, and all have listened to interviews. Some of these have been efficiently performed, while others have failed to elicit the information desired. A few have antagonized the interviewee, while others have become the beginning of a fast friendship. Some have been trivial in nature, and others have been of great significance. It is common to feel, after such interviews, that something different should have been said. Or self-congratulation follows some particularly shrewd question which cleared up an important ambiguity. Once in a while, also, it is recognized that the person who spoke with us "felt a lot better" for having talked about his troubles.

Like other social activities, interviewing has many facets. There are many types of interviews, and their purposes are many. Nevertheless, interviewing can be studied in order to develop skill. Although interviewing is easier for some than for others, everyone can improve his technique by learning to avoid certain types of errors, by developing an alertness to ambiguities and deceptions, and by becoming aware of the purpose of the interview, as well as the interaction between interviewer and respondent.

It is of particular importance that the modern social investigator develop his skill. Increasingly, the social scientist has turned from books to social phenomena in an effort to build the foundations of science. It is true, of course, that speech adds a further complex dimension to research, which the physical scientist does not have to probe. The rock cannot speak. But, as Max Weber once noted, this dimension is also a source of information. If it is not to be ignored, tools for its exploitation must be developed. One can maintain, of course, that every phase of any research is crucial. Errors at any stage may weaken or destroy the validity of the investigation. Yet the interview is, in a sense, the foundation upon which all other elements rest, for it is the data-gathering phase.

Its importance is further seen in the gradual recognition, locational, and control of interviewer bias, since the interviewer is really a tool or an instrument. One interviewer will meet with cliche answers, moderate in tenor and logical in structure, from a certain respondent. Another may find that the same respondent is quite violent in his answers and in his emotion pays little attention to logic. These differences may be extreme cases, but all may be encountered. Important differences between interviewers are generally found, raising the fundamental question of *interviewer reliability*: "*To* what extent can the answers so obtained be repeated?"

Interviewing has become of greater importance in contemporary research because of the reassessment of the qualitative interview. Social scientists of the turn of the century used this type of interview almost exclusively. The interview was likely to be rather unstructured in character and more in the nature of a probing conversation. Guided by a shrewd, careful observer, this could be a powerful instrument for obtaining information. However, it was also an unstandardized instrument. The investigator could not offer definitive proof that his data were as described. The interview was of the character of the anthropological interview, in which no other interviewer was expected to check on the information and the problem of reliability was not often raised.

The development of highly structured schedules was seen as one possible solution to the problem of standardization. Its most complete development, of course, is the polling interview, in which the same questions are asked of every respondent. They were to be asked in the same form, in the same order, with no deviation from respondent to respondent. In this fashion, it was possible to obtain certain items of information for each respondent. This facilitated comparative analysis between individual or subclasses. However, depth was usually sacrificed in order to gain this standardization. As a consequence, there is a movement back to the qualitative interview through the use of the *interview guide*, which requires certain items of information about each respondent but allows the interviewer to rephrase the question in keeping with his understanding of the situation. This permits the interviewer to express the question in such a fashion that the respondent can understand it most easily. Further, the interviewer may probe more deeply when the occasion demands. This permits a more adequate interpretation of the answers to each question. In addition, the development of content analysis and qualitative coding permits some standardization of answers not of the "yes-no" type. Thus, one of the basic objections to the qualitative interview has been partially removed.

On the other hand, this method requires an even *higher level of interviewing quality.* The greater the amount of discretion allowed the interviewer, the more necessary is a high level of competence. The application of more rigid sampling controls takes from the interviewer the choice of respondent. If, however, his interviewing report contain information quite different from that obtained by other interviewers, the problem of "sampling" is reraised-this time, a *sampling of the responses* of the interviewee to these particular questions. If the responses are entirely different from one interview to another, the adequacy of the data is always in question. Consequently, the development of interviewing skills as well as interviewer controls to a high level is of great importance.

INTERVIEWING AS A SOCIAL PROCESS

Neither reliability nor depth can be achieved, however, unless it is kept clearly in mind that interviewing is fundamentally a process of social interaction. Its primary purpose may be research, but this is its purpose *for the investigator. For the respondent*, its foundation and meaning may be different. Even if both have research as an interest, the process of obtaining information is so structured by its character as social interaction that considerable attention to this aspect is required.

It is better to have a first look at the element in social interaction which is most difficult to define, that of *insight* or intuition. This is an unfortunate term, since for many it possesses overtones of vagueness, subjectivity, and even mysticism. Yet no such connotations are intended here. Reference is rather made to the fact that some of the individuals in a social group seem to understand the dislikes and likes of the rest better than others do. They can predict more accurately what the others will say, and respond more precisely to their intended meaning. They know whin one feels offended, and what lies behind the casual comments of another.

It is a common place to feel, when on close terms with a friend, that a casual word, gesture, or look conveys a complete message of story. Yet this is not usual between mere acquaintances, and this describes the importance of what may be called *subliminal cues*. That is, everyone betrays his emotions in various ways. As we become accustomed to friends, we learn, consciously or unconsciously, the tiny behavioral accompaniments of these emotions. Those cues which are not recognized consciously, which are below the threshold of perception, are called *subliminal*. A good poker player wins as much by his guesses as to the plans and emotions of his fellow players as by his knowledge of the cards themselves. Indeed, he will play the cards on the basis of these guesses about his opponents. Sometimes guesses are based on a conscious recognition of these cues; other guesses, equally good, which seem to be based on no such recognition, spring from such unconscious observations. If insight refers to such procedures, then it is clear that if can be acquired. To improve his "insight," the student of social relations should attempt consciously to:

1. Develop an alertness to the fact that there *are* many subliminal cues, and that one learn to "read" them.
2. Attempt to bring these cues to a conscious level, so that comparisons can be made with the hunches of other observers and interviewers.
3. Systematically check the predictions made from these hunches, to see which are correct.

The process of social interaction in the interview is complicated by the fact that the *interviewee* also has insight. This means that the interviewer must not only attempt to be conscious of the real meaning of the answers make by the interviewee; he must also be aware of the fact that his respondent is, in turn, guessing at the motives of the interviewer, responding to the embarrassment of the latter, even to the lack of insight on his part. At times the respondent will give more information because he feels the interviewer "already knows." He responds, then, to the image of himself which he believes the interviewer possesses. This is of real importance when the interviewer must "probe" in order to test or check another answer.

The interviewer must, therefore, become alert to what he is bringing to the interview situation: his appearance, his facial and manual gestures, his intonation, his fears and anxieties, his obtuseness and his cleverness. How do these affect the interviewee? Over some of these characteristics, he may have some control. Others, however, are so much a part of his personality that he can discipline them only slightly. The result will be that every interviewer will meet with some interviewees with whom no rapport will develop, and no adequate interview situation can exist. How ever, being alert to these characteristics allows him at least to change those elements which are under his control, even if only in the restricted context of the interview situation.

A concrete example lies in one of the most common questions asked by the beginning interviewer: How should he dress? If he is to interview lower class people, for example, should he attempt to dress shabbily? Will he get better answers if he dresses in overalls, or even in poorly cut suits? Further, should he indicate, by using lower class "grammar," that he is a member of that class?

The answers to this series of questions are not entirely certain, but some general rules are apparent. The basic rule derives from the *social role* of the interviewer. Whatever else he may be, he is a researcher in this particular situation, and most of his decisions follow from that role definition. There are research situations in which other considerations enter, but in general this status is a middle-class one. The interviewer will find that "overdressing" is as incongruous with this status as is wearing overalls. Indeed, the latter costume may arouse some disbelief that the interviewer is really a representative of an established research organization. The external characteristics of his functional role include such items as adequate grammar, alertness, confidence and seriousness, and clothing whose aim is neither to attract the opposite sex nor to arouse pity. This is not advice to "steer a middle course." Rather, the interviewer's actions, gestures, speech, and dress should divert attention from himself; in this situation, it is the respondent who is important. Just as extreme dress will arouse attention, so will exaggerated mannerisms or overprecise speech.

These externals are not, be it noted, matters of individual personality and taste, but are the indexes by which the respondent himself will make preliminary judgments. Consequently, they may determine whether the interview will be obtained at all. The social researcher is rapidly becoming a definite status in the society, which means concretely that the student who would pass muster must "act the part." His range of choice in these matters is limited by the public's image of his activities. And, of course, since the interviewer is almost always a representative of some organization, he is limited further by its position in the area. His contribution to the total project will be a negative one it he obtains the interview but manages to arouse antagonism or suspicion toward the organization itself.

This is not to say that for all research situations an apparently middle-class role or behavior will be adequate. Several studies have indicated that a greater range and intensity of attitude are more likely to be expressed when the interviewer is closer to the class and ethnic position of the respondent. This is most especially true, of course, when the opinions to be expressed are somewhat opposed to general public opinion. Thus, to take an extreme case, white interviewers would have a more difficult time in obtaining a true set of attitudes from Negro respondents in Mobile than would Negro interviewers. Similarly, in a town torn by union strife, a very obviously white-collar interviewer might meet with considerable suspicion and might find that many respondents express a suspiciously high proportion of promanagement attitudes.

These facts follow, of course, from the general notion that the respondent, too, has insight and will judge the interviewer by his external characteristics, both gross and subtle. The situation, however, is one to be taken account of in the research design itself, so that the most adequate interviewers are chosen for the particular job. A highly trained interviewer con break through most of these barriers. A poorly trained one will not be adequate even if his class position is superficially in conformity with the group being interviewed.

Furthermore, even the average interviewer can learn to become alert to suspicion or reservations on the part of the respondent and to deal with them in an adequate manner.

A common response to a request for an interview is a housewife's, "Oh, I'm much too busy right now. Come back some other time." The interviewer must be able to decide whether the respondent is really too busy or is merely using this claim as a way of avoiding the interview. In some cases, the puzzled or suspicious look on the face of the housewife will tell the interviewer that he should take a few minutes to explain what he is doing and why he is doing it. Even a few casual remarks about the neighborhood, the weather, or his understanding of the housework itself may break through these barriers. In some cases, he may ask a few questions about how to go to his next respondent's house, so as to make known to his interviewee that he is engaged in a quite ordinary activity. It is not sufficient merely to ask the respondent if she will set a time for an early appointment. She may be willing to do that, also, in order to avoid the present situation, but there is no guarantee that she will appear. The interviewer, then, must learn to "read" this situation carefully before accepting her claim. She may be obviously leaving the house or may be dressed for housework and annoyed at the interruption. On the other hand, she may really be asking for further reassurance.

Often, when the interviewer has a list of specific respondents whom he must interview personally, his first contact is not with the interviewee but with a member of the family or a friend. In these cases, he must remember that these people must be understood as well, if he is to persuade the respondent to give the interview. A husband or fiance may be suspicious and refuse permission. A friend of the family may decide that the interviewer is a salesman or a bill collector, and he may give false information or prejudice the respondent so that the latter will not permit the interview. This situation may be very delicate, and particularly so if the subject of the interview is to be explained in detail only to the respondent. The problem must be met before the interviewer goes into the field, so that an adequate answer can be given. However, each situation must be understood as it occurs, so that active cooperation can be obtained from those who may bar the way to the respondent. For example, in one research situation, it was learned that in many lower class areas the statement "I am looking for Mr. Jones" frequently aroused suspicion. Alert to expressions of suspicion such as "What for?" or "Who are you?" or "I don't know the man"-the latter statement made after some hesitation or a long "sizing up" of the interviewer-the decision was made to avoid the question altogether. Instead, the interviewers began their first contact with an expression of smiling, near assurance, "Mr. Jones?" This led more often to a truthful denial of the identity and an offer of information concerning the whereabouts of Mr. Jones. Without this alertness on the part of the interviewer, however, a number of respondents would have been lost because of noncooperation on the part of those who knew the respondents and who had it in their power to misinform the interviewer or refuse access to the ultimate respondent.

ELICITING RESPONSE: A RAPPORT

Establishing rapport may seem as elusive an element in interviewing as insight. "Rapport" is indeed a loose term as now used, but its general meaning is clear enough. A state of rapport exists between interviewer and respondent when the latter has accepted the research goals of the interviewer, and actively seeks to help him in obtaining the necessary information. Although the best way to achieve this result may usually be a warm and sympathetic approach, mere friendliness between respondent and interviewer is not sufficient in all cases. If the term "rapport" is to be used exclusively to refer to a state of friendliness between the two, then it must be concluded that rapport is not enough. The goal is to obtain the facts, to the extent that the respondent is capable of presenting them, and in many situations the friendliness must be broken, or suspended, in order to obtain these facts. Although this point will be discussed further in dealing with probe questions, its meaning in the preliminary contact between interviewer and respondent should now be explained.

To begin with, it must be kept clearly in mind that even the inexperienced interviewer will usually meet with an adequate reception. Most students doubt this and approach their first interviews with considerable hesitation and anxiety. Yet it must be remembered that the interviewer is offering a conversation whose focus is the most interaction subject in the world to the respondent: the feelings, attitudes, ideas, and life of the respondent himself. Few can resist this temptation. It has been said that imitation is the sincerest form of flattery, but the most welcome form of flattery is a keen and sympathetic interest in the problems of the person himself. It is still true that Dale Carnegie's *How to Win friends and Influence People* has much to teach the sociology student who fears that most of his respondents will slam the door in his face. Many people know that the most efficient "line" is simply a good listening ear.

The interviewer must, then, approach the interview with some confidence. Whatever his nervous feelings, he must know that in most cases the respondent will be willing to talk because of the guarantee of a good listener. Confidence, naturally, does not mean brashness. The breezy, cocksure approach is likely to arouse antagonism and refusals more often than even a timid, shy, and awkward approach. The confidence, however, is derived from a calm assurance on the part of the interviewer that the interviewee will find the activity pleasurable. Only experience will teach him the truth of this statement.

The interview is not simply a conversation. It is, a pseudo conversation. In order to be successful, it must have all the warmth and personality exchange of a conversation, with the clarity and guidelines of scientific searching. Consequently, the interviewer cannot merely lose himself in being friendly. He must introduce himself as though beginning a conversation, but from the beginning the additional element of respect, of professional competence, should be maintained. Even the beginning student must make this attempt, else he will find himself merely "maintaining rapport," while failing to penetrate the cliches or contradictions of the respondent. Further, he will find that his own confidence is lessened, if his only goal is to maintain friendliness. He is a professional researcher in this situation, and be must demand and obtain respect for the task he is trying to perform.

The warmth and friendliness-what is usually called "rapport"-can usually be obtained fairly simply. The interviewer greets his respondent with a smile and a simple "Hello" or "How do you do?" It is increasingly the case in modern social research that he is looking for a particular person, rather than any respondent he happens to encounter. Therefore, His next query must establish the identity of his auditor: "Mrs. Jones" Since the first person to come to the door is not always the desired respondent, there must be a definite procedure for obtaining further information, or location the respondent. Having learned that the person is the desired respondent, the interviewer will identify himself: "I am Mr. Smith, an interviewer for the Central City Survey. We are making a scientific study of the way people feel about their city, and I'd like to ask you a few questions."

Some respondents will feel ill at ease, at first, because they are afraid that they will have to answer difficult questions. They do not wish to be embarrassed by being unable to answer queries about international relations, impending legislation, and so on. Usually, however, this type of anxiety can be easily allayed by reassuring the person that "This is just a survey, you know. There aren't any right or wrong answers, and this isn't a quiz. We're simply trying to find out how people feel." Or: "There aren't any questions which you can't answer, because they are all about how you feel, the things which have happened to you and to your neighborhood." Such assurances are not always necessary, but they may be very effective when the respondent is hesitant from such a cause.

Some type of conversational statement is often useful in establishing friendly relations with the respondent. A simple statement which conveys the idea that the interviewer is not a superior person, but a professional doing his job, may help to start the interview on a warm basis. A confession that the interviewer took a wrong bus, or that he failed to plan properly for the weather, may be enough. Anxiety on the part of the respondent may be ignored, and the interviewer himself may confess some anxiety: "You know, as much interviewing as I've done, I'm always a little nervous when I Begin." When the subject matter is taboo, the interviewer will of course give assurances that the answers will be kept confidential. In addition, however, it may be necessary to make certain the respondent knows that the interviewer himself is not going to be embarrassed by anything which may be said.

Most interviewers find that few respondents require any further identification. However, each interviewer must carry some official card or letter which will satisfy the suspicious interviewee that his mission is a scientific one. Most respondents will invite the interviewer into their homes at this point. Others will wait until further assurances are offered. And, of course, for some studies the interview may be satisfactorily carried out at the door.

A number of fairly standard situations may arise, before the interview is finally granted. The research director, or the student carrying out a term project, must plan for these situations in advance, so that his answers of will inspire confidence and ultimately lead to an adequate interview. Most of these can be understood as rapport situations, and they can be most easily seen in concrete terms, as objections offered by the desired respondent. Let us look at some of them:

SITUATION I

Respondent : Well, I don't know about that. How did you get my name, anyway?

Interviewer: Your name was selected at random, from a list of all the citizens in this city. We wanted to get people from all walks of life, and by chance your name was one of those selected.

Here, the interviewer must be certain whether the answer is satisfactory. If not, he may add a few further comments:

Interviewer: As a matter of fact, the statistical expert who chose your name did not know anything about you personally. He used a mechanical system for selecting names from the entire list, just the way some radio programs pick out names for long-distance quiz questions.

SITUATION II

Respondent : Well, I think I'm too busy now. Why can't you talk to my neighbor, Mrs. Dhiman? She likes to talk to people.

Interviewer: I know that I am taking some of your time, Mrs. Sinha, but we're trying to get the opinions of all kinds of people, and if we just got the people who like to talk, and left out all the people who are doing things, who *are* a little busy, thin we wouldn't have a very good sample, would we? We'd have just one kind of person, and we'd mis the rest. So, you see, we need your own opinions. They're very important for the study.

SITUATION III

Respondent : I'm sorry, but I never give my opinions to people. They're my own business.

Interviewer: I think you're very wise, to follow that general rule. Why, do you know that some people come to the door, acting like interviewers, then try to sell magazine subscriptions, or books, or kitchen utensils?

Respondent : (*Grimly interjecting*) I'd like to see son of them try to sell me any books!

Interviewer: It's just because some people want to know more about things before they give their opinions, that all of us on the Central City Survey carry a card to identify us. (*Hands over the card*) That way, You can be sure that this is a *scientific* study, and not just some busybody who wants to find out about your affairs. You see, in a *scientific* study, we don't *even put your name* on our interview records. Furthermore, when the interview goes to the office, only the statistical experts see what you said-and they are interested *only* in the final results, not in the individual comments. It's just like the census interviews, and no outsider can learn what your opinions were.

SITUATION IV

Respondent : Well, I suppose so. Won't you come in? We're having a little gabfest, but you go ahead and ask your questions. I'm sure my friends won't mind, and they can help me out, if there's some question I can't answer.

Interviewer: (*After coming inside*) Do you mind if we go in the next room, instead? That way, your friends won't be interrupted, and I can get your own opinions. You see, it's *your* opinions I want, not theirs-and, besides, we're simply trying to find out how you feel about things; we're not trying to test you.

SITUATION V

Respondent : I'm not so sure I want to be interviewed. What kinds of questions have you got there? (*Tries to look at the schedule*)

Interviewer: (*Without trying to hide the questions*) Well, they're really very simple. Suppose I sit down and we'll try a few. Then you can see what kinds of questions they are.

SITUATION VI

Respondent : I think all that stuff is silly. What good does it do, anyway? Why you people couldn't even predict the 1996 election.

Here the interviewer must decide which of the objections is the real one, and answer that primarily.

Interviewer: With all the new things that are happening to Central City, many people believe that a lot of mistakes could be avoided if we find out what people really think these days. May be we can learn how to handle the everyday problems of the city better. You know, a lot of people are too busy to take part in community affairs. But by giving their opinions to a scientific survey like this, they help just the same, and they can have the satisfaction of knowing that someone will actually listing to what they have to say.

Such situations are frequently met, but of course they represent only a sample of the varied circumstances which the interviewer must face. It can be seen, nevertheless, that he is attempting to establish three elements in the interview situation: (1) his own friendliness and interest; (2) the worth of the research itself; and (3) his own competence. Thus, he will sympathize with the personal problems of the respondent, and will adjust to them in every possible way- except in ways which would weaken the interview. the respondent will be less willing to tell the truth if it is embarrassing, when he feels that the interviewer will not see the deception or that the research is of little importance, anyway.

These elements must be continued throughout the interview. Some interviewers are able to maintain a friendly interest but lose the main thread of the interview, since they are willing to listen to anything. Others do not listen carefully and merely go through the motions of sympathetic listening. The consequence may be that the respondent does not attempt to be precise or grows impatient when he has to repeat an earlier statement. Consequently, a number of transitional phrases are often used which let the respondent understand that the material is worth while and is being understood:

"That's a very interesting point. Would you mind repeating it, so that I can write it down exactly as you've stated it?"

"Now, let me be sure I've understood you. You are saying...."

"You were speaking a moment ago about the Camp Fire Girls organization. Would you mind answering a few questions about that?"

CARRYING THE INTERVIEW FORWARD

The process of continuing the interview will vary, depending on the type of interview. Social research has utilized a great number of interviews, which may be classified in numerous ways. Perhaps the simples variable for classifying interviews is that of *depth,* that is, how deeply the interview attempts to probe. This, in turn, depends of course upon the actual purpose of the research. For some research which attempts to investigate fairly subtle sociopsychological processes, the interview is almost psychiatric or psychoanalytic in character.

It will usually be "nondirective" in form, and the interviewer will follow those items which appear so often in the respondent's comments that they seem of great emotional significance. Thus, in the interviewing phase of the Hawthorne research, the interviewers attempted to refrain from any guiding comments or questions at all. Instead, they simply listened, with a judicious "Hmmm," or an interested "Go on," or a similar comment-at times, no more than a gesture of sympathy. In this way, the workers would return again and again to matters which were close to their personal lives. Even when the researchers attempted to ask specific work-unit questions, they found that the workers would bring up apparently extraneous items, indicating that these were of more personal importance to them than the original questions about the factory it self.

Although the Hawthorne interviews were fairly long, lasting several hours over a period of several interviews, such interview situations may continue for much longer, if the research demands such a depth and range of inquiry into the respondent's life. Indeed, if the research is a cross-discipline study dealing with certain aspects of psychotherapy, a series of interviews may extend over a period of months.

In any event, the types of interviews to be used in social research may vary from extremely lengthy and intensive interviews, which probe into the most intimate aspects of the respondent's life, to the voting poll which merely obtains information about social class, sex, and political-party affiliation, along with voting preference. Clearly, then, "carrying the interview forward" must have a very different meaning for such varying types of interviews.

However, all but the briefest of polling interviews do attempt to utilize some questions for which the answers are not easily classified in advance and which must remain "unstructured" or " open-ended." Such questions, as analyzed in the chapter on the questionnaire, give a depth and meaning to the more structured questions. Furthermore, even the most highly structured set of questions is likely to be unsatisfactory to both respondent and researcher if it is not carried forward with some skill.

The process of carrying the interview forward is greatly aided by writing the questions in a fashion which most closely approximates a conversation, while probing those items for which the research is being conducted. It is often useful to insert appropriate transitional phrases as well as introductory comments in the schedule form itself. This is especially the case if the questions are otherwise short and staccato. However, the burden of the interview must ultimately be borne by the interviewer himself. Recognition of this fact has meant that even with the increasing skill in question making, the social research worker in this decade is steadily increasing his use of the skilled interviewer, as against the interviewing crew picked up for a particular study.

Clearly, many of the earlier comments concerning rapport are also appropriate for the task of carrying the interview forward. Some of these may be elaborated further in this immediate context.

Because both respondent and interviewer have been reared through social relationships, in which verbal exchange is almost solely in the form of "conversations," neither can easily adjust to a situation in which they give and take is of an examination character. The respondent is likely to feel that he is being grilled, and the interviewer will feel that the verbal exchange is wooden and mechanical. The student can test this statement very easily by taking his first draft of a questionnaire to a close friend for a test interview. If, in his test interview, he reads the questions quickly, does not pause between questions, cuts off the answers as soon as the needed information is given, attempts to make no transitions between different subject-matter areas of the questions, and ends the interview without further comment when the last question has been answered, he will find that the entire exchange seems forced, unreal, and emotionally unsatisfactory to both.

There are good reasons for placing a strong emphasis on "emotional satisfaction" in a research interview. To begin with, the respondent for one research study does not cease to exist, but tells others about his experience. Social research in a broad sense depends upon the good impression which the interviewer makes on his respondents. This is obviously true when a study is being conducted in a small community, in which new of the interviews will be carried from neighbor to neighbor in a short while. however, the same processes are to be found in any large city. They exist in specific ways, so that one respondent may actually speak of the study to a friend who may later become a respondent in the same study. In more general ways, however, these processes are also important so that for a later study the good impression made by the interviewer will aid the next researcher.

A further dimension ought to be mentioned. The interview which developed in an easy, natural fashion, approximation a conversation in its effect on both participants, stimulates the interviewer himself to a better effort. He loses his initial anxiety quickly, and finds time to as questions which make definite the sometimes vague answers which the respondent may give. He feels more confident and thus-because of the respondent's own insight-makes the respondent feel his competence.

One of the immediate results of attempting to make the interview approximate a conversation is that the silences which occur need no longer be filled quickly by a hurried question, and the respondent does not feel that he has to have a prepared answer. The answer to the silence may sometimes be merely an interested look, or a sympathetic half-smile, a pursing of the lips to indicate that the comment is being digested. The silence will not be embarrassing, for it can be taken as a matter ofcourse. The interviewer may extend it somewhat by lighting a cigarette, or showing his questionnaire pad. He may invite the respondent to "think cloud" for a while. Or he may simply wait in a relaxed fashion, as though he is certain that the respondent has a further comment to make. In this manner, what could have been embarrassing becomes an integral part of the give and take of the interview.

In spite of this insistence on the conversational character of the interview, it must not be forgotten that the interview is not merely a conversation. The interviewer's goal is to obtain *information* from the respondent, and he must concentrate upon the respondent.

His most efficient method is to treat the latter as a person, giving him a sympathetic hearing. The corollary of this is that the interviewer's attitudes and opinions are not relevant and must not be allowed to intrude into the situation. Again, although it is important for the interviewer to gain the respect of the interviewee, he must not do this by attempting to be "clever," or by arguing with the respondent. Compare, for example, the following tow treatments:

INTERVIEW I

Interviewer: Would you say that in general you have got along fairly well with your South Indian neighbours?

Respondent : Oh, yes! Just fine. They don't bother me, and I don't bother them.

Why, I don't suppose we see each other from one week to the next.

Interviewer: I believe you're just kidding yourself. Can't see that avoiding your neighbours is the same kind of discrimination that is to be found in the South? I don't see any difference at all.

INTERVIEW II

Interviewer: Would you say that in general you have got along fairly well with your South Indian neighbours?

Respondent : Oh, yes! Just fine. They don't bother me, and I don't bother them.

Why, I don't suppose we see each other from one week to the next.

Interviewer: I suppose that once in a while you do meet them face to face on the street. What do you usually do at such times?

The interviewer's attempt, in treatment I, to "educate" his respondent is likely to antagonize the respondent. The result would probably be that the respondent, knowing how the interviewer feels, would change his answers accordingly. In some cases, he simply might not care to cooperate further or might give only polite answers.

In treatment II, however, the interviewer is specifying further just what the respondent means by his preceding statement. The interviewer in the first case has pointed out the underlying meaning of the "fairness" of the respondent but has forgotten that the purpose of the interview is to gain information, not to intrude his own opinions.

Similarly, the temptation to be "clever" is very strong in some interviews. Consider the following, for example:

Respondent : No, I'm pretty sure I wasn't. Oh, no, now I remember. I had a bad cold that day, and stayed at home. I was pretty lonesome, and kept the radio on all day long, just listening to Film Music.

Interviewer : Then you first heard about it over the radio?

Respondent : Yes, that's right. Now, it's all clear to me. When the news announcer first began talking, I thought it was some kind of adventure program, you know, like "amazing Stories," or "Jai Shanker." Then I began to realize that he was really telling the news. When I did, then I got real scared, and....

In this case, the interviewer adopted an obvious but useful technique in answer to the "don't know" response. He began to reconstruct the early situation by having the respondent recall some of the fairly stable facts which most of us remember fairly easily: where she lived at the time, what kind of job she had, and so on. These set the stage for stimulating her memory to a fairly clear picture of the day on which she heard about the blast. In the case of such an event as the atomic bomb, most people can remember the situation, if reminded of the larger facts which were part of that experience. Naturally, even with such aids, many experiences cannot be recalled. However, it will be noticed that the interviewer did not help the respondent by suggesting what her thoughts might have been. It would have been poor probing if he had asked, "Were you frightened when you first heard of the bomb?" or "What significant ideas went through your mind at that time?" or "Were you proud of the American science which produced the bomb?" No suggestions were given to her about either her ideas or her feelings. Furthermore, the probing questions were not attempts to "force" her to remember.

This technique, of indirectly leading the respondent back to a previous experience, has been utilized not only in research into reactions to crisis, but even in such prosaic matters as the respondent's annual consumption of soap, or the respondent's reaction to a soap opera. The following is a somewhat different case in which the respondent, a civil service worker, seemed afraid to give the answer:

Interviewer: Do you, in general, feel that your boss is fair in giving promotions?

Respondent : Why, I don't know. No, I guess I couldn't give an answer to that.

What does the respondent mean? The interviewer must answer this question before he can proceed. Here are some possible meanings:

1. I am afraid you will tell someone how I feel, and I'll get in trouble.
2. You're asking me to make a judgment about personnel policy in my company, and I don't know all the facts.
3. I've never thought about the matter very much, and I don't know what to say.

In this case, the interviewer could not at first decide between (1) and (2) but felt that his opening explanation and the later development of the interview had made the respondent feel relaxed. Consequently, he decided upon (2).

Interviewer : Of course, you may not know all the facts about your company. You see, we're just trying to find out how you *feel*, your *attitude* about these matters: Do you, in general, feel that your boss is fair in giving promotions?

Respondent : Well, like I said, I don't really know. But I guess I don't much believe some of us get a fair break. There's lots of people in our department, so I'm not sure. But it's always seemed to me that the boss plays favorites a lot.

In this case, the respondent wanted to be correct if he made an intellectual judgment, but his own attitudes were not so impartial. Later questions indicated that he had observed a number of incidents which made him feel that his boss did not promote fairly. He really did "know" the answer to the question, which was a query about his attitude. However, he was unwilling to give an answer as long as he believed that the question concerned the detailed facts of promotion in his department. Assuring him that there were no correct or incorrect answers led to a series of fruitful answers concerning his personal experiences.

In the following case, however, the respondent simply did not understand the question:

Interviewer: Are you in favour of the right of the CBI to tap telephone wires?

Respondent : I don't know. Guess I never thought much about it. Couldn't say at all.

Interviewer : I'd like to get your answer to this question-You know, it's possible to fix a telephone line so that a person can listen to anything that's said over that line. Do you feel that the CBI ought to have the right to do that, so that one of their men can listen in that way?

Respondent : Oh, sure. I think the CBI is a fine organization, and if they think they can catch a crook by listening in, I'm all for it.

Even when difficult words are avoided in the schedule, there will be some respondents who will not immediately understand the question. Sometimes it is necessary only to ask the question over again, in exactly the same fashion. In other cases, when it is clear that this will not or does not help, the interviewer may have to rephrase the question so that it is clear. In the above case, the "don't know" answer was simply a way of avoiding the confession that the question was not understood. Of course, in some studies, the interviewer will be given definite instructions to ask each question without any rephrasing at all. Naturally, then, these instructions will have to be followed, and the answer may have to be recorded as "don't know," if the respondent persists in his inability to answer.

It is clear that the function of a probe question is to get beneath the "easy answer." Sometimes this may take the form of a further "Why?" question, or a phrase such as "That's very interesting. Would you tel me more about that?" As noted above, at times the respondent is not answering the real question or is avoiding it in some fashion, and the interviewer must recognize these answers in order to go beyond them.

A further type of probe, beyond those mentioned, may be called the "antagonistic probe." In general, the good interviewer will not violate the rapport which he has developed, but will attempt to maintain good relations with his respondent. This is usually an excellent interview tool. However, such good relations are not an end in themselves, and if the situation demands antagonism, it must be used. This type of probe may range in emotional tone from a polite reminder of an inconsistency, to the forceful preachment which Kinsey reports he has given to respondents whom he found lying to him.

What must be kept in mind, however, is not that this tool exists, but that it must be used *only deliberately*. It must not be a slip of the tongue, or an accident. It should not be used because the interviewer is annoyed at the respondent, and it should be carried out only with a full understanding of the risk involved. It is usually a last measure to be used only when other techniques fail. In the following case, the interviewer was forced into such a probe in order to be certain of the answer.

Interviewer: Were there any times when you felt you did not play fair with your husband?

Respondent : Never. I always played square with him. I never ran around on him until after the divorce.

Interviewer : Pardon me, But I'd like to be certain I have this correct. You say that you did not date until after the divorce?

Respondent : That's right. I was a good wife, and I thought that would be immoral.

Interviewer : Then I must have written down something earlier that was not correct. Didn't you mention earlier that your main activity, when you were separated, was dating?

Respondent : (Excitedly) Well, I never considered that real running around. Sunny was like one of the family, a good friend of ours even while we were married. (*In tears*) Anyway, after what he was doing to me, I figured I had the right to do anything I wanted.

Interviewer: Just what was he doing?

Respondent : Well, I said a while ago that we got divorced because we just didn't get along, but that's not right. The truth was, he started to run around with my kid cousin, who was only seventeen at the time, and got her in trouble. Oh, it was a big scandal in the family, and I felt horrible about it....

Here, if the interviewer had simply accepted her statement about feeling that she had treated her husband fairly, he not only would have lost some additional facts but would have missed the point of the divorce crisis in the family. Demanding that the inconsistent facts be faced led to a better understanding of the emotional experiences through which this divorcee had passed. Nor was it necessary to accuse the respondent of hiding facts, although in a few cases such an accusation can be fruitful.

RECORDING OF THE INTERVIEW

It is the most obvious common sense to state that the interview must be recorded adequately. Yet a careful check of first interviews by beginning students shows that this most obvious rule is not always followed. Considerable experience and repeated corrections are required before the interview is recorded properly. Even for the highly structured questionnaire, in which the interviewer has only to check "yes," "no," or "don't know," or one of a series of answers concerning degree of approval, the beginner will often leave out questions or fail to mark down the answers. In the interesting task of asking questions and trying to understand answers, the interviewer is likely to believe that the answers have been recorded. It is therefore useful to have another person check the interviews even in a relatively small research project so that all the questions are answered for each respondent. For a larger project, of course, checking interviews for completion is a standardized phase in the work flow.

However, just as the interviewer can obtain only a small part of the respondent's total experience, so the interview record presents only a small part of the interviewer's experience in the interview. Increasingly, social research is group research, and increasingly the interviewer is not the person who analyzes the tabulated data. The work of recording the interview, then, becomes still more important. What is quite obvious to the interviewer, observant to the details of his interaction with the respondent, cannot be known to the analyst unless the information is included in the interview protocol. The interviewer may feel, for example, that the respondent is simply hiding the truth, or lying for some reason, but the "yes" and "no" answers do not indicate this important dimension. Failure to include this judgment is a major failure in recording. Again, the respondent may claim that his income is very high, that he prefers certain luxury brands of merchandise, and that he is "getting along very well" in his career-but may live in obvious poverty. If the interviewer fails to record this qualifying fact, his interview protocol will contain a serious error. A similar case occurs when the respondent gives a series of consistent answers but, on taking leave of the interviewer, informs the latter that all the answers are incorrect because of a fear that a neighbor is listening through the wall. It seems elementary that this information must be included in the interview record, but in the bustle and hurry which often characterize a project in the field interviewing stage, such facts may be forgotten or overlooked.

Even in a polling type of interview, consisting of a few carefully chosen questions, to be asked exactly as printed, with no blanks for additional information, the interviewer can sometimes help by including bits of information which help to interpret the answer. However, when the interview is of an intensive, qualitative type, with many unstructured probe questions, the problem of recording becomes crucial. So far as possible, the *exact* words of the respondent should be recorded. They should not be edited for grammar or meaning.

Since most interviewers will not have a command of shorthand, it is necessary to develop skill in writing fast and legibly, with some attention to symbols for common short phrases such as "of the," "also," or words common in the particular research study. However, even the best writer will fail to copy all that is said at conversational speed. It will often be useful, at such times, to interrupt by some such comment as "That sounds like a very important point. Would you mind repeating it, so that I can get your words exactly as you say them?" The respondent is usually flattered by this attention, and rapport is not disturbed.

As an additional aid to complete reporting, the interviewer may make it a practice to go directly from the interview to a typewriter or desk, in order to write out the details while the materials are still fresh in his mind. Even under such circumstances, memories can be treacherous, and delay of any proportions may quickly distort or blur the details. The comments which seemed so clear during the interview begin to lose their distinctness, and the "whys and wherefores" offered by the respondent lose their reasonable quality. The comments which are scribbled in haste during an intensive, probing interview will never convey all the richness of material given by the respondent. On the other hand, an alert student without an extraordinary memory can reproduce some 20 to 40 doublespaced typewritten pages of materials from an interview lasting 1½ hours - *if* he goes immediately from the interview to the typewriter with his notes while the experience is still vivid.

CLOSING OF THE INTERVIEW

The modes of saying "good-by" are many and have many different effects upon the respondent. The question is somewhat complicated by the differing reactions of respondents to the interview itself. In the intensive interview, a common experience for interviewers is to find that the closing is more difficult than the opening. The respondent has found an interested, warm audience and is unwilling to let the interviewer leave. If the interview has touched on fairly deep and troubled matters, the respondent may feel very grateful and exclaim, "This was the first time in months I've had a chance to talk about it." An invitation to stay for dinner, a drink, or coffee and cookies is very common in these circumstances. The interviewer may actually be caught, therefore, by the very web of friendliness he has spun. He has transformed the situation into a conversation between two friends and feels that he would be violating the illusion if he brusquely snatches his papers and mumbles, "Well, I'd better get going."

For the usual polling interview, in which the person's name is not known and in which a few brief questions are asked, a simple "Thank you very much for your trouble," with a friendly smile, will probably be an adequate good-by. However, for the qualitative interview, of longer duration and greater intensity, the interviewer will have to select his occasion for departure more carefully. Since he has presumably obtained the necessary information, there is no particular reason why he may not remain longer, except the obvious one of efficiency. He has spent from 45 minutes to several hours in the questioning process, and he probably has other respondents whom he must see. On the other hand, he should not antagonize the respondent. The good relations which each interviewer develops will, directly and indirectly, help both his own later research and that of others. Besides, he will himself feel embarrassed by social awkwardness at this stage.

Consequently, although his departure should not be abrupt, it can at least be deliberate, open, and continuous. Assembling his papers for a final check, asking a further question to be certain of a previous answer, putting the papers in folder or clipboard, even while continuing the conversation, allows the situation to be defined as one of leave-taking. This restructuring of the situation sets the stage for a final handshake, a thank-you, and a good-by. In some cases, the interviewer may have to reverse the time-honored trick of hosts by asking about some object near the door, such as a lamp, an ornament, or a potted plant. Again, this sets the stage for a good-by. Always, however, the adieu should be accompanied by an expression of thanks in recognition of the respondent's generosity in time and attention.

THE INTERVIEW

Interviewer: I know it's very hard to remember why you decided to do something a long time ago, but would you try to think back to the time when you first began to think of being a lawyer? How did you happen to change from business administration to law while you were in college?

Respondent : Why, the same reasons then as now. The fact was that I saw in the law an opportunity for service. The lawyer can help his fellwo men. All the poor people who come to him need his help, and he has the power to aid them. I've always been one who likes to help his fellow men.

Interviewer: How did you come to believe you could do this better by being a lawyer than being a businessman?

Respondent : Well, all the businessmen I knew were interested only in making money. I was a poor kid in college, and had to work my way through, and I had lots of dealings with businessmen-restaurant owners, hotel men, landlords, clothing store owners, and construction men. They were all hard, grasping men, and I had a hard time of it. I didn't want to be like them.

Interviewer: Did you know any lawyers at the time, who might have played a part in your decision?

Respondent : Oh, yes. I met Mr. Sharma at that time, once when I had gone to the house of a businessman whose store I swept out in the mornings. I went to see him about some money he owed me. He invited me into his house just to tell me he couldn't pay me until Saturday, and I needed the money right then. I guess I was pretty hungry. Why, I can remember his living room still-it was dirty, and it smelled, and the place was ugly. I was sure he was trying to gyp me. Anyway, I had to hitchhike back to where I lived, near the University, and this lawyer, Mr. Sharma, picked me up. I was so mad at Mr. Jones that I couldn't help telling this lawyer about it. Why, right away, he showed how a lawyer can help other people. He agreed to call the man up the following morning, and threaten him with a suit if he didn't pay up. And he did, too. Mr. Sharma was a real gentleman. He invited me to his house for supper, and I was hungry enough to accept. It was a pretty big place, set back from the road, in the middle of a big lawn. Right in the foyer was a great crystal chandelier, and the place was beautiful inside. He was living the way a man ought to live, with servants and fine food. I guess you might say that Mr. Sharma was very important in my decision to study the law.

Interviewer: Then you would say that the personal example of this Mr. Sharma, in helping people in trouble, made you decide to help others too?

Here, the interviewer has not ventured his own opinions. He has listened carefully, and asked the questions in his interview guide. He wishes to avoid a conflict which might antagonize his respondent. Yet his report will be of little value if he does not face the obvious contradiction presented by the lawyer's story. His last question allows the lawyer an easy rationalization, but when the lawyer agrees with these words the interviewer has little opportunity to probe the contradiction. On the other hand, he must understand that the lawyer himself may not be able to face the contradiction.

The rule must again be that his duty is to obtain the facts. He must at least probe once more to see whether the lawyer himself understands his complex motivations. Consequently, the last question must not be asked. Instead, some other formulation must be substituted. One of the following might well be used, depending on the rapport which the interviewer has gained, how far along the interview has progressed, and the interviewer's judgment as to the relative risks involved:

"That must have been a very interesting evening. Could you tell me more about it?"

"Mr. Sharma seems to have ben a very successful lawyer, besides helping por people. Now, I know it's difficult to be sure, but do you think that his way of living-having fine food, a large income, servants, and so on-might have influenced you as much as his being willing to help others?"

"About that time in your life, were you ever invited to the homes of any *businessmen* who made as much money as Mr. Sharma?"

The interviewer must use his ingenuity at such a point, to avoid losing the interview on the one hand, and to gain the crucial information on the other. He must probe more deeply, to avoid the cliches which are used to cover motivations. It is of great importance, in the interview, to unravel sympathetically and intelligently the complex web of paradox which fords much of everyone's life.

Another problem in carrying the interview forward occurs when the question to be asked seems to have been answered previously, as a side comment on an earlier question. The inexperienced interviewer is likely to pass over such a question on these grounds. Yet there is considerable field experience to indicate that the direct question may elicit a slightly different answer, or an entirely different answer, than the earlier comment seemed to suggest. For example, this answer was given to a question about the respondent's parents:

Respondent : My family had farm in the country, and I lived with them until I was grown. They live in Dehradun, and I haven't seen them in a long time.

A later question centered on the respondent's dating activities following the divorce, and her success in adjusting to the possibility of a new marriage. The interviewer was tempted two ignore the question as to whether the parents of the respondent had helped her to meet eligible men. It was quite clear that they were far away and entirely outside the urban circles in which she moved. Nevertheless, the interview phrased the question in this fashion:

Interviewer: I believe you may have answered this question before, when you mentioned that your parents live in Dehradun, but I'd like to ask the question just the same-Did your parents help you to meet eligible men after the divorce?

Respondent : Oh, yes. As a matter of fact. I met my present fiance through them. They wrote me a letter about a fellow from our home town who was a Chemist here, and they told him about me, and he called me very soon afterwards. And I made a trip home right after the divorce-they saw to it that I met a lot of young men then.

Even under the best of circumstances, the interviewer can bring out only a very thin thread of tact concerning the life of his respondent. What is most obvious to the interviewer, from some casual comment of the respondent, may become entirely opposite in meaning, when a direct question elicits still more facts. The interviewer must not attempt such judgments about answers, but should present each one in turn, for the additional facts may throw great light on, or change basically, the earlier comments and answers. The use of a fairly simple phrase may avoid the awkwardness of asking what seems to have been answered and will often help greatly in understanding the respondent.

THE PROBE QUESTIONS

Even in a schedule in which most questions demand simple "yes" or "no" answers, there will usually be a number of questions directed toward deeper and more difficult issues of motivation, attitude, and personal history. Furthermore, in the earlier stages of any research, when the questions are being tested, the interviews should not be highly structured in any event, since the range of possibilities will be narrowed too soon. In addition, the interview guide leaves considerable scope to the judgment and skill of the interviewer. In ass these situations, then, there will be some questions whose answers will not fall into simple categories. Since these questions may be the most significant ones in the schedule, they must be presented with great care. The interviewer cannot be satisfied with merely writing down the answer. He must be certain (1) that he understands the answer, and (2) that it is actually an answer to the question. Often this will require further questioning, an attempt to "probe" more deeply into the meaning of the response given. Here is a simple case, in which the respondent simply did not answer the question:

Interviewer : Mr. Lakhera, suppose your son decided to become a lawyer. Would you approve such a decision?

Respondent : Funny you asked me that. I just came from my lawyer's office, and I guess they're all just the worst crooks a man could meet. Why, they're worse than card sharks!

Here a probe question is definitely required. The interviewer cannot assume that, because the respondent has a low opinion of lawyers, he would disapprove his son's decision to become one. Furthermore, he is expressing the anger of an immediate situation and may give a more sober opinion after further conversation. In this situation, if the man's emotion seems fairly strong, the interviewer might well smile and wait in interested silence, encouraging the respondent to talk out his annoyance. Then the question should simply be repeated, and in most situations it does not need to be rephrased at all. The interviewer must recognize that in the interview, as in our private conversations generally, people often fail to answer the question. They respond *in terms of the question*, but the answer will at times simply reflect the enthusiasm or annoyance of the moment. The question has been worded out with much effort, and it should not be lost through failure to see that the words written down are not really an answer.

Another type of probe is required when the interviewee is not able to answer the question. When the respondent simply does not have the information, of course a probe will be of no use, except to be certain that the respondent really does not know. When the purpose of the question is simply to measure the extent of knowledge about a subject, the "don't know" answer represent a definite and useful category. Questions about specific provisions in a new immigration law, or labor legislation, or about local legal and medical services available to low-income groups, would all be examples of this.

However, often the respondent gives a "don't know" answer because he is unable to think of the answer immediately, or is afraid to attempt an answer, or has not understood the question. Of course, as is discussed in the section on making a schedule, a large percentage of "don't know" answers to a given question means that the question itself is not properly phrased. In such cases, it is necessary to discover the communication problem and to rephrase the question in the final draft of the schedule so as to elicit a greater proportion of answers. Nevertheless, the interviewer may meet with a "don't know" answer to almost any question and must learn how to meet this obstacle. Below are a few concrete cases illustrating how some interviewers have solved the problem.

Interviewer : How did you feel when you first heard that the atomic bomb had been dropped on Hiroshima?

Respondent : Why, I don't know. That was so long ago.

Interviewer : Perhaps that is a difficult question. Were you living in this house at the time?

Respondent : No, I believe I was living in an apartment on Bleecker Street then.... That was in 1946.... No, it was in 1945, wasn't it?

Interviewer : What kind of a job did you have then?

Respondent : Well, that was before I married, so I had a job as a stenographer, at Mumbai. I think I had just been working a few weeks when it happened.

Interviewer: Were you working when you first heard about the bomb?

INTERVIEW I

Interviewer : You say that you did not begin to date until after the divorce. About how long was it after the divorce before you did begin?

Respondent : Oh, it was a long time, nearly a year. You see, I didn't think anyone would want to have dates with me, after all that mess.

Interviewer : Why, that's very silly. Don't you know that according to a study made by the Life Insurance Company, your chances of remarriage, at your age, are about 94 in 100?

INTERVIEW II

Interviewer : you say that you did not begin to date until after the divorce. About how long was it after the divorced before you did begin?

Respondent : Oh, it was a long time, nearly a year. You see, I didn't think anyone would want to have dates with me, after all that mess.

Interviewer : Would you try to think back to that time, and give me some idea of anything that happened that might have made you feel that way?

In the first case, the interviewer has indeed shown that he "knows something," but he has diverted attention to himself and away from the problem he is trying to investigate. Some respondents may feel rebuked by such a remark. Some will not, of course, and may be interested in the fact. However, even to divert the interview to some of the interesting facts about divorce is to miss the point of the interview. It is not to be an exchange of information, but the obtaining of information.

What is the interviewer to do, however, if the respondent really wants information? Suppose the interviewee does answer the question but then asks for the opinion of the interviewer. Should he give his honest opinion, or an opinion which he things the interviewee wants? In most cases, the rule remains that he is there to obtain information and to focus on the respondent, not himself. Usually, a few simple phrases will shift the emphasis back to the respondent. Some which have been fairly successful are "I guess I haven't thought enough about it to give a good answer right now," "Well, right now, your opinions are more important than mine," and "If you really want to know what I think, I'll be honest and tell you in a moment, after we've finished the interview." Sometimes the diversion can be accomplished by a head-shaking gesture which suggests "That's a hard one!" while continuing with the interview. In short, the interviewer must avoid the temptation to express his own views, even if given the opportunity.

Nevertheless, the interviewer cannot be efficient if he tries to be only a passive listener. Not only will he fail to impress the respondent with the significance of the research, but he will fail to obtain the information which is the purpose of the interview. He must he a critical and intelligent questioner.

10

Different Technologies of Research : The Questionnaire

The observational methods are less effective in giving out information about personal beliefs, feelings, motivations, expectations or future plans. To be sure, they provide no information about a person's past or his private behavior since inherently such behavior is beyond the pale of observation. The questionnaire, the interview and the projective methods are eminently suited to obtaining such information.

There shall be concerned with the questionnaire as an instrument of data-collection. In quite a few books devoted to research methodology, the terms 'Questionnaire' and 'schedule' are treated as synonyms. Technically, however, it is desirable to differentiate between them. A questionnaire consists of a number of questions printed (or typed) in a definite order on a form (or set of forms). The form/s are usually mailed to the respondents who are expected to read and understand the questions and reply to them in writing in the relevant spaces provided for the purposes on the said forms. Ideally, the respondent has to answer the questions on his own, i.e., totally unaided. A schedule also has a reference to proforma containing a set of questions. The researcher/interviewer puts to and records their replies to them. In certain situations, the schedules may be handed over to the respondents and the interviewer may get these filled in his presence, offering necessary explanations with reference to the questions if and when necessary.

The signal advantage of the questionnaire method is that it affords great facilities in collecting data from large, diverse and widely-scattered groups of people. The distinctive characteristic of the questionnaire has been apply summarized by Johan Galtung as 'written-verbal stimulus' and 'written-verbal response'. It is used in gathering objective, quantitative data as well as for securing information of a qualitative nature. In some studies, the questionnaire is the sole research tool utilized but it is more often used in conjunction with other methods of investigation. In the questionnaire (as also in the interview) technique, great reliance is placed on the respondent's verbal report for data on the stimuli or experiences to friends and feels that he would be violating the illusion if he brusquel snatches his papers and mumbles, "Well, I'd better get going."

For the usual polling interview, in which the person's name is not known and in which a few brief questions are asked, a simple "Thank-you very much for your trouble," with a friendly smile, will probably be an adequate good-by. However, for the qualitative interview, of longer duration and greater intensity, the interviewer will have to select his occasion for departure more carefully. Since he has presumably obtained the necessary information, there is no particular reason why he should not main longer, except the obvious one of efficiency. He has spent from 45 minutes to several hours in the questioning process, and he probably has other respondents whom he must see. On the other hand, he should not antagonize the respondent. The good relations which each interviewer develops will, directly and indirectly, help both his own later research and that of others. Besides, he will himself feel embarrassed by social awkwardness at this stage.

Consequently, although his departure should not be abrupt, it can at least be deliberate, open, and continuous. Assembling his papers for a final check, asking a further question to be certain of a previous answer, putting the papers in folder or clipboard, case while continuous. Assembling his papers in folder or clipboard, even while continuing the conversation, allows the situation to be defined as one of leave-taking. This restructuring of the situation sets the stage for a final handshake, a thank-you and a good-by. in some cases, the interviewer may have to reverse the time-honored trick of hosts by asking about some object near the door, such as a lamp, an ornament, or a potted plant. Again, this sets the stage for a good-by. Always, however the adieu should be accompanied by an expression of thanks in recognition of the respondent's generosity in time and attention.

Which he is exposed as also for data on his behavior. The subjects reports may not be taken at face value; these may be interpreted on the basis of other available knowledge about them (subjects) or in terms of some psychological principles. Needless to say, the questionnaire (also interview) approach can normally help obtain only materials that the respondent is willing and able to report.

It is well worth noting that persons are not only reluctant to openly report their feelings, plans, fears and so on; they may in point of fact, be unable to do so. We may not be aware of many of our beliefs and hence may not able to report them. Nevertheless, each one of us has a unique opportunity to observe himself and to that extent one is in a position to and often will communicate his knowledge about himself. But such reporting or communication, especially one that diagnoses and explains why one's behavior was what it was, requires qualities of penetration much beyond the reach of average persons. It is given to only a few to be able to engage in self-diagnosis. The capacity to peep into depths of one's personality is conspicuous by its absence among the people at large. It is precisely this that works to the detriment of the efficacy of the questionnaire method. Despite the limitations of self-report, it is often possible and useful to get people's own accounts of their feelings, attitudes, etc., by means of questionnaires.

It is now better to turn discuss the typical advantages of the questionnaire as compared to other major methods of collecting data for research.

(1) In so far as the questionnaire is usually mailed to the respondents and contains specific, clear-cut directions, the persons charged with the collection of data need not exert themselves on offering additional explanations or instructions. It is obvious that the questionnaire technique does not call for any special skills or training on the part of investigators in the field.

(2) Since the questionnaire approach makes it possible to cover, at the same time, a large number of people spread over a large territory, it is decidedly more economical in terms of money, time and energy. Other methods do not afford such a facility.

(3) The questionnaire, by its very nature, an impersonal technique. Uniformity from one measurement situation to another is provided by virtue of its standardized workings of questions, standardized sequence of questions and fixed or standardized instructions for recording responses. This alleged uniformity, viewed from the psychological angle, is often more illusory than real. A given question in spite of its 'standardized' wording could have different meanings for different persons. Careful trial-testing and helping respondents understand the questions in the course of administration may, however, go a long way toward ensuring uniformity of questions in the questionnaire and as such, making the replies comparable.

(4) Yet another typical merit of the questionnaire is that it ensures anonymity. The respondents have a greater confidence that they will not be identified as holding a particular view or opinion. The subjects feel more free to express views that they think would arouse disapproval or get them into trouble. It has been found that there is often a marked difference between the replies to the questionnaire and those to the interviews. This difference stems from the element of anonymity that is characteristic of the questionnaire approach. Anonymity is not, however, the best method of eliciting frank replies at all times. Complex issues like familiar adjustment which are bound to have strong emotional overtones may not be inquired into

by means of the anonymous tool that a questionnaire is. Here a personal understanding and permissive manner on the part of an interviewer may prove effective.

(5) The questionnaire places less pressure on the respondents for immediate response. The subject, given ample time, can consider each point carefully before actually putting his reply in writing. If there is some kind of pressure for time on the subject (as is often the case in interview) he may reply with the first thought that comes to his mind. It should, however, be noted that pressure on the subject for immediate response has a certain advantage in situations where spontaneous responses matter.

The foregoing discussion also hints at some of the disadvantages or limitations of the questionnaire. We shall deal with these at some length.

(1) One of the major limitations of the questionnaire is that it can be administered only on subjects with a considerable amount of education. Complex questionnaire requiring elaborate written replies can be used indeed on a very small percentage of population. It is seen that even the highly educated persons have little facility for writing and even granting this, very few have the motivation and the patience to write as much as they might speak out. Thus, questionnaires are hardly appropriate for a larger section of population. In so far as the contemporaneous burden of writing and of maintaining interest on the subjects is quite heavy, the number of questions they may be asked as also the fullness of response is severely limited.

(2) In a mailed questionnaire, the proportion of returns is usually low; it may sometimes be low as 10%. Among the factors that may affect the returns are the sponsoring agency, the attractiveness of the questionnaire, its length, nature of the accompanying appeal, the ease of filling out the questionnaire and of mailing it back, inducements for replying and the kind of people to whom questionnaire is sent, etc. Even under the

best of circumstances, a considerable, a considerable proportion does not return the questionnaire.

(3) In a questionnaire, if the respondent misinterprets a question or writes his reply his reply unintelligibly, there is very little that can be done to correct them or seeking clarification of a particular response. In questionnaire approach, the validity of respondent's report can hardly be appraised. The researcher here is in no position to observe the gestures and expressions of the respondents. He cannot follow up the inconsistencies in the replies..

(4) The usefulness of the questionnaire is restricted to issues on which the respondents have more or less crystallized views that can be simply expressed in words. 'The rigidity of questionnaires and the inability to explain elaborately in writing one's `abnormal', anti-social feelings and behavior coupled with the fact that the subject has to render his response in writing-all go against frank discussions of socially-tabooed issued raised in a questionnaire.

(5) The success of the questionnaire approach depends upon the 'sense of responsibility' among the subjects. A serious attempt at filling out the questionnaire-format presupposes, among other things, the awareness science. Only then may responsible help be forthcoming. Such an awareness, even in countries where education is quite advanced, is difficult to come by.

(6) A significant limitation of the questionnaire is that the researcher/ investigator is not in a position to vary the stimuli or social atmosphere impinging upon the subjects according to his designs. Certain other approaches to data collection do allow this facility to a greater or lesser extent. The interviewer, for instance, can within limits, vary the nature of the stimuli or atmosphere as hi questions the subjects. Such a flexibility characteristic of the interview is conspicuously absent in the questionnaire. This flexibility is indeed a very valuable asset. Johan Goltung has offered a very apt analogy that sums up

our discussion. He likens interview to the musical symphony; waves after waves of sound impinging upon the audience. The questionnaire, on the other hand, has been likened to presentation before subjects of stimuli in the manner of a painting; various shades of colour spread over the canvas. In other words, the interview method involves presentation, one after the other, of stimuli in the continuum of time whereas in the questionnaire, these are presented in space.

TYPOLOGY OF QUESTIONNAIRES

The types of questionnaire vary widely. Questionnaire may be classified on a number of different basis. The classification of questionnaires used here is based on the variable of structure. Accordingly, we have:

(a) Structured/standardized questionnaire;

(b) unstructured/non-structured questionnaire.

Structured questionnaires are those in which there are definite, concrete and preordained questions with additional questions limited to those necessary to clarify inadequate answers or to elicit more detailed responses. The questions are presented with exactly the same wording, and in the same order to all the respondents. The reason for standardization is ensure that all the respondents are replying to the same set of questions. The form of the question may be either closed or open; the important point is that they are stated in advance, not constructed during the questioning. Standardized questionnaires may differ in the amount of structuring of the questions used. They may present fixed alternative answers to questions so the respondent just chooses the appropriate one, or they may leave the respondent free to answer in his own words. Extensive use of structured questionnaire is made, for example, in studies of the cost of living, consumer expenditure, and investment practices, etc. The most famous of the structured questionnaires are those used by the U.S. Census Bureau for the population and Housing Censuses.

Fixed Alternative Questions are those in which the responses of the subject are limited to the stated alternatives. These alternatives may be simply Yes or No. The following is an example of fixed-alternatives question: To what social class would you say you belong: (a) middle class, (b) lower class, (c) working class, or (d) upper class?

Open-ended questions are designed to permit a free response from the subject rather than one limited to certain stated alternatives. The distinguishing characteristic of open-ended questions is that they merely raise as issue but do not provide or suggest any structure for the respondent's reply. The respondent is given the opportunity to answer in his own terms and in his own frame of reference. When open-ended questions are used in standardized interviews, the questions and the task of the interviewer is to encourage the respondent to talk freely and to make a verbatim record of his replies.

RELATIVE ADVATAGES/DISADVANTAGES OF OPEN-ENDED AND CLOSED QUESTIONS

Fixed alternative or closed questions have the advantage of being 'standardizable', simple to administer, quick and relatively inexpensive to analyse. The analysis of response to open-ended questions is often complex, difficult and expensive. Sometimes the provision of alternative replies helps to make clear the meaning of the question. Respondents are more likely to understand the question when the alternative replies are provided. The function of alternative responses is to clarify the dimensions along which answers are sought. One of the principal values of open-ended question is its use as an exploratory tool before opinion has crystallized or before the research objectives have been clearly defined. The closed question may require the respondent himself to make a judgement about his attitude rather than leaving this to the interviewer or coder.

Most of these advantages of fixed alternative questions have their attendant limitations. One of the major drawbacks of the closed question is that it may force a statement of opinion on an issue about which the respondent does not in fact have any opinion. Many individuals do not have any clearly-formulated or crystallized opinions on many issues. Closed questions are ill-equipped to reveal these. Although the wording of questions is the same for all respondents, different respondents are likely to make different interpretations, some of which may be quite different from those intended by the researcher. This possibility exists both in closed and open questions but it is much more likely to go undetected in the former. Closed questions are more efficient where the possible alternative replies are known, limited in number and clear-cut. Thus, they are appropriate in securing, factual information (eg., age, home-ownership, income) and in eliciting opinions on matters on which people hold clear views. Open-ended questions are desirable when the issue is complex, hen the relevant dimensions are hazy, or when the interest of the researcher is in the exploration of a process. Closed questions have the advantages of focussing the respondent's attention precisely on the dimensions with which the investigator is concerned. But they do not provide information about respondent's own formulation of the issue, the frame of reference in which he perceives it, the factors that are important for him and motivations that underlie his opinions. When these matters are the focus of interest, open-ended questions are justly warranted.

Another approach which opinion-pollers use is the "exploratory questions". In questions of this type, the informant is given a sufficient sensible judgement.

DESIGNING THE QUESTIONNAIRE/SCHEDULE

Several considerations should be borne in mind while designing a schedule or questionnaire. Careful planning, the physical design of the questions, careful selection and phrasing of the questions definitely affect the number of returns as also the meaning and accuracy of the findings.

(1) The physical appearance of the questionnaire affects the cooperation the researcher receives. In a mailed questionnaire, an attractive looking questionnaire is a plus point for co-operation. Conversely, an unattractive one may cause the recipient to put it aside.

(2) As pointed out, schedules are usually filled by the investigator whereas the questionnaire generally by the respondent himself. This consideration as to who is to record the responses must go into designing a schedule/questionnaire. If a hiighly-trained investigator is to do the one drawn up for the informant to fill out. The terminology and questions should be adapted to the type of people who will give the information. For example, a questionnaire addressed to experts who are thoroughly conversant with the subject-matter of the survey can be much more technical than one directed to a random sample of the population. In designing question-level of education, the biases, and the interest or other characteristics which affect the ability and desire to fill in the form truthfully and correctly should be taken into consideration.

(3) The choice of words is understandably an important consideration. The informant must grasp the spirit of the question rather than its precise wording.

(4) In inquiries of certain aspects, it may be important for certain questions to follow certain others so that a proper "set" is developed. Special attention must be given to the sequence of the items/questions.

(5) If the number of questions is small, their arrangement of the questionnaire will not require detailed planning. When the number of questions is large, they should be condensed in a very limited space.

(6) The purpose of the questions is another important consideration. It may be to ascertain facts, to test the 'knowledge' of the informant or discover his beliefs or attitudes. If opinions are desired, for example, care must be exercised to see that the questions do not just bring out only the points of fact.

(7) If the questionnaire is to be used for a periodic survey, the questions should be designed with a view to uniformity and comparability of results.

(8) Questions must be designed with the possible difficulties of

analysis well in view. Analysis is facilitated to the extent the information is in a form which is readily amenable to classification and tabulation.

KINDS OF QUESTIONNAIRE ITEMS

The information sought by the questionnaire may be classified under three heads:

1 Identifying Information

The following items may be included under this category: Questionnaire case, cross-reference questionnaire number, name of survey, name of agency sponsoring the survey, name of individual or family interviewed, sex of informant, relationship of informant to family head, address of the case, telephone numbers, interviewer's name or treatment of returns.

2. Social Background and Factual Data

The following items may be included under this category: Age of head of the family and family members, marital status, education, religion, political preference, union membership, family size and composition, occupation of the head of the family or of the respondent, employment, family income, socio-economic status, etc.

3. Subject-matter of the Survey

The informant may be asked a direct question on the facts as he understands or remembers them. Certain information can be obtained rather easily by asking straightforward questions. The opinions which he holds are not so readily ascertained. First, there is he so-called "information questions". When knowledge about the topic is definitely correlated with the opinion held, these information questions are particularly important. The opinions may be elicited only from those who are in a position to hold them.

A second approach is that of "seeking advice". The informant is usually flattered by the fact that his advice is considered important. This approach has been used effectively in a study of factors associated with family size.

PHYSICAL FORM OF THE QUESTIONNAIRE

1. Size

The size of a questionnaire depends to some extent on the scope of the survey and the number of items to be included. The basic question is what size of the questionnaire is preferable? This can be best answered by considering the advantages and disadvantages of various sizes. If the schedules are small, they can be carried easily in pockets and brought out only after the respondent has answered the call. If the questions can be put on handy cards, sorting, counting, counting, filling checking, etc. in the office are facilitated. Investigators object to carrying a large folder because their identity may be mistaken. The questionnaire should not be too cumbersome for respondents.

It is best use only one side of the form, the reverse being left blank for special remarks by the recorder. If both sides are to be filled out, filing and sorting the schedules become difficult.

Mail-questionnaires should be large enough to provide adequate space for comments of such supplementary material is desired. Charts, diagrams and pictorial material may be introduced in order to avoid too large a schedule, a booklet may be used.

2. Quality and Colour of Paper

The schedule is handled a great deal after it reaches the office. Therefore, the paper should be durable. If sorting and counting are to be done by hand, a strong flexible card with a smooth surface is desirable. The sell conspicuous the schedule, the less likely the objections to giving information. Ordinary white and light-coloured schedules are preferable from the collection point of view.

When planning mail-questionnaire, it may be desirable to use a colour which will attract the recipient's attention. In certain marketing studies, yellow paper was found to have the highest percentage of returns but dark colours were not effective. When several questionnaire are sent out in a sequence, alternation of colours elicits more returns than a single colour.

3. Arrangement of Items on the Questionnaire

Questions which belong together should be arranged so. When the question is dependent upon the answer to the preceding one, it should be given a subordinate place. Paying due attention to the appearance of the questionnaire will avoid many errors and ensure a higher percentage of usable returns than would be obtained from a poorly-arranged questionnaire.

CHOICE OF QUESTIONS

(1) The researcher should include only such questions as have a direct bearing on the problem itself or the evaluating of the methodology adopted for study.

(2) Questions whose answers can be secured more accurately easily and effectively from other sources may be excluded.

(3) The selection of questions should be done with an eye on the subsequent tabulation plan.

(4) In drawing up the schedule or questionnaire, other studies or surveys on comparable material should be kept in mend. As far as feasible, identical items, terms, definitions, and quantitative units of measurement should be employed.

(5) Care should be taken while asking personal questions or those which may embarrass the respondent.

(6) Only such factual questions, answers to which most of the informants can reasonably be expected to know, should be asked. Frequently, duration, vividness, interest, meaningfulness and setting are some of the important factors that help securing the required information.

(7) Questions that are likely to yield inaccurate responses should be avoided. People often resort to a form of wishful thinking in answering questions on such matters as the level of education they have had, the jobs they have held, etc.

(8) Questions which involve too much mental effort on the part of the informant should be avoided, e.g., entailing mathematical calculations.

WORDING OF QUESTIONS

Understandably great care is required in formulating the questions. Reliable and meaningful returns depend to a large extent on this. Even when factual information is to be secured, certain precaution relating to phrasing of questions are necessary. Even greater care must be exercised when opinions are to be obtained. Since words are likely to affect responses, respondents with limited vocabularies are likely to be suggestive. If questions are beyond the comprehension of the respondent, he may just choose one of the alternative responses without any idea as to the meaning of his response.

SUGGESTIONS FOR WORDING QUESTIONS

1. Simple words which are expectedly familiar to all potential informants should be employed. This should be done without making the questions appear too elementary for those of higher mental or educational level. This is often possible and it is here that art of question-framimg comes in. A question that contains long, dependent or conditional causes may confuse the informant.
2. Formulate the questions so specifically as to yield the exact information that is needed. The more specific the question, the greater the usability of the answer to it for tabulation purposes.
3. Avoid multiple-meaning questions. Such items hat will give rise to confusion should be formulated as two or more questions.
4. The researcher should not make use of ambiguous questions. Ambiguity may arise if terms are beyond the vocabulary of the respondent. If the phrasing is too complex or in general terms, the informants may start with entirely different assumptions. The best means to this end is to pretest the questions.
5. all questions which produce biased answer may be regarded as 'leading questions.' Questions worded in such a way as to suggest the answers may be avoided. For example, to the

question, "do you regularly visit the library?" many people will answer "yes", even though they may not be doing so.

6. Answers to questions in which prominent personalities are mentioned will be conditioned by the informant's personal feeling towards them. Indiscriminate ban on important names is not, however, desirable.
7. Danger words, catch-words, stereotypes or words with emotional connotations should be avoided. Names of political parties and political figures may colour the responses, hence such use may be avoided.
8. Chapin suggests the occasional use of "slant side-questions". For example, when respondents were asked, "Are you married? "most of them replied in the negative but when the question was changed to "Where is you wife?", a much higher percentage was discovered to be married.
9. Most people like to feel that they are reasonable, intelligent, generous, understanding and prestigious members of their community. They thus tend to answer questions in terms of what they "ought" to think or feel about a situation. Hence, caution must be exercised in the use of phrases which reflect upon the prestige of the informant.
10. The question must allow for all possible responses. Thus, provision for such indefinite answers as "don't know", "no choice", "doubtful", "other (specify)" should be made.
11. The alternatives in multiple-choice questions must realistic and not far fetched. They should conform more or less to the way people really think and feel about the issues involved. If the alternatives are phrased in terms of concrete situations; the questions will be more meaningful. When framing the alternatives, it should be borne in mind that people answer questions in terms of the relative value of the choices presented in the questions and not in terms of absolute universe of preferences.
12. The amount of writing required on the schedule or questionnaire

should be reduced to the minimum. Since most handwriting is poor, there is the danger of misinterpretation and errors. Whenever feasible, symbols may be used for replies.

13. A few questions that will serve as checks on the accuracy and consistency of questions as facts but are worded differently and placed in different sections of the questionnaire afford a check on the "internal consistency" of the replies.

15. Seemingly unreasonable questions should be justified by using an explanation why they are worth asking.

ON QUESTIONNAIRE CONSTRUCTION

The investigator should first discover the extent to which the desired data are already available in published reports and decide whether all or part of the needed data can be obtained through a formal questionnaire-construction can be divided into following aspects:

(i) Information to be sought.
(ii) Type of questionnaire to be used.
(iii) Writing a first draft.
(iv) Re-examining and revising questions.
(v) Pre-testing and editing the questionnaire.
(vi) Specifying procedure for its use.

(i) The formulation of the problem provides the starting point for developing the questionnaire. The investigator must decide what aspects of the problem are to be dealt with in a particular study.

(ii) The appropriate form questions depends on the mode of administration, the nature of information sought, the sample of people and the kind of analysis and interpretation intended. The investigator must also decide whether to use closed or open-ended questions. The use of follow-up questions or probes is advisable at many points in connection, especially, with free responses. The questionnaire should anticipate where several alternatives are needed, depending upon the preceding responses. For example, if the answer is too general and vague, the follow-up question may be "how do you mean?"

(iii) The best sequence of topics should be carefully considered when framing the questions. Some closely-related questions may be asked in order to measure consistency and for checking the reliability of responses. At this stage of questionnaire-framing all available suggestions need to be utilized. Questionnaires previously drafted on similar lines may prove quite helpful.

(iv) Next, the Questionnaire should be scrutinized for technical defects, Quite apart from biases and blind spots arising due to personal values.

(v) Pre-testing is necessary to find out how the questionnaire works and whether changes are necessary before launching off the full-scale study. The pre-testing of instrument provides a means for solving unforeseen problems in its administration in the field. It may also indicate the need for additional questions or deletion of others. If substantial changes are warranted, a second pre-test may be conducted. Sometimes, a series of revisions and pre-testing is required. After pre-testing, the final editing is done to ensure that every element passes scrutiny of content, form, sequence of questions, spacing and arrangement. Editing is intended to make the questionnaire as clear and as easy to use as possible.

(vi) The questionnaire itself should contain simple, straight-forward directions, indicating, just what the respondent is supposed to do.

SEQUENCE OF QUESTIONS

It is essential to examine the order in which questions are to be asked. Many a refusal and misunderstanding can be avoided by a proper arrangement of questions . Questions should be arranged logically. The question arrangement makes it possible to determine the directions of the response. The opening questions should be such as to arouse human interest. The respondent then is less likely to refuse to co-operate.

The opening questions should be such as are easy to answer. Questions which might embarrass the informant should be placed in the middle or at the end of questionnaire. Questions on economic status, or those that test the knowledge of the respondent and those of an intimate personal nature should be put at the end. Questions seeking personal information should be put at the end. Questions to which the informant may be sensitive should not be put at the extreme end because this may leave him with wrong impressions and make it difficult to question him later. since there is the likelihood of the mail-informant losing interest as he proceeds to fill in the questionnaire, important questions should advisedly be put at the beginning.

THE MAILED QUESTIONNAIRE

The problem of formulation questions regardless of whether they were to be incorporated in a questionnaire, a schedule, or an interview guide. The questionnaire, it will be recalled, is differentiated from the schedule and interview guide by the fact that it is self-administered. Not all questionnaires are mailed. They may be administered to groups of people who have gathered together for any purpose. In this case, not all the problems which face the mailed questionnaire are present. Since, however, research of the group-questionnaire type differs from interview studies in the same direction, though not as sharply, as does the mailed-questionnaire technique, it seems best to discuss the latter in greatest detail. The student will be able to see for himself at what points the problems of the two are different.

In spite of many abuses, the mailed self-administering questionnaire remains a useful technique in sociological research. So long as this method is employed in appropriate research designs, it can frequently be rewarding. The crucial point in its use is determining whether or not this method of gathering data is the best one possible in the specific situation. The decision to use one method of collecting data over another method is complex and must take many factors into consideration.

THE RELATION OF THE MAILED QUESTIONNAIRE TO THE RESEARCH PROBLEMS

The appropriateness of the mailed questionnaire will depend upon the requirements of the research problem with regard to (1) the type of information required, (2) the type of respondent reached, (3) the accessibility of respondents, and (4) the precision of the hypothesis.

Type of information required. First, very extensive bodies of data cannot often be secured through the use of the questionnaire. It is usually unwise to expect returns from a questionnaire which requires much more than 10 to 25 minutes to complete, and thus its use is restricted to rather narrow areas of data. Further, an extensive, survey type of problem suggests the need for so wide a range of data that personal participation and/or depth interviewing is required.

Second, the questionnaire is effective only when the respondent is able or willing to express his reactions clearly. A considerable controversy has existed among social researchers as to whether the answers from the anonymous questionnaire are franker, or given with greater openness, because there is less fear when there is no immediate listener. This frankness has been contrasted with the interview situation, since it is claimed that the interviewer may inhibit the answers somewhat.

This, however, seems to ignore the major problem. There can be no question that a good questionnaire can elicit frank answers on almost any subject, even such personal matters as sex and income. It is equally true, on the other hand, for the interview. When good questionnaires are compared with good interviews, it is likely that on the score of simple lying or frankness there is little to choose. The interviewer has the advantage of seeing the evasion, while the person who answers the questionnaire may feel less constraint in telling the truth.

The difference between the two is not in the dimension of frankness, but in that of *depth*. On this matter, there can be little doubt that the good interview can probe far more deeply than the best questionnaire. The reason for this can be seen in both statistical and social-relational terms. With reference to the former, the experienced researcher knows that the most simple question has a great depth of motivation, desire, attitude, and concrete complexity to it. In one project, for example, information was desired about the dating practices of divorced mothers. A simple question for a questionnaire might be, "How often do you date? Almost every night, two to six times a week, once a week, twice monthly, almost never?" However, such a question would not reach the complexity of observable patterns. Some women might have answered, "Almost never," because they were living with their ex-husband, or with their fiances, or with boarders. Further, each of the complex patterns breaks down into still further questions to be asked. A simple question to which there are eight possible answers, each of which must be probed by three possible alternatives, demands a series of 24 questions. These not only take up a large section of the space in any questionnaire, but would be very difficult to arrange spatially so that the respondent could thread his or her way through the maze. At each deeper level of probing, the possible number of answers multiplies enormously, ad all these possibilities must he included in the mailed questionnaire.

The more important item for consideration, however, is that the *active work of the interviewer* is required to stimulate the respondent to express these deeper levels of motivation and feeling. It is not that in the interview it is possible to obtain a better rapport with the respondent, although it is likely that the interviewer can get and hold the emotional commitment of the respondent somewhat better. Rapport is not the most important element in this comparison, but it is rather the fact that the respondent is not *able* to give the necessary answers without help.

A social scientists attempt to compare the frankness of answers from the questionnaire and interview by asking comparable questions concerning the love experiences of a group of college girls. Although in general the two techniques gave comparable results, with perhaps a slight advantage in favor of the questionnaire, one or two questions illustrated the present point, that frankness is not the sole issue.

One dealt with whether the girl had ever been in love with two boys at once, and the interviews showed a substantially higher number of girls who admitted such attachments. The questions were phrased similarly, but it was discovered that when the interviewer received a "no" answer to this question, the further probe question was asked: "Never?" A number of girls then remembered such an attachment. However, there was no lack of frankness in the first answer. Rather, the probe question forced them to think again, to search their memories in order to be certain. Since the romantic complex in this country is opposed to such double attachments, many persons tend to forget them. This is also true for a number of incidents in the life histories of any individual. Even with the best of willingness to tell the truth, the truth does not come easily to the tongue.

A further point is the fact that the questionnaire fails when its questions place an emotional burden on the respondent. This is a different dimension from that of being *unable* to answer because of unawareness of the complexity of one's motivation or the details of one's life history. The latter problem is met by the mental alertness of the interviewer, who probes when the answers are vague, meaningless, irrelevant, or contradictory. However, the face-to-face interview offers the *emotional support* of a sympathetic listener, in addition to the purely intellectual help. This factor may be of even greater significance in eliciting the facts than the latter. And, in any event, neither is obtainable when the respondent faces a mailed questionnaire.

Type of respondents contacted. Although questionnaires have been used for a wide range of social groups, yet the experience has shown that not all groups respond equally well. At the lowest level of differentiation, it must be clear that it is impossible to obtain a representative sample of the whole population by using this technique. A minimum necessity is the ability to read and write. Further, the amount of reading attention and writing skill required for most questionnaires is much greater than is implied by a minimum definition of "literate." for many who are able to read and write, neither burden is assumed willingly or easily.

The consequences of this aspect of the questionnaire are that it cannot be used for a representative sample of the entire population. This does not detract from its usefulness in specific research situations, when more literate groups are the focus of the study. It is, however, only by recognizing the limitations of any research tool that we can utilize it to the fullest.

Emphases has been laid up the fact that a substantial segment of the population *cannot* answer a questionnaire. However, the *willingness* of the addressee to answer the questionnaire is a still further problem. The researcher is not there to add his own pleas to those which are printed or typewritten in the letter of introduction.

Both the "cannot" and the "will not" group bias the sample in a *known direction*, but to an *unknown degree.* Since questionnaire studies with a fairly wide population base have reported the percentage answering as from 20 per cent to around 70 per cent, it is clear that this type of sampling bias could be fatal to the validity of the study.

The direction of this bias is towards those who are interested in the subject matter, those who are higher in socioeconomic status, and those who have had more education. Thus, a questionnaire circulated among college professors of English, querying them about the kind of work load they carry, is likely to be answered by a high proportion of the respondents.

In one study, on traveling by train, a substantial proportion of returns was received from the first wave of questionnaires. However, it is now standard procedure, in using the questionnaire, to send a second wave of questionnaires, or a third. Depending on the technique used, these can be sent to everyone on the primary list or only to those who have not answered. In this study, the second wave showed very different characteristics from the first. Looking more closely for the basis of the differences, it was seen that the first wave was mainly composed of those who had actually traveled on the newer types of "super" trains. The group had, therefore, a keener interest in questions about innovations in train travel and were willing to take the trouble of answering the questionnaire. It was only with the second wave, which stimulated those whose interest was less strong, that the peripheral group was tapped, those who had not enjoyed the newer train facilities.

The respondent will ordinarily not answer a questionnaire dealing with a subject with which he is unfamiliar, such as air travel, impending legislation, or experience with a particular branch of the government or an occupation. This lack of knowledge has been classed under the general heading of "lack of interest," for convenience, but it is clear that cases may exist in which these do not coincide at all. In a particular organization, for example, a controversy may have continued in a futile bickering fashion for many months, leaving the members willing to wash their hands of the matter and unwilling to answer a polling questionnaire which seems to bring up the issues once more. Another type of refusal to answer occurs when the questionnaire deals with the use of luxury goods, for in such cases there is a strong bias in the resulting sample, in the direction of those who have used the article in question.

The central point of mentioning these results is to underline the fact that the questionnaire is not an effective research tool for any but a highly select group of respondents. It is not effective because a biased sample is obtained. As noted in the section on sampling, the mere existence of a "bias" is not the primary point, but the fact that the extent of the bias is not measurable. If the exact characteristics of those who do not answer could be known, it would be possible to weight the results accordingly or to restrict the conclusions to the select group who responded.

On the other hand, questionnaires can be fairly effective if such a select group is the object of study. A group of business executives, for example, will answer a Dun and Bradstreet questionnaire with a low rate of refusals. The income-tax blank is a questionnaire and (backed in this case by police power) is fairly successful in eliciting a high rate of response. The *dictionary of American Scholars* sends a questionnaire to those who are suggested for inclusion, and it is safe to say that the response is very close to 100 per cent.

Accessibility of respondents. It is granted that the questionnaire is effective only for a highly select group of respondents, it is a very useful tool for certain situations in which the respondents are geographically widely dispersed. This, of course, actually reduces to a problem of time and money. The savings to be obtained from the use of the questionnaire are not to be formulated by saying that one is always cheaper than the other. To begin with, research on these tools has not proceeded far enough to be able to offer acceptable time and cost breakdowns. Actually, a large part of published research is done by academic or other scholars who, like home craftsmen or weekend farmers, work for the excitement of it. "Costs" include the actual outlay of money, with little allowance for their own time. Especially during a research project, the researcher and his associates are likely to pay little attention to the total number of hours worked. Furthermore, the extra costs on a questionnaire and an interview research are for different things. The questionnaire costs less per questionnaire than the interview costs per interview, but this is true only if immediate costs are considered. A great amount of time may be spent in waiting for successive questionnaire waves to come in. Or, the questionnaire may have to be supplemented by interviews. There may be extra transportation costs for interviewers, and extra costs for added efforts needed to fill in blanks which were left incomplete by the questionnaire respondents. In short, no simple comparison of costs can be made which will hold good in all cases.

However, it is certain that when the group of respondents is widely scattered, the costs will be less if the questionnaire is used. For example, if the researcher wishes to poll the membership of the Indian Sociological Society, transportation costs tor interviewing would be excessive, both in money and time. Similarly, if an attitude study is to be made among the participants at a conference, there is not enough time to make the necessary interviews. However, questionnaire relative to a current controversy, even from a fairly isolated campus as a research base. further, this could be done by a single researcher, without the large funds otherwise required to hire an interviewing staff, or to pay a notional staff, such as the National Opinion Research Center, to carry out the interviewing in various cities.

This is not a blanket statement that the questionnaire is cheaper, only that it can be cheaper under certain circumstances. It must be kept clearly in mind that costs should not be computed on the basis of the *number* of interviews or questionnaires secured, but rather on the basis of the *amount of usable information* secured. For some information, the questionnaire cannot be used at all. For other information, under particular circumstances, the questionnaire is certainly cheaper than the interview and may be as adequate.

The precision of the hypothesis. From the preceding discussion, it is clear that the questionnaire is most useful when a considerable amount of exploratory work has narrowed the questions to be answered. The respondents are not likely to take the trouble to work out careful discriminations of attitude, personal history, and value. The questionnaire itself must do this, for the respondents to choose from. Of course, a great amount of exploratory work must go into any research project, no matter what tools are used. However, the interview remains a considerably more flexible instrument, even at the final stages. What is emphasized here is not the amount of preliminary work, but the sharpness of the hypothesis. The more closely focused the hypothesis, the more effective the questionnaire. At such a stage, the interview is equally applicable. However, the interview is effective even with a vaguely exploratory hypothesis. Indeed, the *testing of the questionnaire must utilize the interview*. A few questions can be tested by using the questionnaire without interviews. It can be determined, for example, that some of them are not answered or that the answers seem inconsistent. A few respondents will take the trouble to make marginal comments. However, this will not be adequate criticism. The questionnaire will have to be used with a selected sample who are then interviewed further concerning each question. Researchers often do this without selection members of the respondent group, but the comments of colleagues or students are not sufficient at this stage. The meaning of each question can be adequately tested only by flexible, probing questioning of those who are representative of the final respondent group. This type of test cannot usually be done by the use of the questionnaire alone. As a consequence, it is only when the hypothesis has been rather sharply focused that the questionnaire is most effectively used.

MAILING OUT THE QUESTIONNAIRES

The questionnaire must be thought of as a kind of interview which is surrounded by peculiar obstacles. Consequently, many of the comments to be found in this section are equally applicable to the interview research technique. For example, it is clear that the respondent can judge the study only by what he can see. In interviewing, it is the interviewer himself. In the case of the questionnaire, it is several pieces of paper. These cannot adjust themselves to the situation. They are the same for all respondents. The questionnaire maker, then, must offer as impressive a presentation as possible, if the response is to be adequate. Only the papers are there to make his plea, and he cannot count on any personal charm or social skill when the respondent opens the envelope. He must, then, plan carefully and seek a great deal of professional help, before he sends out his queries. The following are concrete suggestions for building a questionnaire.

An appeal

A covering letter must accompany the questionnaire. This is analogous to the opening "sales talk" of the interviewer, explaining what he is doing, why he is doing it, and for whom. The letter must explain these facts, but must cover as many objections as possible, since an unanswered objection means an ignored questionnaire. The introductory comments of the interviewer need not do so, since in most cases an elaborate explanation is unnecessary. The interviewer has answers ready for the objections, but he need not offer them unless the objections appear. The letter of appeal, however, must leave nothing unexplained.

On the other hand, it must be brief. Most of the recipients are not willing to read a long letter, and lengthiness usually destroys its impact. Yet within it a number of basic facts must be presented. Some of these follow:

1. **THE AUSPICES.** Who is sanctioning the study? As in the case of the interview, this information must be given at the outset. If the research bureau is well known as a responsible, scientific group, the response is likely to be good. In some cases, the cover letter may devote a few sentences to explaining the character of the organization sanctioning the study, as well as the one carrying it out. The letterhead should convey the impression of scientific competence, and the address as well as the telephone number should be given to allow an easy check. Nothing should appear to be hidden or suspicious.

2. **WHY THE STUDY?** The interviewer may include this information in his introductory remarks, but it is often left out unless the respondent asks for an explanation. In the questionnaire cover letter, it is necessary to explain why the sanctioning organization needs the information, or why anyone at all wishes it. This need not be elaborate, but it must be sufficient to explain the need for answers to the questions. Questions dealing with marital relations can usually be explained adequately by referring to the modern "crisis of the family." Studies which explore religious behavior can allude to the secularism of the era. It cannot be assumed that *all* respondents will read the letter carefully, but it must be carefully tested to be certain that every phrase in it conveys the meaning intended. Tor *someone* will read the phrase, and an unfortunate interpretation will mean a loss of those respondents who found a different meaning in it.

3. **WHY SHOULD THE RESPONDENT BOTHER TO ANSWER?** Mention of the group authorizing the study, the group carrying it out, and the need for the information merely indicate that someone else is interested in the study. There must be an appeal to the respondent himself, which persuades him that he ought to participate. A great number of appeals have been used in the history of the questionnaire. Some have included money or promised it (usually no more than a nominal sum, such as 25 cents). Others have offered special

services, such as marketing reports, radio bulletins, or samples of goods. Others have challenged the respondents to "prove what many thought impossible, that thousands of interested people would give information for this cause."

In general, the most effective appeal is an altruistic one. Although these special inducements such as money have increased the proportion of returns slightly, it remains true that no advantage that a research organization is likely to be able to offer will appeal to a large group of respondents. The amount of money that can be offered is trivial, and so are the other advantages, compared to the amount of time and thought requested. Whatever the student may believe concerning the cynicism of the selfishness of people, extensive research has demonstrated that an appeal to disinterested motives is strongest. "The information is needed by thousands of leaders attempting to solve today's problems," "You will he contributing to the advancement of science," and "You will help improve the education of thousands of students who will attend Xiphosuran College in the future" are all better arguments than attempting to exploit the self-interest of the respondent.

The social scientist will ordinarily test which appeal is most effective for the group he is investigating, but the final form of his letter must *impel the respondent to action*. Mere presentation of the questionnaire is not enough. The impulse to activity is initially lacking, and the researcher is not even offering the respondent a sympathetic audience, as is done in the interview. The appeal is the "one-shot" stimulus, and its failure will result in the failure to gather data at all.

4. **THE DIRECTIONS FOR HOW TO FILL UP A QUESTIONNARE.** Almost always, the beginning user of the questionnaire overrates the literacy of the average person. As anyone knows who has checked questionnaires filled out by civil service applicants, even those with a great deal of formal education are not always careful in following directions. Therefore, the student must made certain that a total stranger to the research can follow the directions with no effort. This

aspect of the pretest should utilize individuals *with less education* than the group for which the directions are ultimately intended, to give a reasonable margin of error. It is not lack of education or intelligence which is the stumbling block, *but lack of attention and interest*. There is no primary good reason why motivation should be high. When high motivation cannot be expected, the demands on time and attention should be minimal. Directions, then, should be few and simple, both in the cover letter and in the questionnaire itself.

5. **FIRM ASSURANCE OF ANONYMITY.** One element which is used to back up the appeal is a guarantee of anonymity. Although many questionnaires do not ask for information which is embarrassing, respondents will ordinarily not answer if they have any reason to suspect that information about them will be made public. This suspicion will be more easily aroused, of course, if the information itself touches on delicate personal matters. The letter, then, should include a guarantee that the respondent will remain anonymous. There should be no request for names and no questions which are so detailed as to make identification easy (such as street addresses, etc.). The guarantee alone is not sufficient, if the questionnaire itself seems identifiable.

Such a rule is not to be interpreted too narrowly. When the investigating agency has a long history of making such studies within the same group, as an annual study of production from specified factories in an industry, such anonymity may become unnecessary.

TECHNIQUES FOR FACILITATING THE RETURN OF THE QUESTIONNAIRE DULY COMPLETED

The questionnaire is sometimes not mailed, but is administered to groups within the same room. This is the simplest collection situation usually. However, if the document is mailed to the respondent, with directions to return it by mail. Perhaps the least effective method is having friends or students distribute copies to their own friends, with a request to return them after completion. Not only is the sample biased, but the proportion of non reciept of questionnaire duly completed is extremely high.

The questionnaire maker cannot seriously expect the respondent to exert himself in taking care of this task. Therefore, a stamped, self-addressed envelope should be sent with the questionnaire. There is some evidence that a regular stamp affixed to the envelope is more effective than postage from a mailing machine, or even than the stamped envelope from the post office. The claim is that respondents do not like to see the stamps wasted. It is equally likely that the regular stamp gives some evidence that the organization is not carrying on a selling campaign. Commercial stamping is often associated with mailed advertisements, and there is a tendency on the part of many individuals to throw such envelopes away almost immediately.

The students will see from these comments, "techniques for returning" must be thought of as overlapping the "techniques for eliciting response." Facilitating the return of the envelopes yields a greater response. Accurate typography, printed if possible, which is well spaced for easy reading, not only creates a favorable response in the recipient but also helps to eliminate errors in mailing. A slightly larger investment in format and typography will create a very great dividend in number of questionnaires completed and returned. Even the choice of paper is not to be taken lightly. The questionnaire will be handled by the recipient and the researcher, and it will be turned and shuffled many times while it is being coded and tabulated. The paper must, then, be of a good grade and of a convenient size. Many questionnaires, on the other hand, are reproduced on ordinary mimeographed paper, which is likely to smudge or blot when written upon with pencil or ink. As to typography, the researcher should investigate the different methods of reproduction before choosing. A number of new processes are much better than ordinary mimeographing, at only a slightly greater cost. Further, new processes are being developed as time goes on. One simple example of such a process, for the researcher with limited funds, is offset mimeographing, using bold Bodoni type such as is found on modern electric typewriters.

The result is very much like printing and considerably more impressive (and therefore more effective in eliciting responses) than ordinary typewriter type.

CHECKING THE SAMPLE : PRETESTING

A major problem in using the questionnaire is the structure of the resulting sample. A low response is almost always indicative of a biased sample. However, a high proportion of questionnaires is not proof that no bias exists in the sample. If the questionnaire elicits a response from only certain groups among the respondents, the sample will be biased. to make certain that the resulting sample is representative, several devices have been used.

One of the most obvious is that of tabulating separately the respondents which result from (1) successive time periods, or (2) successive waves of questionnaires. For most studies, those who answer promptly are different from those who delay their answers. As noted previously, those who answer immediately have a much closer relationship to the subject matter, or wish to offer their opinions about a luxury product, or have a higher level of education. The student, then, may separate the answers received promptly from those received later. When there is very little difference between these two groups, and the percentage of response is high, he will have a fair assurance that the sampling bias is not great.

When successive waves of questionnaires are sent out, in order to obtain a very high level of response, such as 80 to 95 per cent, the same device can be used effectively. By an active-follow-up campaign, a good response can be obtained from the group under study. Each new wave will refer to the previous mailing and comment on the importance of the work, appealing once more for an answer.

In order to check the resulting sample more carefully, some researchers have found it useful to assume that there is a final die-hard group who simply care little about the study and cannot be persuaded to bother greatly about it. For the final wave, then, a double postcard is sent, with a few basic questions to be marked with "yes," "no," or similarly brief answers. The double postcard is cheap, and this final group can be compared, for at least a few important characteristics (age, sex, occupation, etc.) with those who answered the questionnaire with little urging. This allows, then, some check on the sample obtained.

A comparable device, to be used with successive questionnaire waves, eliminates some of the cost of duplication. This technique utilizes a small section of the questionnaire, or a separate sheet, on which the respondent can put his name, either with or without cross-tabulation data such as age, sex, etc. This identifying tab is mailed separately by the respondent. The duplicate, stamped envelopes are an added cost, but on receipt of the tab the student can save the cost of sending a copy of the second wave to that respondent. The system preserves the anonymity of the questionnaire, while allowing the researcher to know who has answered the questions.

Further advantage is an obvious one; the unknown character of the sample bias is thereby clarified. The researcher usually knows some thing about his respondents, else he would not be sending his questionnaire to the particular persons concerned. Even a few items of information allow a simple comparison between the answers and the nonanswerers. To the extent, then, that any such comparisons can be made, the extent of the bias can be known.

Knowing the direction of the bias, or something about it, may lead to a decision to *weight* the tabulations, under the assumption that those who do not answer have the same characteristics as those who answer very late. A more sophisticated technique was developed by the Bureau of the Census, which involves the use of face-to-face interviews for a certain percentage of those who do not answer the questionnaire. Given the *cost* of such a field interview as compared to the cost of mailing the questionnaire, and the *degree of uncertainty* in the sample structure, which is increased as the percentage of response is lower, it is possible to calculate how many interviews ought to be used for any given level of response. It is always assumed, of course, that the *level of precision is not to be changed*. If the answers are not valid and reliable, that is, adequate for the problem, there is little point in doing the study at all. Hansen and Hurwitz have actually calculated hypothetical tables from which the student can determine how large a proportion of interviews to obtain, given the factors of cost, percentage of response, etc.

Although in the beginning student is not likely to be able to be use such a technique, yet it is of great utility in large surveys where a definite level of precision is demanded. The interviews allow a clear picture to be drawn of those who do not answer the questionnaire. In this way, not only is the *direction* of the sampling bias known, but the *degree* and *value* of that bias. Consequently, the resulting tabulations can be weighted with accuracy. On the other hand, not all the savings of the questionnaire technique are lost unless the level of response is very low.

OPEN-ENDED QUESTIONS

Although the previous remarks have suggested that the most effective questions for the self-administered questionnaire are those which are highly *structured, i.e.,* posing all the possible alternatives for the respondent to choose from, the *unstructured* question may yield further information. Presumably, the work prior to the final formulation of the questionnaire has narrowed the possibilities somewhat, but questions allowing greater freedom to the respondent may still be required. It must be pointed out, however, that such questions are useful with an even smaller proportion of the total population, for such questions require a higher with the further emphasis that the open-ended question demands a still greater amount of energy, willingness, and care on the part of the respondent.

As a result, unless the sample is extremely carefully chosen and carefully restricted to a rather literate group, the answers to such free questions are likely to be incomplete, couched in cliches, or nonexistent. The problem of coding them is, of course, no different for the questionnaire than for other data-gathering techniques.

If, however, such questions are to be used, the researcher must be rather generous with space on the sheet. A space which is only large enough for a sentence is likely to be filled with no more than a cryptic phrase. It is far better to allow the respondent more space than seems necessary, as a stimulus to a fairly full response.

CONCLUSIONS

The mailed questionnaire has been very useful in social research in the past and is likely to continue to be so in the future. When the student chooses between the mailed questionnaire and the face-to-face interview, he must weight their relative advantages for the purposes and conditions of the project. The questionnaire does not allow complex probe questions which require the respondent to thread his way through many levels of subquestions. Further, the interviewer is not there to give emotional support and other stimuli to increase the respondent's ability and willingness to answer. The questionnaire can be most fruitfully used for highly select respondents with a strong interest in the subject matter, greater education, and higher socioeconomic status. Otherwise, an unknown amount of bias is introduced into the sample. However, when respondents are widely dispersed geographically or will be in one spot only briefly, the questionnaire may be very useful. Whether its cost, for the information needed, is less will depend upon many factors such as degree of response, costs of mailing successive waves, waiting time, etc. Finally, the questionnaire is efficient only when its basic hypothesis is relatively precise. It is not a useful device for gathering preliminary observations concerning social behavior. The present chapter has attempted to analyze the factors which should be weighed in choosing between the interview and the mailed questionnaire and has also described the procedures to be followed in using the questionnaire.

11

Different Techniques of Research : The Case Study Method

The method of exploring and analyzing the life of a social unit/entity, be it role-incumbent (person), a family, an institution or a community, is customarily known as case study method. The aim of case study method is to locate or identify the factors that account for the behaviour patterns of a given unit, and its relationship with the environment. The case data are always gathered with a view to tracing the natural history of the social unit, and its relationship with the social factors and forces operative and involved in its surrounding milieu. In sum, the social researcher tries, by means of the case study method, to understand the complex of factors that are working within a social unit as an integrated totality. Looked at from another angle, the case study serves the purpose similar to the clue-providing function of expert opinion. It is most appropriate when one is trying to find clues and ideas for further research.

Burgess has highlighted the special potency of the case materials for understanding complex behaviour and situations in specific detail and referred to these data as a social microscope.

The major credit for introducing case study method into the field of social investigation must go to Fredrick Leplay. The English social philosopher Herbert Spencer, was among the first to use case materials in his comparative studies of different cultures. William Healey resorted to the case study method in his study of juvenile delinquency. He realized that the problem of juvenile delinquency was too complex to be understood simply on the basis of available statistical data. Hence, he declared himself in favour of the case study method which afforded a deeper and rounded understanding of the phenomenon. Anthropologists and ethnologists interested in the systematic description and study of the primitive as well as modern cultures have liberally utilized the case study method. Cora Du-Bois, Robert Redfield and Oscar Lewis, to mention some of the prominent names, have liberally employed the case study method. Historians have resorted to this method for portraying some historical character or a particular historical period and describing the developments within a national community. Many a novelist and dramatist has used some semblance of the case study method for presenting a word-picture of characters.

The case study method received the necessary impetus and recognition as a systematic field-research technique in sociology with the well-known study, "The Polish Peasant" by Thomas and Znaniecki. In the course of this study, they made extensive use of life history documents and them their chief instrument in reaching out to the actual experiences and attitudes of individuals and groups as well as in securing "a cross-section of the entire process of their social becoming." They scrutinized a large number of personal diaries, letters, autobiographies and other types of case materials with a view to getting at the concrete details of the individual and collective behaviour of persons in a given cultural context. Thomas and Znaniecki aimed at reconstructing a chronologically continuous and complete word-picture of the feelings of individuals subjected to particular experiences, of their ideas about the relations they have with others and the impact of these on them. Thomas and Znaniecki maintain that the case data constitute 'the perfect type of sociological material' in so far as they represent a more enlightening and fundamentally more reliable record of personal experiences, with a wealth of concrete detail, vivid memories, tension situations, and multifarious reactions to social situations which would escape the attention of the most skilled investigators using other techniques.

Thomas and Znaniecki contend that the social science has to resort to the use of data other than the case-history or life history simply because of the practical difficulty in securing, at the moment, a sufficient number of such records encompassing the totality of sociological problems and the enormous amount of work involved in an adequate analysis of all the personal data necessary to fully characterize the life of a social group. In India, quite a few monographs on rural and tribal communities have resorted to the case study method.

Social scientists ultimately aim at some kind of generalization or theory-building. Whether the case data can be regarded as sufficiently typical or representative affording a secure basis for theory-construction is a question that has been plaguing the social scientists for quite some time. The issue has been a subject of controversy among the social researchers. Hence, it is important to thrash out whether the materials offered by case history may be considered as adequate basis for generalizing with respect to the category of cases that the particular case under study represents.

Stouffer, Kinsey and Adorno among others, have had occasion to study a large number of cases. These social scientists found a remarkable uniformity among independently conducted studies of large groupings in different socio-cultural and temporal contexts. The opinions of Stouffer, Kinsey etc., in regard to the reasonably high generalizability afforded by case data are in tune with those of Thomas and Znaniecki. Anthropologist Franz Boas too, on the basis of his several case studies of the 'primitive' groups came to the conclusion that human nature any where is of one piece.

But, the fact of uniformity among cases does not warrant the conclusion that the cases under study are the typical representatives of the larger category of cases they were drawn from. It is indeed improper to overstress the element of uniformity since the similarity among cases hardly, it ever extends to all the dimensions there are to life.

While human behaviour may vary according to situations, it is usually possible to identify the 'basic' human nature in the midst of such variations. This is the assumption that underlies collection of case data. All human beings experience certain physiological tension; certain experiences are ubiquitous, e.g., birth, death, sex drive, fatigue, etc. As DuBois, the anthropologist, rightly points out, the comparative studies of personalities as determined by variations in culture are possible simply because of certain basic homogeneity or similarity evidenced in the mankind. G.W. Allport contends that some statements about human nature broadly apply to each individual or to each member of a larger group. As such there does not appear to be any reason why a quest for identifying the innate human tendencies cannot capitalize on personal case data.

Various media and techniques have been utilized by researchers in the course of certain excellent case studies, they managed to turn out. Nels Anderson, who conducted a case study of the Hobos, got to know about their inner lives through the medium of their poetry, folk- songs, ballads and other cultural manifestations. Anderson collected their photographs published in journals and newspapers. He also collected from several institutions the statistical and other types of information about life of the Hobos. Collecting relevant bits of information from such diverse sources, Anderson could offer a systematic account of the inner life of the Hobos and the practical ethics of their organization. Warner and associates have, in the course of their case studies entitled, 'The Yankee City Series', made use of various methods and techniques of data collection. Personal interview, observation, questionnaire, statistical records, etc., were the diverse means employed by them. In sum, various researchers have employed a number of different means and techniques to get at data substantiating, supplementing and verifying the information gained through the case study method.

The specific method of case study would depend upon wit, commonsense and imagination of the person doing the case study. The investigator makes up his procedure as he goes along. Saturating oneself in the situation is very important. Some anthropologists believe that case studies of less than several year's duration are likely to be misleadingly superficial. Bronislaw Malinowski, a doyen anthropologist, gives a vivid argument on this point.

"Living in village with no other business out to follow native life, one sees the customs, ceremonies and traditions over and over again, one has examples of their beliefs as they are actually lived through and full body and blood of actual native life fills out soon the skeleton of abstract constructions. That is the reason why working under such conditions, the ethnographer is enabled to add something essential to the bare outline of tribal constitution, and to supplement it by all the details of behaviour, setting and small incident."

Let us now turn to discuss the criteria for evaluating the adequacy of the case history or life history which is of central import for case study. John Dollard has proposed seven criteria for evaluating such adequacy. These are as follows:

(1) The subject must be viewed as a specimen in a cultural series. That is, the case drawn out from its total context for the purposes of study must be considered a member of the particular cultural group or community. The scrutiny of the life histories of persons must be done with a view to identifying the community values, standards and their shared way of life.

(2) The organic motors of action must be socially relevant. That is, the action of the individual cases must be viewed as a series of reaction to social stimuli or situation. In other words, the social meaning of behaviour must be taken into consideration.

(3) The strategic role of the family group in transmitting the culture must be recognized. That is, in as much as the individual case is a member of a family, the role of the family in shaping his behaviour must never be overlooked.

(4) The specific method of elaboration of organic material onto social behaviour must be clearly shown. That is, case histories that portray in detail how basically a biological organism, the man, gradually blossoms forth into a social person, are especially fruitful.

(5) The continuous, related character of experience from childhood through adulthood must be stressed. In other words, the life history must be a Gestalt or configuration depicting the inter-relationships between the person's various experiences. Such a Gestalt affords a comprehensive understanding of a person's life as a continuum.

(6) The 'social situation' must be carefully and continuously specified as a factor. One of the important criteria for the life history is that a person's life must be shown as unfolding itself in the context of and partly owing to, specific social situations.

(7) The life history material itself must be organized according to some conceptual framework, this in turn would facilitate generalizations at a higher level.

The criteria just discussed stress the specific chain of coordinated, related, continuous and configurated experiences in a cultural pattern which motivate social and personal behaviour. The criteria laid down by Dollard are principally perfect but some of these are hard to materialize are to be translated into practice.

Dollard tried to articulate the diverse events depicted in the life histories of persons in the course of repeated interviews, utilizing psychoanalytical techniques in particular situational contexts. His criteria of life history emanate directly from this experience. While the life histories have their independent importance as research documents, the interviews their writers can afford as Dollard observes rich insights into the nature of the social situations experience by them.

A person's life is quite complex indeed. There is till date no technique that can bring in some kind of uniformity and consequently, ensure the cumulativeness of case history materials by disentangling the complex totality that is human life. But although case data are not amenable to rigorous analysis, a skillful handling and interpretation of such data may help developing insights into cultural conflicts and problems born out of culture change.

Gordon Allport has suggested the following with a view to broadening our perspective in relation to case data.

(1) If the life history has been written in the first person, it must be as complete and coherent as possible.

(2) Life histories should have been written for knowledgeable persons. That is, if the enquiry is sociological, the writer should write it on the assumption that its readers will be sociologists.

(3) It is advisable to supplement case data by observational, statistical and historical data since these provide standards for assessing the reliability and consistency of the case materials. Besides, such data afford a basis for generalizations.

(4) Efforts should be made to ascertain the reliability of life history data through examining the internal consistency of the material, repeat-interviews with the person and personal interviews with the members of the subject's own group who are well acquainted with him.

(5) A judicious combination of techniques of data collection is a pre-requisite for securing data that are culturally meaningful and scientifically significant.

(6) Life histories or case histories can be regarded as an adequate basis for generalization to the extent that these are representative or typical of a particular group.

The researcher engaged in the collection of case data cannot afford to ignore the unique or atypical cases. He should take account of them as exceptions. As Thomas points out, there is no sharp line of division separating the normal from the abnormal in concrete human life.

Case histories are replete with valuable information of a personal private nature. This information helps the researcher to portray not only the personality of the person and the social situation impining upon him but also in formulating relevant hypothesis. Though critical of documentary materials generally, Blummer gives the credit due to them by pointing out that the personal documents afford an opportunity for the researcher to develop his spirit of inquiry. The researcher can conduct a more effective analysis of a particular aspect if he has acquired an intimate acquaintance with it by means of personal documents. Blummer does not, at the same time, lose sight of the limitations of the personal documents. He points out that independently, these documents hardly fulfil the criteria of reliability, adequacy and representativeness, but to exclude them from any scientific study of human life will be a blunder in as much as these documents are necessary and significant both for theory building and practice.

Despite the formidable limitation case data suffer from, these are used, not infrequently, by sociologists, psychologists, industrial psychologists, psychiatrists and anthropologists. In so far as the effectiveness of psychiatric diagnoses and treatment depend on the case studies, psychologists have laid heavy stress on a deep-going and comprehensive study of persons' lives. Gordon Allport has recommended in strong terms the use of case data.

The knowledge of particulars is truly the beginning of codified knowledge. It is out of our acquaintance of the concrete persons that the desire to know nature and understand its springs is born. The first step is to understand the concrete individuals and all the complexity of their nature. If we are in haste about analysing and classifying, we shall be running the risk of cutting down the emotional world of a person into artificial bits; as a result, the important emotional anchorages, organizations and natural identifications characterising the personal life of an individual may not be adequately represented. Hence, the psychologist must understand life as it is being lived.

On this view, the totality of life processes that is reflected in the well-ordered life history documents is invaluable in stimulating insights. The life history documents that afford a basis for comparisons contributing to statistical generalisations and drawing of inferences about the uniformities in human behaviour are indeed of great value. There is no reason to under-rate the personal lives of people that rightly comprise the basis of the psychological science. The final aim of science is to understand, control and make predictions about human life and to the extent this, expectation of science is borne out by the personal documents in terms of preparing the ground for psychiatric treatment, the theoretical and practical importance of personal documents should be considered beyond doubt.

A case may be considered the gateway to and at the same time the final destination of abstract knowledge. It is the interpretations of the peculiar and the concrete that contribute to the continual growth of abstract knowledge.

In 1929, Read Bain vigorously attacked the value and validity of case life history materials as significant scientific data. It was Bain's contention that these materials do not provide knowledge of the "impersonal universal, non-ethical, non-practical, repetitive aspects of phenomena."

The foregoing remarks of Bain point to some of the major deficiencies of the life history data. The subject, says Bain, "may write what he thinks the investigator wants... The greater the 'rapport' the (greater the subjectivity)... The subject is more likely to be self-justificatory than factual (characterized by) over and under-statement, convenient forgetting and (fantasy)... Case situations are seldom comparable... in a pluralistic universe of discourse... Since the subject tells history in his own words, logical concepts, units of scientific classification, have to be read into it or out of it by the investigator."

Prof. Bain has since his initial objection, changed considerably his stand vis-a-vis the case study research. In his subsequent modified stance Bain states that most of the dangers will be avoided as a matter of routine by those who are well-trained in the modern methods of collecting such materials and in the scientific techniques of assembling, classifying and processing data. The case data according to Bain are useful for diagnosis, therapy and other practical case problems. Case studies and life histories, he says, are an aspect of idiographic research and thus, a necessary prerequisite for any nomothetic (abstract) science.

Bain concedes that, by and large, case study affords fruitful hypothesis as also the data which may be useful in testing them and that without these, generalized social science would be handicapped.

Tremendous improvements in the techniques of case studies have been registered during the past few decades. Elton Mayo, Alfred Kinsey, Carl Rogers and M. Komarovsky are some of the researchers who have used the new techniques of collection, recording and processing the case data.

During the last few decades, case study techniques have shown a steady trend toward formalization, that is, case studies can now be conducted in such a manner that the data are amenable to quantification and statistical treatment. Case study techniques have become indispensable for therapeutic and administrative purposes. The materials collected by research-minded social workers can be very useful for 'pure' or 'basic' research. It should be remembered, however, that the social caseworker's orientation is substantially different from that of a social researcher. The social researcher, unlike the social caseworker, is interested in comparable case data and persistently searches for similarities or uniformities that enable him to classify or analyse data to formulate ultimately the law of their occurrences and relationship. He does not regard specific case situations as a sufficient basis for understanding human behaviour; rather he views the cases under study as the possible examples of a line of reasoning by which the researcher might be enabled to develop new concepts or theories or test the existing conceptual schemes.

12

SURVEY METHODS AND SAMPLING TECHNIQUES

A research study requires data, information and indicators in order to test a given hypothesis. Such information is either collected from secondary sources or is collected, complied and analysed. Usually primary and secondary, both sources are used in studies. Survey data includes information already in existence while experimental data can be obtained only through a well designed and controlled statistical experiment. Various methods are adopted by researchers towards collection of their requisite information for analysis. Most common methods are, (a) mailed questionnaires (b) personal interview structured scheduled (c) check-lists distributed by the researcher to a group or person (d) group interview by discussions initiated by researcher (e) case studies (f) systematic observation procedures (g) registration (h) study of records (i) tape records of reactions to given set of questions.

The choice for the method in a study can be exercised considering the nature and objective of a research study. Different methods may be useful for different types of information, nature of respondents, and may also be different in the state of availability of respondents, time and resources of the researcher. The researcher needs a complete set of information about a group of people before he proceeds to collect specific information in respect of sub-groups and categorised sections separately. For this an enumeration is a must. It covers only a few basic equiries which make grouping and sub-grouping of the population possible. Enumeration on a few given important items affords preliminary idea about the universe. In this enumeration each unit of the universe is contacted. This stage can be eliminated if we already have such requisite information from a reliable secondary source and if the margin of permissible error in conclusions is greater. In order to avoid a huge cost, greater time, personnel involvement and undue details of a study, we usually choose to work out our inferences about the whole universe from a part or some parts or the universe by way of a sample survey. The advantage of such method may be, (a) reduced cost (b) faster speed (c) greater scope coverage (d) much better accuracy and (e) saving of personnel.

The micro-studies are concerned with the observation of responses or behaviourial pattern of basic units such as firm, household person, or any other basic unit of a system. The assumption is that these work are under homogenous system. A single farming enterprise, a family, a soldier, a patient etc. are the units of study for studies on farming decisions, family budgets, problems of war-personnel, and worries of patients in a hospital. The definition of the elementary unit has to be adopted at the very outset and every elementary unit be under the sample unit. The sample selection is usually done by looking into probabilities, purposively or by mixed sampling. If the individual units containing the sample or selected with some probability of inclusion of each item of universe in the sample, it is probability sampling. Random method is one where such probability of inclusion in sample is equal for all units in a universe. This makes the selection objective. If the nature of study is such that the entire universe is not of equal relevance but some units are definitely to be included to make the conclusions sure and non-inclusion of these may destroy the purpose of study, we resort to purposive sampling. Here the probability of inclusion in sample in respect of some units is very high as compared to that of other units. The criterion of selection is determined beforehand. In mixed sampling both of the above methods are mixed to make a sampling design. The universe is grouped and sub-grouped in parts basing on the characteristics. This is purposive method. Then in each group or sub-group random method is applied.

From the stand point of sampling variability, systematic sampling method is better than random method. It is operationally more convenient and also ensures equal probability of inclusion in sample to each unit. It consists in selecting every 'K-th' unit, starting with the unit corresponding to a number 'r' chosen at random from L to K is taken as the integer nearest to N, the reciprocal of sampling fraction. The random number r chosen from L to K is known as random start and the constant K is termed as sampling interval. The value of r determines the value of the whole sample. This procedure amounts to selection with equal probability one of the K possible groups of units into which population or universe could be divided in a systematic manner.

The most usual method used by social scientists in social or economics is the method of stratified sampling. The total universe is first studied from the angle of variability. The universe is divided in certain groups between which the variation is greater and within which the homogeneity prevails with respect to the objective under study. For each group or set of groups, then independent samples are drawn. An appropriate estimator for the universe as a whole is obtained by suitably combining the stratum-wise estimators of the characteristics under consideration. The basis on which strata are formed is called the stratification variable. Generally, economists estimate the economic behaviour and it may vary with area, ethnic groups etc. They form such strata in sampling frame. When estimates are required with definite permissible margin of error for both the entire universe and in respect of a sub-group, it is convenient to treat the sub-parts or groups as strata. If researcher is investigating in to a divisional problem, he can treat district boundaries as strata. This will classify his data nicely and shall indicate more precise classified data. The sample shall also scatter itself in order to represent a greater variety. Administratively also stratification by area pays better. Lesser sampling error is likely to occur in stratified sampling.

Varying probability sampling is also adopted in some studies where the sample units may vary from various establishments according to size or nature of establishment. Cluster sampling is another method for intensive studies in specified areas of universe. Some suitable cluster of units are formed and all units in specified clusters are studied in this method. It is often found that the groups or units to be studied are not equally distributed in a division. Some patches are specifically more representative for such studies. Operationally this method is cheaper in cost and convenient for surveying. It is purposive method as mixed with stratified. The sampling efficiency in this method of clusters decreases with increase in the size of the cluster. When the principle of stratification and clustering is extended to random method of selection, we come to multistage sampling method. The selection of units may pass through various stages. We may cross several stages in reaching our ultimate unit of study. From a region we may choose the clusters and further choose sun-clusters and then choose observational units of study. From division one can proceed to choose districts, then in districts one can further choose development blocks and from selected blocks, we can choose villages and then among them the sample households can be chosen. The method is a good technique to scatter the sample over a large area and seeking better accuracy. This method is not convenient from the standpoint of cost but affords a large variety of data in respect of each sub-unit. A choice for this method necessitates a good levels of information at every stage. In case of a fixed number of sample unit study, this method affords greater scope to cover variability.

If the information about any universe is very scanty and decisions of sampling are possible only when some information is available, researchers resort to the explorative pilot surveys. This has two advantages; (a) collection of basic information and (b) testing of the apparatus.

At the execution levels, a researcher needs special care at being specific regarding the data requirements. His clarity is needed in making definite as to what is his domain of study, how data are to be tabulated, what levels of accuracy he expects in his results, the cost and time of survey, whether his enquiry is an adhoc field assessment or a repetitive assessment extended over a larger span of time, which method he would combine in his design of sampling, the form in which a respondent would be put to interview, what would be the reference period for reporting in his enquiry, what sort of training would be necessary for interviewers, whether mechanical tabulation is to be resorted to how and which checks and balances would be needed at which stage of field-work i.e., whether field spot-checks, cross-checking, pre and post survey checks, scrutiny of schedules, inter-penetrating sub-samples, how non-response will be dealt with and how the consistency would be checked and inconsistency explained etc. The best method to take decisions and being firm on the plan of survey, is to consult the experienced field staff of research organisations working on similar lines. Class-room lectures do not so much help the procedural knowledge and method of decision-making at the field.

Stratified sampling is the most popular method used in social and economic surveys. The total population units, or any other units as the case may be, are subdivided in sub-population units which constitutes the strata. This may be a division adopted by spatial parts or the division by some other demarkable feature. The sub-units, so formed are *non-overlapping* and exclusive. If samples are drawn from the stratum, by separate random sampling it is ensured that the features of the strata are given representation which could also be left out under the unstratified random sampling. Stratified random sampling has some special advantages over the simple random sampling. Suppose we want to study saving behaviour of a set of population at a point of time. The population group under study is our universe. It consists of a large variety of sub-groups like persons or families at starvation level, slightly better than these are families which are at poverty line but are not the well to do people still other demarkable sub-group is composed of wealthier families whose saving behaviour may be distinctly different from the rest of the two sub-groups. These three sub-groups may be taken separately for selection of random sample. Greater precision in results may be obtained by using this stratified random selection. The decisions as may be necessary for adopting this may include the successive stages like; (a) identification of strata (b) Determining the number of strata which are to be considered by the study, (c) Deciding the exact number of ratio of the sample in each strata, (d) The proportion which obtains between the population of adopted strata in the universe suggests the number of sample units in each strata. The strata populations added together always equal the population of the universe. The strata are characterised by comparable homogeneity in the population inside the strata. Features within the strata are similar as compared with the features of the content of other strata. Geographical or spatial satratification is also done to allow an equal representation to each part of the universe. This scatters the selected samples in each part of the area, or universe. Topographical, climatic, racial, ethnic, income, size of operational holding, irrigated and unirrigated zones etc can make the strata. Residents of *Harijan Basties*, landed higher caste zamindars and government servants are the three demarkable social groups and their localities of residence can make the strata. Within each strata, the extent of variability may be reduced to minimum by adopting such a feature as the basis which is absolute and can be segregated. It is however essential that the surveyor should possess a good knowledge of the universe and the dividing features taken as strata should be fit to make the mutually exclusive categories.

The primary methodological consideration in selection of samples in the different strata is concerned with the resources; money-cost, convenience, persons to handle the work and the time resource. If the variabilities in the sample are many then the size may have to be quite big and each variable subset of the strata may have to be separated to constitute the second stage strata. Each stratum size should be adequately big. An effort is always made to achieve the best precision with minimum of cost.

The size of the sample from the strata depends on the nature of study, its expected level of precision, variability level, and the cost aspects. There are mainly four methods of deciding allocation of sample size; (1) equal allocation (2) proportional allocation (3) Neyman allocation; and (4) optimum allocation. The first may be adopted when different strata have same size and these are the spatially formed administrative units. A study sponsored by the state divides itself in regional strata and each district forms its group. In each district the samples are the same. But this is not scientific in case of all types of studies. Districts are not formed by any rationality and not even the area or population or climate or topography or ethic settlement etc. These are rather formed by chance or historical events and are based on administrative convenience. Bowley technique of proportional allocation was founded in 1926 and it is a most simple and scientific method if the nature of study fits in this. This also depends on the information base available at the time of sampling regarding the universe. If the features under study are likely to be nearly same everywhere in the universe divided in the subgroups constituting the strata, this proportional allocation of the sample may be quite useful. Similar sample fractions are adopted for all strata.

Tschuprow discovered the method of 'size' and 'variation' collaborated considerations for allocating the sample among the strata. In 1934, Neyman named it as 'minimum variance allocation' method. The variability as well as the size of strata are together taken in consideration in this technique. But the difficulty which a researcher faces in this is that nothing is known about the universe before the actual survey. Then the extent of variability keeps unknown to the researcher. In order to overcome this, the usual practice is to hold a small pilot survey before the actual large size study. Pilot survey affords the data base to use minimum variance allocation. The minimisation of variance for a specified cost of conducting the sample survey can be attained by applying the optimum allocation method. The values of stratum variances are determined by pilot surveys or the studies referring back to other surveys in the stratum demarkated.

13

DATA COLLECTION

AN INTRODUCTION

Various methods of data collection are employed by social scientists. Varied dimensions relevant to data generation and attempt to arrive at an abatract typology involving stimuli, responses and sertings for data collection, are discussed.

A datum is what is observed, is manifestation or phenotypical. Data in social sciences, as in other sciences, are based on our sense-observations. The word 'observation' as used here includes all forms of perception used in recording responses as they impinge upon our senses. But response is not a datum. A responses is some manifest kind of action, whereas a datum is the product of the process of recording the response. The continuum from reponse (which is observable) to the datum (which is observed and recorded) has been presented by Johan Galtung as under:

The Stimulus to Datum Sequence

1.Stimulus	2.Object	3.Response	4.Impression	5. Datum
Presentation	Manifestation	Perception	recording	
a	b	c	d	

The stimuli(questions, tests, pictures or other objects) presented to the respondent(subject) may be classified as: (a) systematic stimuli, and(b) unsystematic stimuli. By systematic stimuli we mean those that are kept constant while objects are changed, i.e., all units (subjects) are exposed to the same standardized stimuli systematically. Contrariwise, the stimuli are unsystematic when they lack standardization, e.g., in informal interviews where subjects are asked questions they are most likely to find meaningful.

The responses of the subjects to the stimuli may similarly be classified as:(a) systematic responses, and (b) unsystematic responses. Systematic responses have a reference to constant(definite, standardized) response categories. Thus, the responses of subject to a stimulus(S1) are recorded on a predetermined set of response category(R1). Contrariwise, the responses are unsystematic where the answer is recorded verbatim with due regard to all possible individual variations and characterological nuances (as in informal interviews).

Bringing the categories of stimuli and responses together in a single complex table, we ger the main setting for data collection as under:

		Stimuli	
		Unsystematic	Systematic
	Unsystematic	Informal settings	Formal Unstructured settings
	Systematic	Impossible	Formal Structured settings

Thus, the possible settings of data collection are:

(a) Informal.

(b) Formal unstructured.

(c) Formal structured.

The responses of the subjects may be characterized as acts. Inaction or silence on the part of the subject may also constitute an important response, often more revealing than many responses which can be called 'acts'. Acts in the sense may be classified into (A) verbal, and (b) non-verbal.

The verbal acts may be sub-divided into oral and written. Verbal acts are acts where verbal symbols are used to communicate. The non-verbal acts are like bowing, clapping, shrugging shoulders, etç. The oral-verbal acts consist of the subject replying to a stimulus by the word of the mouth. The other kind of verbal acts consist in writing out the responses/replies to the stimulus.

If we intertwine the three kinds of manifest acts with the three settings of data collection, we get a table with nine boxes or cells. This break down table (given below) brings out most of the known procedures of data collection utilized in social sciences.

The contents of different cells in the table may be considered to be general ideas that may also be used to generate other techniques of data collection. The subsequent chapters are devoted to detailed treatment of the major forms of data collection and significant ramifications of these.

The main forms of data collection responses

	Responses		
	Non-verbal	*Oral-verbal*	*Written-verbal*
formal settings	Participant observation	Conversations, use of informants	Letters, articles, biographies
Formal unstructured settings	Systematic observation	Interviews unstructured	Questionnaire open-ended
Formal structured settings	Experimental techniques	Interviews structured	Questionnaire structured

THE PAPER SOURCES OF DATA

The two main sources of data (information relevant to the research problem) in social science research come from the inner world of library and the outside world of living people. We may broadly designate these two main sources simply, the 'paper' and 'people'.

'Paper' sources may provide the social or behavioural scientist wealth of usable information. It is often unnecessary and uneconomical to expend time and energy mounting field-surveys to collect information readily obtainable from authentic 'paper' sources. Under the general rubric of documentary or 'paper' sources, we may subsume historical records diaries, biographies and statistical records, etc.

When one turns to consider 'people' as the potential source of social science data, we identify various forms of observation but more particularly and primarily, the interview and questionnaire, as the techniques for collection of data from this source.

Documentary Sources of Data

Let us turn to discuss the typical and the major limitations of the documentary or 'paper' sources of data.

The social scientist as a rule has important facility in that the events and processes which concern him are human beings mostly living through them. Written evidence thus has straight-forward function of providing facts and figures and the indirect function of helping us project our under standing into other times and places.

It is customary to distinguish between the sources of documentary data as primary and secondary. The 'primary' sources provide data gathered at first-hand and the 'secondary' ones are those from which data are got at, second hand, that is, sets of data are culled from other people's original data. It is not always easy, however, to be able to determine whether a particular source is 'primary' or 'secondary'. This is so because in much published word, there is not just one writer who would have collected the information himself. For example, as for the census report, one can hardly say that the Commissioner of Census himself is the author. He does not collect data personally. But the census data are regarded as 'primary' data since the Commissioner is a single entity collecting and analysing the information gathered at first-hand through field workers under this charge.

The distinction between 'primary' and 'secondary' can be made even more useful if a further division of documents between what John Madge calls 'records' and 'reports' were to be effected.

"Record' is primarily concerned with a transaction taking place now, whereas the 'report' is usually written after the event has taken place(e.g., historical account). Cross-tabulating these two contrast sets, i.e., Primary-Secondary and Contemporary -(Record) Retrospective (Report), we get a four-fold classification of documentary sources, as shown below:

		Primary data		*Secondary data*
Contemporary	(1)	Letters Contracts Court records Census of Population Tape recording and Films etc.	(2)	Historical study using actual documents, Statistical research based on census data, Research using other peoples' correspondence. Research report based on assistants' field-work.
Retrospective	(3)	Personal Dairy Autobiography Report on Institutional Visits, etc.	(4)	Research using diaries or autobiographies.

Cell(1) to (4) connote as follows:

(1) Compiled at the time by the writer.

(2) Transcribed from primary contemporary sources.

(3) Compiled after the event by the writer.

(4) Transcribed from primary retrospective sources.

It should be noted that the cells in the above table, however, do not represent water-tight compartments; these should be regarded as displaying the general categories which may cut into each other. The fourfold categorization helps us, nevertheless, to identify common features of the different kinds of documents. John Madge proposes that documents, for the sake of convenience, may be broadly divided into two groups. The first of these groups would comprise the personal documents, the authors of which describe events in which they participated or indicate their personal beliefs and attitudes. Such documents are essentially subjective and are generally distinguishable from the second group which consists of the public or official documentation of social activity, hence relatively speaking, more objective.

Personal Document: In its narrow sense, the personal document is a spontaneous first person description by an individual of his own actions, experiences and beliefs. The wide range of personal documentary material comprises autobiographies, diaries and letters and other artistic and projective documents which describe the subject's experiences and his beliefs or which give an insight into his cultural background. 'Life history' as a personal document relates to a comprehensive autobiography. But in common usage, a 'Life-history' may be almost any kind of biographical material. For Thomas and Znaniecki, the authors of 'The Polish Peasant,' the personal document constituted a perfect type of sociological material. Thomas and Znaniecki made vigorous use of the personal materials in their study of the Polish Peasants. Their stress on the use of such personal material subsequently proved to be something of a turning point in the development of social science.

At the time of publication of 'The Polish Peasant' more than 60 years now, the social scientists were very keen on making their discipline comparable in objectivity to natural sciences. From this view-point, personal documents (being essentially subjective) were regarded as of low scientific value. However, the sociological use of personal documents, thought to be out of the mainstream of development for a time, had not at any stage disappeared totally. Its persistence was partly due to the growing acceptance by social science of the whole range of psychological concepts and methods. The major thrust of the revelation by Sigmund Freud that it was possible to conceptualise human beliefs and actions in terms of private and even unconscious motives and influences was that the subjective world is also accessible to and cot beyond the scope of scientific investigation.

Blummer's criticism of the use of personal documents by the authors of 'The Polish Peasant' inaugurated a controversy. Subsequently, four authorities drawn different social science fields, namely, G.W.Allport, L.Gottschalk, Clyde Kluckhohn and Robert Angell were invited to develop their views on the validity and limitations of personal documents as a tool of social science. These authorities reached the conclusion that subject to necessary safeguards, the use of personal documents was not only permissible but also indispensable. They have indeed made a lasting contribution to social science in terms of systematically analysing the typical hazards attendant upon the use of personal documents. Two crucial issues they raised pertain to:

(1) The methodological question of how far disortions enter in the course of translating private thoughts into permanent records, and

(2) The question of how to gather and analyse the number of personal documents needed for the derivation of abstract principles or hypotheses.

Allport indentifies thirteen motives that might induce individuals to record details about themselves, viz., self-justification by special pleading, exhibitionism, desire for order, literary delight, securing personal perspective, relief from tension or catharisis, monetary gain, assignment to write a brief autobiography, assisting in therapy (for a psychiatric patient), confession as means to absolution, scientific interest, public service and example (to achieve a reform or offer a model) and desire for immortality.

It is understandable that the individual's underlying motive is quite liable to influence the contents of the documents. Some authors, for example, may have a deliberate propagandist intention. Literary dishonesty may lead to suppression of unpalatable and undramatic sequences to form an aesthetically structured whole. It must be remembered that "...every contributor is a prisoner of his own culture." It cannot be helped, therefore, that his thought processes are likely, by and large, to be determined by the society in which he lives.

It shall be discuss briefly the main forms of personal documents, namely, autobiographies, diaries and letters.

Autobiographies which are written sometime after the occurrence of events recorded in them and intended for publication, may be expected to suffer from propagandist intentions, from a tendency to rationalize and from conscious stylization. The prospective view, on the other hand, enables the writer to select and display such of his experiences and actions that subsequently come out to be significant features in his 'life history'.

Diaries are often the most revealing, especially, when they are 'intimate journals'. This is so because they are less constricted by the fear of public showing and because they reveal with greatest clarity what experiences and actions seemed most significant at the time of their occurrence. But the diaries may exaggerate the conflicts and dramatic phases of life maintaining silence about the long calm and happy periods. Often the diarist assumes that the reader knows the persons and situations which he fails to adequately describe. A shrewd diarist may with some ulterior motive write a diary which will easily fall into the outsiders' hands and in effect mislead them.

Letters are often used by researchers, as evidenced in the study of the Polish Peasant. The authors Thomas and Znaniecki analysed 754 letters exchanged between the Poles in the U.S.A. and those in Poland. Letters often have some propagandist intention since they are designed by the writer to convey to the recipient some impressions more telling than mere facts. As with diaries, the letters often lack continuity and assume much of what any third party may be ignorant about.

It has been seen how the personal documents by their very nature engender strong possibilities of distortion. It must be admitted that no internal test or screw exists for the analyst to correct such distortion . The only satisfactory correctives are the external ones, such as the degree of correspondence with other sources of information or with observed behaviour and the success of predictions based on the original material. Gottschalk lists five kinds of circumstances which may predispose the investigator to believe that the informant's statement is truthful.

(a) When the truth of the statement is a matter of indifference to the witness, he is likely to be unbiased (this might possibly have impaired his observation or memory).

(b) When the statement is prejudicial to the informant or his interests, it is likely to be unusually truthful.

(c) When the facts at issue are so much the matters of common knowledge that the informant would be unlikely to be mistaken or lie about them.

(d) When the part of the statement of primary interest to the investigator is both incidental and intrinsically probable.

(e) When the informant makes statements which are contrary to his expectations and anticipations as assessed by the investigator's knowledge of this thought-patterns and preconceptions.

It may be remembered here that many of the personal documents are recorded not by the investigator (as when the informant is illiterate). In the course of recording, the investigator himself may be 'blinkered' and 'polarized' by the investigator's own interests and line of approach. The informant is not only led to introduce topics which may barely be of any interest to him; he may even adopt attitudes and pretend investigator's influence.

It should now consider how far the personal document material might serve as a basis for generalization. It is generally believed that people whose personal documents become available are the ones who tend to be suffering from frustrated emotional lives. Should this be a fair surmise generalisations based on personal documents would clearly refer to such people and not to the population as a whole. One way or overcoming this limitation is to solicit the cooperation of a more representative cross-section of the population. The documents may be offered to be purchased. The offer of payment coupled with a promise of anonymity has been shown to induce the otherwise reluctant people to come out with personal documents. But such a practice may affect adversely their representativeness.

Even if the problem of typicality is solved, the problem of obtaining. A sample of documents large enough to permit fine analysis still remains. In favourable circumstances, however, investigators have been able to obtain large samples (for example, Thomas and Znaniecki used a number of fragmentary autobiographies, large number of letters and a considerable collection of records, newspaper accounts, etc).

Thrasher in his study 'Gang' was able to supplement his main technique by persuading a number of gang members to write their life-stories.

The Public and Official Documents

Newspapers: *Newspaper* reports, where a reporter was present at the scene, might be thought of as valuable. But it has been shown too often how little reliance can be placed on them. It should be recognized the pressure under which the newspaper correspondents work. Many of the correspondents may depend on their personal system of Recording. In many cases, the correspondent may highlight only the 'eye-catching' and the 'dramatic parts of the total occurrence. Typically, newspapers work very fast. Latest news is always most desirable. Staleness is a taboo. Reports are controlled by available space and newspaper's policy. The popular press is often more concerned with entertaining than informing.

Public Records and Statistics: These are, on the face of things, the most satisfactory and reliable sources. For example, the verbatim parliament one can find. More valuable than a written record is tape-recording which preserves not only what was said, but also how it was said. An unedited sound film could be even better. Their reliability too is usually high. The inventory, balance sheet etc, are useful accessories to business transactions; there are penalties for false statements.

The Census Reports, the annual digests of statistics and statistical reports of various State departments and other national bodies produce a great deal of useful data for social scientists to work with. Official statistics, although the data on which they are based may not be directly relevant to the researcher's interests, are in most instances designed to inform rather than deceive the readers. These are normally prepared by experts and this is a point in their favour.

The range of matter covered in available records and the treatment a subject receives in such records varies with the administrative needs for which they were collected. Health statistics give birth and death rates, etc. Public and private economic organizations collect and publish data on wages, hours of work, productivity, absenteeism, strikes, etc. In addition, a small but steadily increasing body of data is being collected by various institutions like schools, hospitals, social service agencies, etc, on the psychological level proper.

Data collected in the course of such other activities have a number of advantages for social research in addition to that of economy. A major one is the fact that much information of this sort is collected periodically, making the establishment of trends over time possible. Another is that the gathering of information from such sources does not require the co-operation of the individuals about whom information is desired as does the use of techniques such as questionnaires, interviews, projective techniques and often observation. Moreover, since such data are collected in the ordinary course of events, the measurement procedure is less likely to reveal the investigator's purpose or to change the behaviour in which he is interested.

K. M.. Landis based his study entitled 'Segregation in Washington' exclusively on the analysis and interpretation of available statistical data, e.g., census reports, official health statistics, employment data, police statistics, etc. Similarly, Leo Srole in his study of 'Status and Prestige' (in the 'Yankee City' series of investigations by Warner and Associates) utilized a rather unusual source of data relevant to his problem- the cemetery records.

It needs to be stressed that the statistical data require that the investigator is able to ask many different questions related to the research problem. If a research idea or hypothesis can be formulated in such manner that the available recorded material bears on the question, the use of such material becomes possible. The guiding principle for the use of available statistics consists in keeping oneself flexible in respect of the form in which research questions are asked. Durkheim's study on suicide provides a classic example of how the superior flexibility of a genius resulted in the testing of a social theory by available statistics. Durkheim started with the hypothesis that the causes of suicide are to be found in the social conditions. To test this theory, Durkheim studied critically the statistics on suicide in certain European countries.

Certain studies, such as Durkheim's, rely entirely on the analysis of data collected for purposes other than those of the particular study. In regularly collected for other purposes may be used to measure the effects of an experimental treatment. Thus, in the Hawthorne electrical studies, Roethlisberger and Dickson found that changes in such conditions as illumination, rest periods and hours of work could not account a consistently rising rate of productivity in the experimental groups over a period of time. They subsequently concluded that changes in social organization of work groups and their relationship to management were responsible for a rise in productivity.

Available statistics may be used for other purposes, in a study. They are frequently useful in selecting cases with specified characteristics for intensive study. Available records may also be used to supplement or to check information gathered specifically for the purposes of a given investigation. For example, in a study of the psychological impact of long term unemployment in an Austrian village (Jahoda, Lazarsfeld and Zeisl) the 'shock' effect of unemployment was checked against such records as the accounts of the local grocer.

The records of specific behaviour may be used as an indicator of some more general concept. A series of studies by Tryon illustrate this use of records. Tryon was concerned with the problem of identifying sub-cultural groups in more meaningful and reliable ways.

One of his hypotheses was that the residents of common demographic social area will experience certain common socially relevant situations and common psychological states elicited by those situations and will behave in certain common ways. As an evidence to test this hypothesis, Tryon used voting records. Voting for him was an indictor of social attitudes.

The investigator must take certain precautions even when using statistics which are generally considered reliable.

(a) The definitions of categories used in available statistical material do not so often coincide with those used in social research. In criminal statistics, for instance, the concept of 'crime' is operationally defined in a number of ways. Asocial scientist interested in family composition may be grossly misled if he proceeded on the basis of the operational definition of a household as used in the census reports. In view of such confusion, the use of available records may be more misleading than enlightening unless the precise definition on which the statistics are based is ascertained.

(b) To know merely what the original collector of available data (records set out to gather is not enough; it is also necessary to enquire into his methods. Many records are collected with the intention of covering an entire 'population' and not just a sample. Many obstacles stand in the way of realizing this ideal. It may also be that the informants from whom the original collector drew information were not willing to provide it. Income statistics based on individual tax declarations generally tend to be underestimates. This cannot but be the case.

(c) It is quite possible that the degree of inaccuracy in official statistics due to these reasons may be negligible from the point of view of the social scientist. But there are methodological errors that may lead to serious inaccuracies. This fact needs to be kept in mind especially when dealing with data collected over many years. Kingsley Davis in 'The population of India and Pakistan' has pointed out that the olden rural statistics were kept by the village chowkidars to whom the most obvious and indtelligible cause of death was 'fever'. The increase of certain causes of death (other than fever' shown in later statistics is probably a reflection of the change in the techniques of reckoning.

Thus, to ignore how statistics are kept and for what purpose, is to misuse statistics badly. It is, of course, no criticism of the statistics themselves. Occasionally, it is possible to correct available records in the light of what is subsequently known about the methods by which they have been gathered. In any case, the proper qualifications in respect of such data when used for research purpose can be made only if the social scientist is aware of the possible errors inherent in the particular method employed.

The brilliant remarks on the subject by Professor A. L. Bowley is quoted: "It is never safe to take published statistics at their face value, without knowing their meaning and limitations, and it is always necessary to criticise arguments that are based on them unless one is able to trust implicitly the knowledge and good faith of the persons bringing them forward. It is extremely easy to falsify lessons which numerical statements should teach. The actual use of appreciation of statistics are ultimately a matter of intelligence, special knowledge and common sense."

Biographies

A glance along the borrower's registers of a public library will show that the common borrower enjoys reading about other people's lives. The biographer generally works on people of some fame, whatever their spheres of activity. Thus a biography is more likely to be about some famous person, his outstanding success or the eye-catching personality. The professional biographer depends on sensationalism for the sale of his work and as such he may try to make his book sensational, shocking, dramatic. There is a possibility that the biographer may be motivated by a concern with the defence of a dead person, such as biographies written by loving sons and daughters. In yet another instance,. biographer may have been commissioned by the family of a person. This latter type of biography must be carefully sccrutinized since it is hardly likely to contain much criticism of its subject; it is rather likely to be replete with justifications and accentuation.

Historical Documents

Conventionally, historical documents deal with events of the past about which the main source of information is documentary, the participants being dead. This definition is by no means satisfactory since there is plently of the present century alive in the minds of the living people. Nevertheless, the historical document belongs to special category of its own since it enables us to appreciate the importance of the links between social sciences and history.

Much of sociological investigation is prefected with historical background. For example, community studies bring out the historical development of the given settlement, the study of organizational structure of the trade union can only gain a good perspective by tracing the development chain. In all investigations such as these the sociologist must turn to documents to establish the sequence of events and try to understand the process that took place in the past. The sociologist who drives into historical research without seeking advice from the historian will only waste time and effort in seeking out correct sources and is likely to use the sources badly if he knows little about the way in which the documents were compiled.

Case Histories

'Case- history' records are collected in the course of welfare work. the case-workers are first-hand observers of social behaviour. This material can be utilized by social scientist with great advantage. It should be noted, however, that the case-workers tend to record their observation in an impressionstic way, their descriptions are subjective based on general personal experience with little concern for classification within an integrated conceptual framework. Since there is likely, in case-work, a bias toward the socially pathological (in the selection of cases) and as the case records have little uniformity, generalization is often difficult. On the other hand, it is in the nature of case-histories that they abound in richness and evocative quality. There is no doubt that the data of the large and increasing body of case-workers with experience of various forms of pathology, can be utilized by the social scientists very fruitfully in their researches.

Before the close of the discussion on documents, which afford a potent source of social science data, it is important to consider the question: "How far can documentary evidence, even when properly selected and checked for authenticity, be used as proof?" This is an issue of great importance, not only because a large part of social evidence is still entirely derived second hand from documentary sources but also because there are reasons for supposing that the user of documents is often tempted to stretch his material to suit his imaginative thesis. He also has, to boot, unique opportunities for doing so.

It has been recognized generally that the documentary material by itself may never provide a deep insight into the motives and activities of other generations. It is also generally accepted that the ideal of objectivity, however possible for the natural scientist, is beyond the reach of any historian. This does not mean, of course, that the historical facts are a suspect. As Carr points out, "...(the facts) have the same relation to history as bricks or steel or concrete have to architecture.... But they are not in themselves 'facts of history'. It is only the decision of the historian that they are significant for his purpose which makes them into the 'facts of history'... His choice and arrangement of these facts and juxtapositions of them which indicate his view of cause and effect, must be dictated by presuppositions and (these) will be closely related to the conclusion which he is seeking to estahlish... History therefore is an interaction between the historian and the past of which he is writing. The facts help to mould the mind of the historian. But the mind of the historian also... helps to mould facts."

In the light of the above, a question that poses itself is how the social scientists can exploit the documentary material and how they can overcome their prejudices while using them. The classical well-thumbed method is for the scientist to search his mind until he has exposed his own biases. Even if he cannot overcome them, at least he is able to make some allowance for them (Socrates). But the psychologically naive belief that it is possible by introspection to unearth every secret interest and prejudice is no longer tenable. The most persistent, 'obvious' and 'commonsense' of the individual's presuppositions may just be those which could be restricting his understanding and preventing him from realizing the significance of many of the facts available to him. If his access to the problem is by way of documents alone, these limitations are especially prone to detract from the richness of his results.

Even within the bonds of admissible ideas, the user of documents has ample scope for distortion so long as his conclusions are based on impressions and he wants us to take a lot of trust. A more recent development which consists in the direct use of quantitative methods on documents themselves, greatly reduces the possibility of impressionistic distortion. The technique is known as 'Content Analysis'. We shall discuss this technique at some length.

Content Analysis

Berelson defines 'content analysis' as a "research technique for the objective, systematic and quantitative description of the manifest content of communication."

Content analysis is a methodologically sophisticated version of the commonsense technique of finding out how an author of a book has treated a particular subject. This can be found out easily enough by the commonplace practice of looking at the book. Content analysis is a formalization of techniques that have long been used informally. As we well know, the number of references and the space devoted ton a particular subject give a fair indication of the importance attached to it by the author. This commonsense technique was gradually improved upon and in 1930 the first full analysis along these lines was published (New York). The topic happened to be the amount of space devoted to foreign news in American morning newspapers. Early examples of formal content analysis are afforded by military intelligence agencies during wartime. Enemy newspapers and radio stations were monitored exhaustively and counts were made of various kinds of references to transportation, obituaries and so forth. Variations in the numbers of such references from week to week generally signified troop movements and other changes that suggested what the intentions of the enemy could be. The value of this technique a few years later, was enhanced and confirmed in Hornell Hart's analysis of trends in the space devoted to various subjects in American periodicals and books. The next important step was the adaptation in 1973 by Harold Lasswell of the technique of content analysis for the systematic study of recorded psychoanalytical interviews. Subjects covered in these interviews were systematically classified and as a result, much of the same scheme of categories could be used in a variety of other contexts. With the outbreak of war in Europe, Lasswell took over the directorship of an officially sponsored World Attention Survey based on content analysis of foreign newspapers. Apart from certain immediate functions, this technique was found to provide an intellectual weapon of substantial consequence. For example, the content analysis indicated that Germany was clearing the path for a sudden change in diplomatic orientation. This surmise came out to be true, subsequently.

Later, Leites and Pool used a similar technique to study changes in the Comintern policy and throughout the war, students of Lasswell and Leites undertook analyses of United States foreign language pres on behalf of the U.S. Department of justice. Over the years, internal propaganda, the speeches of politicians, the content of radio programmes, films, popular magazines, etc., have been subjected to content analysis. Content analysis was used during the initial interviewing programme in the 'Hawthorne Electrical Company Studies' and also included in the preparatory technique for the 'focussed interviews' undertaken by Merton and Kendall. R.K. White content analysed the public speeches of Hitler and Roosevelt with a view to identifying the propaganda techniques and describing the appeals of Political leaders to their followers. White systematically ascertained the main, he identified three values on which he compared the two leaders, one authoritarian and the other democratic, i.e., strength values, moral values and economic values. Content analysis has been used extensively on studies of mass media to determine changes in either the media themselves or in society and culture with the passage of time.

A survey of the field by Berelson brings to light the specific purposes for which documents or communication-contents have been analysed. These are as detailed below.

One of the more exciting uses to which content analysis has been put is exemplified by D. McClelland's study of the historical relationship between the motivation to achieve among the members of a society and the economic development of the society. McClelland and his associates literature of the society at various periods and related these frequencies to economic indicators. For example, they found a close correspondence between the content analysis of data and coal imports into London from 1550 to 1850. Considering the multiple obstacles present in such investigations the closeness of the correspondence has been acclaimed to be startling. Pitrim A. Sorokin used content analysis to analyze the ground cultural changes over millennium. He clearly brought out how the proportion of philosophers of different outlooks has changed from century as a proxy for the way held by the various systems of truth.

The content of art has also been analysed systematically and the technique has been acknowledged as a source of much of our understanding of the contacts among cultures, diffusions and the transmission of knowledge among them. Anthropologist A.L. Kroeber traced the travels of the flying gallop (an invention of artists) as a way of representing a running house in art and established a sequence of transmission of knowledge amongst cultures.

Berelson specifically mentions, schematically, the major purposes for which content analysis has been employed.

(a) purpose of Ascertaining the Characteristics of Content:

* to describe trend in communication-content;
* to trace the development of scholarship;

* to disclose international differences in the communication of content;
* to compare media or 'level' of communication;
* to audit communication-content against objectives;
* to construct and apply communication materials;
* to aid technical research operations;
* to expose propaganda techniques;
* to measure 'readability' of communication materials;
* to identify stylistic features.

(b) Purpose of Ascertaining the Causes of content:

* to indentify intentions and other characteristics of the communicators;
* to detect the existence of propaganda;
* to determine the psychological state of persons and groups;
* to secure political and military intelligence.

(c) Purpose of Ascertaining Effects of Content:

* to reflect attitudes, interests, values of populations;
* to reveal focus of attention;
* to describe attitudinal and behavioral response to varied items of these three broad purposes.

The research procedures involved in the content analysis generally, of books, magazines, newspapers, radio programmes, T.V. serials and films etc. consist in utilizing a system or scheme of categorization on which basis the communication or documentary content is analysed from a quantitative angle and this in turn is geared to test hypotheses the investigator sets before himself. Hence, content analysis may be used to test hypotheses about the treatment of minority groups in magazine articles or in films etc., or to enquire into propaganda techniques. Communication through the media or radio, films, public speeches, etc., has been subjected to content analysis. The important point about content analysis is that content of communication is analysed by means of systematic predetermined categories based on themes, value intents and styles, etc., as the need may be, which often yield quantitative results. A simple instance would be to hypothesize that a certain newspaper has changed its policy orientation since the ownership of the newspaper changed hands, say, a couple of years ago. Rather than leaving this as an impression of the readers, content analysis would test the impression systematically and see if it conforms to reality.

Due largely to the work of Lasswell and associates, the technique of content analysis has registered a tremendous improvement. The analysis of content proceeds under certain controls that render it systematic and objective in comparison to the conventional impressionistic review of communication content. Firstly, the categories of analysis used to classify the content are clearly and explicitly defined so that other individuals can apply them to the same content to verify the earlier conclusions. Secondly, the analyst is not free to select and report merely what strikes him as interesting but must methodologically classify all the relevant materials in his sample (which is of course, selected as a representative of the 'universe'). Thirdly, a quantitative procedure is used in order to provide a measure of the dominance and emphasis in the material of certain ideas or themes found and to make a possible a comparison with other samples of material. For example, if we took a systematic sample of newspaper editorials and counted the relative numbers of editorials expressing favorable, unfavorable and neutral attitudes toward a certain international issue, we would be carrying out a simple form of quantification that has proved feasible and reliable. We can on this basis come out with a more exact picture of the situation than would be possible if simply the general impressions or memory were relied upon. In the absence of some sort of mathematical aid, there is a limit to the amount of materials that can be digested and recalled in detail by the human mind.

LIMITATION OF CONTENT ANALYSIS

Firstly, definitions of content analysis tend to emphasize the procedure of analysis rather than the character of data available in communication. In addition, they imply a somewhat arbitrary limitation of the field by excluding from it, all accounts of communication that are not cut out in the form of the number of items various ideas or themes (or other elements) appear in the material being analysed. Secondly, concern with quantification in practice, seems to have become so dominant that it often overshadows concern with the unique content of communication. It is indeed difficult to be convinced as to why quantification should be regarded as an essential requirement in content analysis when it is not so in the customary analysis of data obtained by interviews or observation. Granted that quantification is a more precise procedure, yet it is not always feasible. It hardly needs to be stressed that both quantified as well as qualitative data have their legitimate place in the contemporary social science. Besides, the stress on measurement in content analysis often implies that one indulges in an exercise of measuring the unmeasurable, i.e., qualities.

The problem of drawing a sample of the material to be content analysed, poses its own brand of problems. Suppose a researcher was interested in analysing the concern of the national press with the issue of ceiling on urban property. The first task of the analyst will be to define his universe, i.e., the national press. For his purposes, it may not be satisfactory to list all the newspapers published in the country and to draw a systematic sample(every fifteenth or twentieth newspaper) even if he were to ensure that newspapers representing different geographical areas, political orientations, economic policies, etc., are included in the list of the newspapers. The fact is that the newspapers vary greatly in size and influence and, therefore, a realistic sample should not weigh some obscure journal with an influential metropolitan daily. Thus, it would be proper to divide the newspapers into a series of classes according to their circulation and then draw from each class a 'random' sample covering a given volume of readers. So far as the issue of ceiling on urban property is concerned, it may not be judicious to assume that the volume of circulation of a newspaper correctly represents its influences over the population. To overcome such problems, the researcher may more properly choose the procedure of a 'Popularity sample'. He may, for instance, choose a sample comprising the write-ups from ten largest newspapers in the country.

Another problem related to sampling of the mass media contents relates to the time order. The researcher may get a distorted impression of the general policy of newspapers if the editions for only a single day or even a single month were studied. On the other hand, if the researcher were to cover a period of several months, the task would plainly become unmanageable. Before he knows how many issues he can handle, the researcher/analyst will have to decide on the nature and size of the units that are to comprise his sample.

Frequently then, the sampling procedure in communication research consists of three stages:

(a) Sampling of sources (which newspapers, radio stations, etc. are to be analysed);

(b) Sampling of dates (which period is to be covered by the study);

(c) Sampling of units (which aspects of communication are to be analyzed).

Now we need to ponder over the problem of establishing categories for analysis. Suppose, our researcher has decided to choose a sample of editorials. His next task will be to establish categories in terms of which the editorials could be classified. The researcher has two major bases for establishment of relevant categories:

(a) The research purpose or hypothesis; and

(b) The material itself.

The newspaper's concern with say, ceiling on urban property can fend expression in a variety of ways. The paper may emphasize it or it may ignore the issue. It may confine itself to straight non-committed or informative reporting or it may generate much editorial comments on it. It might use certain key words such as socialism, welfare, etc., frequently or rarely. It can treat the matter lightly or seriously. It may appeal to commonly accepted values or refrain from expressing moral implications of the issue: Each of these categories of analysis and many others can be used in content analysis depending on the purpose of the study.

Lastly, we turn to consider the problem of reliability of responses and classification in content analysis. Ideally, the methods of analysis and quantification should be so clearly defined that different judges would arrive at suggested above, at the present time is something that can only be realized at the cost of a deeper interpretative understanding of the material. Merely counting the number of times a word turns up in a given volume of material does ensure reliability, but this cannot but be an analysis of a very superficial type, because the same word carried different meanings or messages in different contexts arising from its relationship with other words and the theme. The primary method of increasing reliability of classification is to specify clearly the characteristics of statements (rather than words) that are assigned to a given category and to use many examples drawn from the materials being analyzed to illustrate what kind of statements are to be considered as representing a given category.

In conciuding the discussion on the documentary sources of data, It would be well to remind that the rich human material which quite a few documents contain is a very fertile source of ideas. Spontaneous personal documents, newspaper reports, business or official files, etc. typically provide an invaluable preliminary to direct observation. "They also supplement observation and participation in social processes by broadening the base of experience. But by themselves they tell an incomplete story and it is clearly unwise to stretch their adoption into contexts in which they can offer neither economy nor satisfaction."

Social Research and History

We shall now discuss more directly the relevance and utility of data obtained from historical sources, for sociological research. At various places in this chapter, the value of historical data for social research was tacitly recognized. The following account is pertinent to the basic issues that might be posed in regard to the use of the historical approach for understanding social systems as dynamic and living entities.

A group of thinkers, during the relatively brief period in which social science has been recognized as a disciplined form of intellectual endeavor, has tried to effect a rigid differentiation between what are conventionally known as social sciences, like sociology and economics on the one hand and history on the other, in terms both of their logic and method. They have argued that history is basically an 'idiographic discipline', whereas the social sciences, generally, are 'nomothetic' ones. Definitionally, an idiographic discipline such as history is concerned with the unique and particular events or happenings that are studied for their own sake, while the nomothetic disciplines like sociology are concerned with the formulation of general principles through which the class of phenomena constituting their subject-matter is sought to be understood. It is this dichotomous view of sciences which has quite often been referred to by the group of historians and social scientists who would jealously want to maintain some clear line of demarcation between their respective fields.

The main argument has been supplemented by two further derived distinctions between these disciplines. It is held, for instance, that the sociologist in his quest for general propositions about social systems, of necessity, must develop conceptual schemes so as to be able to analyse and order the many diversities of human existence in society. The historian, so runs the argument, concerned as he is with the individuals and events in their particularistic detail, has little, if any, use for such conceptual schemes of generic applicability. In essence, the sociologist and the historian are conceived of as working on different levels of concern for abstraction.

To trace the example further, a further distinction between the two disciplines as brought out by the group of thinkers espousing the dichotomous view, concerns the role played by the dimension of time in the two disciplines. The historian, on this view, is engaged in tracing a chronological sequence of the past events, showing how one event led to another, while, say, the sociologist by contrast, is mainly interested in the functional relationships which exist between analytically distinct elements in social systems, time notwithstanding. The sociologist is seen as seeking general propositions not bound by temporal or spatial contexts, i.e., timeless and spaceless.

Yet another argument in the ultimate analysis to the same end, is advanced mainly by sociologists who are keen on guarding their rather 'newly acquired status' as scientists and to the effect that history and sociology are most decisively marked off from each other by the kind of method they use in the conduct of their inquiries. The sociologists according to this view, follow the methods of the hard core sciences while history does not, and for most part cannot aspire to this because of the very nature of its subject-matter. It has to make do with methods that can afford only qualitatively inferior findings.

However, drawing strict lines of demarcation between History and Sociology (as a social science) as has been done both by a group of historians as well as sociologists, may involve considerable difficulties. Bagel has convincingly shown that the distinction between the idiographic and nomothetic disciplines is one which, in the ultimate analysis, can scarcely be maintained. It is hard to appreciate how in a purely idiographic discipline one could acquire knowledge of anything at all. On the other hand, in a nomothetic discipline any consideration of the singular, particular or non-recurrent can hardly be avoided.

Any attempt to distinguish between history and sociology on methodological grounds is similarly fraught with hurdles for this would imply that sociology would have to be virtually restricted to the study of present-day societies, here and now. This would result in the scope of the discipline being defined by reference to a particular set of research techniques.

The arguments advanced in favour of a strict demaraction between history and sociology would thus be seen to have rather alarming implications for the sociologists' appreciation of the uses of historical data in their own fields of research. If sociologists adhere to the view that history and sociology are logically or methodologically distinct, they understandably would be inclined to have a low estimation of the significance of history for their fields of study. Admittedly, for a sociologist considering the major task of sociologists as a class, the building up of a general theory of social systems based on logically ordered body of abstract categories, the historical materials in general may not seem to be of much value. They may, of course, be of a particular interest to him in just one respect, viz., in connection with the dynamic aspects of his purported general or trans-historical theory. It is not difficult to see that data secured through conventional methods of the historian having a continuity over time, are required to develop and test general propositions about the process of long-term social change. In fact, as Hans Gerth says, "History consists of changes which social structures undergo." Each change, each emerging as philosopher Whitehead noted, "is...containing within itself all its past and seed of its future."

Smelser's study entitled 'Social Change in the Industrial Revolution', testifies, in unmistakable terms, to how well historical data may be employed by a sociologist interested in testing the general propositions about the process of long term social changes. Smelser uses a great deal of data from the industrial and social history of Lancashire covering a period of over seventy years commencing from 1770, with a view to providing an empirical test of general theory of change in social systems through process of structural differentation. The theory is a part of the wider theory of social action developed by Talcott Parsons. The procedure that Smelser followed was to show how his model of structural change could be successfully applied to change (a) in the Lancashire cotton industry and then, to change, (b) in the family economy of the Lancashire working class, concretely two different institutional sub-systems. Both the sub-systems, Smelser argues, conform to the same pattern of structural differentation and the process of change, in both cases could be explained in terms of a common dynamic model. Thus, Smelser claimed the general applicability of the model and corollariously of the general theory of action from which the model was derived. In this manner, Smelser utilized the data of history as a useful type of material to inject content into his trans-historic theoretical scaffold. He was not interested in the Lancashire cotton industry or the wording class family for their own sake, nor even in the context of some broader theory of the industralization process, rather, he was interested in this simply because they provided data that could be used in testing a general theory of social systems. For Smelser, historicity of the two sub-systems was of no consequence.

For the group of sociologists which stresses the basic methodological difference between history and sociology the historical data have a still meagre significance as compared to what they may have for the sociologists dealing with theories of general scope. While this group may accord some recognition to the general orientation value of the broad historical studies for sociologists, (for, who can deny the strong historical base underlying the sociological thinking of Marx, Weber and Durkheim) the conventional historiography is regarded as a representation of some pre-scientific mode of thinking about man and society which is clearly outclassed in the study of contemporary societies contemporary societies conducted with the aid of 'modern' research techniques. For them, the empirical basis of much historical argument is suspect. Lazarsfeld has criticized in strong terms the sweeping assertions so often made by historians without an adequate empirical basis. These methodological purists would not, as far as possible, make use of the conventional type of historical materials even in connection with the study of social change; they would rather create their own kind of historical data using techniques like panel study. Only thus, they would argue, can the data of a quality affording fruitful theoretical analysis be obtained.

Besides the aforementioned two groups of sociologists for whom relevance of historical data is little more than marginal, exists a major group representing what may be called the 'classic' tradition. This group takes on an entirely different stand vis-a-vis the relevance of history for social research. This tradition stems from the faith that the study of history one of the most important sources of sociological data. Sociological inquiries following this tradition are characterized by a focus on different forms of structure and culture exhibited by particular societies at specific points of their development or evolution and on the understanding of particular processes of change delimited in geographical and historical terms.[13] This group of sociologists, operates, to use Wright Mills' phrase "at the level of social-historical structures." The great masters of the classic tradition in sociology, to name only the most outstanding, are Karl Marx, Max Weber, Herbert Spencer, Mannheim, Schumpeter, Mosca, Michels, Veblen, Hobson and C. Wright Mills. The perspectives of the 'classic' sociologists are decidedly far wider as compared to the perspectives of sociologists who would let the modern methods of field research define for them the scope of their subject.

The classic tradition in sociology may thus be seen as occupying an intermediate place in the continuum of the various inquiry types that constitute modern sociology. Sociologists of this tradition neither aim at an entirely general theorizing nor would they be happy with mere empirical descriptions of social milieu at certain point in time. The central concern of those of the 'classic' tradition is with comprehending the diversity which is manifested in the structure and culture of societies, with identifying the limits and determinant of this diversity and with explaining how given societies or structures within them have developed in a particular way and function the way they do. This implies thinking in terms of societies developing structures and as such would call for the introduction of a historical dimension. Thus, the special relevance of historical data for sociologists of this school is easily appreciated. Obviously any developmental approach cannot do without historical materials. When one speaks of a change from folk society to a modern society or from the informal to formal organization of production or business, he is using in effect, the conceptions which derive their validity from historical study.

The comparative method, fundamental to the classic tradition draws its breath from history. The approach consists in comparisons being drawn between different societies with the view to explaining the variation in social structure and culture. Such comparison involves or must involve, in principle, the societies of the past as well as of the present. The exponent of the comparative method cannot afford to neglect the vast fund of information about man and society which the past has to offer, regardless of whatever materials are available about the contemporary societies. For him, history is the broadest and probably also the richest field of study.

According to the classic tradition, sociology in effect is nothing short of a historical discipline and the problems of its concern cannot be approached or fruitfully formulated without adopting a historical perspective and an extensive utilization of historical data. Thus, the classic tradition refuses to admit of any clear demarcation of any kind between history and sociology, They are seen as inextricably intertwined or as merging imperceptibly, one into the other. This tradition would regard the differences between them as differences of degree only, not of kind.

The above discussion affords a cognitive back-drop for the issue of the relevance of history for sociological studies. As we have seen there are on the one hand, sociologists who take the 'Natural science view' of sociology, whatever their focus of interest; formulation of a general theory or empirical social research by use of quantitative techniques, and there stands on the other hand, a strong group, committed to the classic tradition and operating at the level of social-historical structures. For the former, the relevance of history to sociological studies is just about negligible or marginal, whereas for the latter, sociology is inevitably rooted in the study of history. The former claims that a true science of society must be able to transcend history, both in theory and methods, while the latter argues that history will not be transcended. As Marx said, "...real history, history as temporal order, is the historical succession in which ideas, categories and principles have manifested themselves... it is the principle which (makes) history, and not history... the principle." They (the latter) question the value of both of the attempts to establish trans-historical theory and of the detailed empirical studies of social milieu that typically ignore the societal and historical contexts.

Although the merit of this controversy (which has gradually died down in recent years) is rather difficult to evaluate, yet it may be said with a certain measure of conviction that it will not be worthwhile either for the methodological purists to exclude them from the map of the sociological discipline and such studies as do not come up to the arbitrarily decreed methodological standards of validity and precision nor for that will it be desirable for the 'classic' traditionalists to deny the relevance of quantitative methods current in social researches on consequential sociological problems. The real import of the argument arises over questions of how the sociologists of the present generation may best direct their efforts and resources. No one can deny that studies on the 'classic' lines are of crucial significance to contemporary sociology and should be pursued enthusiastically, in the larger interest of the subject. Any proposed general theory must understandably take into active account the range of possible variations in human societies, especially, of the ways in which they are integrated and change. The Parsonian general theory has been criticized on the score that it is not as general as it purports to be; that is, certain variations or exceptions manifested by some societies have suffered neglect in his theoretic scheme.

It hardly needs to be overemphasized that studies of the historical and comparative kind fulfil the function of operating as frameworks into which detailed empirical studies of social milieu can be fitted in a meaningful way. The most rewarding procedure would be to study with the help of modern research techniques particular social milieu which seem to have a particular significance in the context of some wider structural analysis. It is easy to appreciate also that studies focussing on patterns of variation in social structure or on what is taken as 'human-nature', can be a great aid in understanding our own society and the times we live in. Comparisons with other historically diverse settings typically help us understand our setting more intelligibly. Hence, the tradition of historically oriented study would continue to form the very core of sociology.

During the past few decades the importance of historical perspective has been largely recognized by the rival camp representing the natural science view of society'. In fact, this quarter of sociologists had to face a barrage of criticisms from within the discipline itself. Increasingly critical positions have been taken toward both the 'general theory' and method of survey-research in recent year. The value of structural-functional theory operating on the premise of social system has been seriously questioned. While the recent years have shown significant advances in the equipment of quantitative analysis, the validity of the data subjected to such analyses has come under searching examination. The outcome of these developments according to Goldthorpe is that the concept of social action has assumed a new centrality, both from the methodological and theoretical standpoints. The need to explain social structure in terms of action and interpret the meaning of action, has once again become the major preoccupation of sociological analysis. With this development, the void between the perspectives of the historians and sociologists has lessened considerably, and once again the possibility of a meaningful mutual dialogue between the two disciplines, typical of Max Weber's has come close to materialization.

The previous decades witnessed the development of new forms of social history (or 'urban' history) built from large bodies of quantitative data secured from such sources as official registers, trade directories and census reports, etc. There is thus no real basis now, for marketing off historians from sociologists by reference to the kinds of data with which the two work and the way they utilize them. The historians in having to handle such data (social history) are being required to lean heavily on the techniques of analysis developed, in the main, by sociologists. They also have to depend on sociological concepts which they have now started appreciating. Reciprocally, the new social history has important functions for sociologists. The demonstration of historical data as of a systematic and quantitative breed as apparent in the new social history has encouraged sociologists to use such materials for testing specific hypotheses involving quantitative comparisons. The new social history is thus a welcome augury for sociologists to undertake empirical investigations of certain theories of the middlerange relating to the long term effects of a certain process on other institutional mechanisms and processes.

The contemporary sociology is characterized by a renewed interest in the macro-sociological and evolutionary or developmental perspectives and it is precisely this development that calls for a cautious and critical stance toward historical data. Especially, sociologists seeking to work in the classic tradition need to be aware of the need to adopt historical data from the secondary sources with a pinch of salt. It is apparent that writers of this tradition who cried hoarse against 'positivistic' sociologists banking entirely on survey-based data are themselves exhibiting a measure of dogmatism in treating the 'facts' contained in historical works as self-evident truths rather than understanding them chiefly in the nature of inferences of the historian drawn from the 'relics' at his disposal. Any kind of historical sociology relying in the main on the secondary historical sources needs to apply the screws of critical scrutiny in the same manner as methodologically required for the quantitatively oriented sociology. Certain versions of present day sociology. Certain versions of present day sociology utilizing the evolutionary or developmental approach (such as, Bellah R.N.: *Religious Evolution*, A.S.R. 1964) seems to reveal a measure of uncertainty in regard to the relationship between historical and theoretical statements. The objective in such studies is the well-intended exercise of demonstrating empirically, on the basis of historical evidence, certain sequential patterns in institutional or structural change. But the procedure of tracing historical patterns post-factum, cannot by itself lead to theoretical explanation.

A theoretical explanation entails a separate exercise. There are in evidence some recent attempts to produce 'theoretical' history, i.e., theories of social evolution or development which purport to represent the principals underlying sequential regularities and thus afford estimations about the future. Such attempts are reflected clearly in the works of the 'new' Marxist writers like Perry Anderson and have been shown (Goldthorpe-1971) to be present, albeit covertly, in a bulk of current American writing on the modernization and industrialism themes. In the latest work of *Parsons* (*The System* *of Modern Societies*, Engle-wood Cliffs, Prentice Hall, 1971) an attempt of this order is discernible (revivification of *structural functional* theory by linkage with a *pro-naturalistic evolutionism*). In all such attempts there is according to Goldthorpe, a tendency to ignore the reasoned criticisms directed against the notion of theoretical history by writers like Karl Popper and Gellner. The authors of this methodological lineage, according to him, seek in "the classic historicist fashion, to use their theories to lend a spurious scientific basis and objectivity to what can be shown to ideological arguments". Theories of social evolution and development according to Robert Nisbet, are typically 'haunted' by the problem of how to make the historical record congruent with the proposed immanent processes of change. A keener awareness of the historical record and the way it is constructed would stand the sociologists in good stead, since such an awareness may be expected to sensitize them to the treacherous sports that may lie concealed in the evolutionary theories as a class.

Thus, while agreeing with Arthur Schlesinger that "No social scientist can wisely ignore the long arm of the past", we need not agree with Daniel Webster that "the past is, at least secure." The axiomatic belief about the past being secure may lead one to treacherous theoretic conclusions. A critical and cautious stance vis-a-vis the historical materials is, on all counts, most desirable.

14

DATA ANALYSIS

So far the emphasis has been on the necessity of carefully *planning* the collection of data so that significant questions can be answered and on the problems of *collecting* data so that the answers will be reliable and valid. it is quite obvious, however, that performing these two steps alone will not provide an answer to the original hypothesis. Rather, they will provide a means for answering it. This chapter aims at clarifying some of the ways in which such data can be so ordered as to provide the desired answers.

CLASSIFICATION AND TABULATION

Classification has been defined by Prof. Connor in the following way- "Classification is the process of arranging things in groups of classes according to their resemblance or affinities and give expression to the unity of attributes that may subsist amongst a diversity of individuals."

The following characteristics may be deduced :

1. Classification is the division of whole data into different groups. Thus by means of classification we convert the jumbled mass of data into a few homogeneous groups. The complex mass of data is thus put into a more manageable form.
2. The basis of grouping is uniformity of attributes. The items falling within a group are similar in some respect, at the same

time they are dissimilar from the units of the other group at least in that respect. If this similarity and dissimilarity is not present there is no basis for classification.

3. The basis of classification is unity among diversity. In any phenomena and more so in case of social phenomena each unit appears to be different from the other, but they are not different in every respect. In many cases they are similar and can be grouped into homogeneous classes. Thus, for classification both unity and diversity are essential. If there is perfect unity there would be only one class. If there is complete diversity so that no two units are like, the classification is impossible.

OBJECTS OF CLASSIFICATION

Following are the main objects of the classification of data :

1. To express the complex, scattered, haphazard into concise logical and intelligible form

The marks of a thousand students convey no sense, but when they are grouped into 'first class, second class, third class and failures, their significance can easily be followed.

2. To make the points of similarity and dis-similarity clear

Classification makes the similarity and dissimilarity clear. It is in the fact the basis of all classification. Thus, classification of people into rich, middle class and poor gives a idea about their similarity disparity regarding economic status.

3. To afford comparative study

Classification makes comparative study possible. If the marks gained by the students of two colleges are given, it is difficult to say which class is better, but when they are grouped into 'pass' and 'fail' the comparison becomes very easy.

4. To avoid strain on mind in understanding the significance

Classification makes the complex data so simple that its significance be easily followed by the researcher without much strain on the mind. Besides avoiding undue strain on the mind, classification helps to follow the significance in its true form.

5. To display underlying unity of the items

The items placed in one class are similar in some respect. This helps us to understand those items more clearly. Thus if the workers are divided into skilled and unskilled classes, we can form an idea about the skill of a person by knowing the class to which he belongs.

CHARACTERISTICS OF A GOOD CLASSIFICATION

Following are the chief characteristics of a good classification

1. The classes are clear-cut and there is no over-lapping. Every unit of the group must find a place in some class or the other and no unit can be placed in more than one class. Thus classification of population into Hindus, Muslims, Christians only is not perfect because Buddhists can not find a place in any one of these groups.
2. The unit lying within a group must be homogeneous in respect of the fact that has been the basis of classification. All the units of group must either possess or should be lacking in the quality that has been the basis of classification.
3. The same basis should be applied throughout the classification. Thus, if the population is classified into Hindus, Muslims, educated and poor, it will be a wrong classification as the basis of the first two is religion, while that of the third and fourth is education and economic status respectively.
4. The total different classes should be equal to the total of all the items in the universe. This quality can be easily achieved if every units has been placed in one group or the other, and there has been no duplication of the units.
5. Classification should be according to the purpose of enquiry. For example if two groups of students are to be compared in

respect of their intelligence, their classification according to religion would be useless as apparently religion has little effect upon intelligence of person.

KINDS OF CLASSIFICATION

Classification is of two types

(*a*) Qualitative classification or classification according to attributes

:

(*b*) Quantitative classification or classification according to variables.

1. Classification according to attributes

In this method the basis of classification is some quality or attribute. Qualitative classification is again of two types. (*a*) *Classification according to dichotomy* and (*b*) *multiple classification*. In case of classification by dichotomy the classification is made on the basis of the presence or absence of some quality or attribute. In this way there are only two classes, one positive group and the other negative group. Thus, classification into male and female, educated and uneducated, Hindus and non-Hindus are made according to dichotomy. Multiple classification is one, where number of groups are formed on the basis of some quality. Thus classification of students of a college into Art, Science, Commerce, Law and others is this type of classification.

2. Classification according to variables

When the universe consists of variables in place attributes the classification can not be done on the basis of their presence or absence. Thus, if the incomes, ages, or marks are given their classification will depend upon the quantity in which the variables is present rather than its presence or absence.

STATISTICAL SERIES

The tables in which such classifications are given are known as *statistical series*. The following are the main type of statistical series :

1. Array

When the measurements of individual items are arranged either in ascending or descending order it is known as array. Some times this arrangement is made according to some other scientific order e.g. geographical, alphabetical etc. An illustration array is given below :

Array of marks gained by 10 students.

S. No.	*Marks*	*S. No*	*Marks*
1	0	6	15
2	4	7	18
3	8	8	20
4	11	9	22
5	12	10	25

2. Discrete series

When the measurement or size is one single number, the table is known as discrete series. Thus, discrete series consist of two columns only, first the size or measurement and second, frequency or the number of cases upon which that measurement is applicable. An illustration of discrete series is given below :

The table showing distribution of number of children of 80 families :

No. of issues per couple	*No. of couples*
0	10
1	12
2	18
3	24
4	11
5	5
Total	80

3. Continuous series

When the measurement, instead of being given in form of one digit, is in form of a group of digit it is known as continuous series. Thus the measurement in a continuous series is in form of a continued flow rather than in dependent integers. Following is an illustration of continuous series :

Marks	*Number of Students*
0-10	5
10-20	7
20-30	12
30-40	9
40-50	7
Total	40

Certain terms generally used in connection with the series may be understood at this point. In the above example the marks are technically known as *size* or *measurement*. The two limits of each class is known as *lower* and *upper class limits*. Thus in the first class 0 is the lower class limit while 10 is the upper limit. The different between upper and lower limit or total range of a class is known as *class interval*, or *magnitude of class*. The number of students would be called as *frequency*.

4. Inclusive and exclusive methods

The illustration of continuous series given above is an example of exclusive series. In that example we find that upper class limit of the previous class is the same as lower class limit of subsequent class. Thus in the first group 10 is the upper class limit but the same is also the lower class limit of second group. A problem thus arises. If a student gets exactly 10 marks will he be placed in the first group or in the second. Here it must be followed that group 0-10 means 0 or more that 0 but less than 10. Thus the student getting exactly 10 marks would be placed in the second group and not the first.

In order to remove this ambiguity of the exclusive series, another type of series known as inclusive series is used. In such series both the upper and lower limits are included in the same group, and the upper limits like exclusive series is not excluded. An illustration of inclusive series is given below :

Marks	No. of students
0-9	5
10-19	7
20-29	12
30-39	9
40-49	7

Thus, we find that inclusive series are most scientific and they are more commonly used in the statistical tables.

DISTINCTION BETWEEN DISCRETE AND CONTINUOUS SERIES

Generally people think that there is no fundamental difference between the continuous and discrete series and they can be used interchangingly. If the measurement is expressed in form of a single number it is discrete series, if it is expressed in form of a group it is continuous series. It is, however, a wrong notion. The two types of series are fundamentally different from each other.

The size of any group is of two types (1) integers and (2) measurement. When the size advances by certain minimum values it is known as integer. Thus a couple may have either one child or two children. They cannot have any number in between them e.g. 1.6, 1.9 etc. Similarly number of pages in book, number of servants in shop advances by equal measurable in whole numbers. Again there are some values that advance in continuous flow and there may be any degree of difference between two units. Thus for example, the difference between the ages of two persons can be any period, a few minutes, seconds or even split seconds. Thus age advances by continuous flow not by regular jumps. It is therefore, called measurement and is generally expressed by continuous series.

SIZE OF CLASS INTERVAL

One of the most important problems in the information of continuous series is the determination of class interval. Class interval not only affects the number of classes to be formed, nut also the nature of frequency distribution and thus many kinds of statistical measures like mode, median, skewness etc. No hard and fast rules can be given but following points may be kept in mind determining the class interval :

1. Even distribution within the class

According to **F.C. Mills**, "In deciding upon the size of class-interval (which is deciding the number or classes) one fundamental consideration should be borne in mind *viz.* the classes should be so arranged that there will be no material departure from an even distribution of cases within each class. This is necessary because interpreting the frequency table and in subsequent calculations based upon it the mid value of each class is taken to represent the value of all cases falling within that class. Thus formation of class-interval of 0-10 can be justified if the average of items falling within this group is the mid value of the group *viz.*

2. Regular sequence of frequencies

A second requirement which ordinarily conflicts with the first is that number of class should be so determined that an orderly and regular sequence of frequencies is secured. Regular and orderly sequence of frequencies means that various frequencies when plotted on a graph will form one single hump, and the whole frequency curve would be nearly bell shaped. If too short or other wise unsuitable class interval has been selected, there may be several bumps and troughs and the curve instead of assuming a bell-shape, may be in form of a zigzag line.

3. Class interval should be equal for all classes

It is better if class interval of all the classes is kept equal. Sometimes the last class has very few frequencies and too large a measurement. For example, in survey of incomes of the people of a locality 95 persons have income ranging between 100 to 500 and persons have incomes of 750, 800, 1000, 2500 and 5000 respectively. In such a case a class interval of 50 or 100 may easily be chosen. But the last class would be one class termed as '500 and above'. Such tables are known as *open end tables*. They may begin with, Below... and end with above.. Such tables should be avoided as far as possible but if they have to be given, the individual measurements should be shown separately in a foot note outside the table.

4. Total range of measurement

The total range of measurement of size is also an important factor in deciding the class interval. The larger the range the greater will be the size of class-interval.

5. Yule's formula for class boundary

Prof. Yule has recommended a principle for fixing the class boundary in decimal points. According to this method one further place in decimals, than those recorded, is taken. Thus if the measurements have been taken correct to one decimal point the boundary will be kept correct to two decimal points. For example, if a class interval of 10 is taken it would be 0-9.99, 10-19.99, 20.99 and so on.

6. Classes with zero frequency

Classes with zero frequency should neither be merged with other classes nor should they be omitted. They should, however, be shown separately along with other classes.

7. General class intervals

Generally 5 or 10 or their multiples are taken as class intervals. This is because they make further calculation easy. But there is no hard and fast rule to it and any class interval keeping in mind the considerations given above may be selected.

OTHER TYPES OF STATISTICAL SERIES

Other types of statistical aeries are *time series, spatial series* and *conditional series*. In case of time series the data are arranged according to time sequence *e.g.*, the population for different years, rainfall for different months, or sale for different days. In spatial series the data are arranged on the basis of space *e.g.* the population of graduates according to districts of states. In the conditional series the data are grouped according to some other condition *e.g.*, number of students according to different faculties.

TABULATION

When the data has been classified it is arranged in form of tables. Tabulation is thus dependent upon classification. More numerous and complicated the classification, equally complex will be the tables required to represent them. The schemes of classification and tabulation thus are interdependent and are prepared generally together.

DEFINITION

Prof. Neiswanger has defined a statistical table as "a systematic organization of data in columns and rows." According to **Horace Secriest** "tables are a means of recording in permanent form the analysis that is made through classification and of placing in the right position things that are similar and should be compared." **L.R. Connor** has defined tabulation as "The orderly and systematic presentation of numerical data in a form designed to elucidate the problem under consideration."

OBJECTS OF TABULATION

The following are the main objects of tabulation :

1. To make the purpose of enquiry clear

According to Prof. **A.L. Bowley**- "The function of tabulation in the general scheme of statistical investigation is to arrange in easily accessible form the answer with which the investigation is concerned." Thus most important use of a table is, that it makes required information easily accessible. For example, if number of students reading in different colleges and different faculties, with makes and females is given in form of a paragraph, it is difficult to find any required information, but if it is arranged in form of a table, the same may be followed at a casual glance.

2. To make significance clear

By arranging in form of table the significance of data is made very clear. This is because table permits the observation of the whole data in one glance. The total information is clear to the view and the significance of different parts be followed.

3. To express the data in least space

Table also permits the data to be represented in least possible space, making the whole information clear to the view. If it is expressed in form of a passage it would not only be difficult to follow, nut would require more space too.

4. To make comparison easy

Table makes the comparison easy mainly because of the arrangement of figures in it. When two sets of figures are given side by side, it is much easier to form a comparative idea of their significance.

KINDS OF STATISTICAL TABLES

Statistical tables are of two types :

1. General purpose table
2. Summary table

1. General purpose table

It is also known as repository or reference table. According to **Croxten and Cowden**,[1] "The primary and usually the sole purpose of a reference table is to present the data in such a manner that individual items may be found readily by the readers." Such reference tables give general information regarding the whole data collected and are not concerned with any special part of it.

2. Summary tables

These tables are prepared from the main table with the view to afford comparison about some aspect of the problem. They are relatively small in size. The following procedures may be followed in preparing the summary table :

1. Data which are not important for the problem in hand may be omitted.
2. Detailed data may be combined into groups.
3. Arrangement of the data may be altered to suit the special purpose of the table.

4. Average, ratios, percentages or other computed measures may be substituted or given in addition to absolute figures.

3. Simple and Complex Table

Another classification of statistical table is on the basis of number of classes or comparisons. Thus, when only one factor is to be compared and there is only one class, it is known as simple table. When the number of classes is more than one, it is called complex table. Following is an illustration of simple table :

The population of different states according to census of 2001.

States	*Population*
Total	

The complex table may be formed according to double tabulation, triple tabulation or manifold tabulation. When two different factors are to be compared it is called double tabulation. An illustration of the same is given below :

The population of different states according to census of 2001.

State	*Population*		
	Males	*Females*	*Total*
Total			

In this table not only the total population but also the number of males and females can be compared. When three factors are to be compared from the same table it is called triple tabulation. See the illustration given below :

State	Males			Females			Total
	Educated	Uneducated	Total	Educated	Uneducated	Total	
Total							

The three factors compared in the table are total population, sex ratio and education. When a table has to afford comparison of more than three different factors it may be called manifold tabulation. An illustration of same is given on the next page.

PREPARATION OF TABLE

Preparation of a table is an art and requires an expert handling of data. The preparation of table depends upon the size and nature of data , number of classes and nature of comparison sought, space available and purpose of tabulation. Following general rules may be cited for purpose of preparing a perfect table :

1. Title of the table

The first part of the table is its heading. Every table is provided with a suitable heading. The heading should be short, clear and convey the purpose of table. It may contain four types of information. (1) What is the subject matter of the table ? (2) What is the time to which it belongs ? (3) What has been the basis of classification ? (4) What is the source from which the table has been extracted ?

Besides the main heading, there may be some sub-headings also. The heading should be preferably a clause and not a full sentence. Precision is the fundamental quality of a heading and every unnecessary word should be the cautiously avoided. The heading should be given in the centre of the table.

The population of different states according to census 2001

States	*Age*	*Males*			*Female*			*Total*
		Educated	*Uneducated*	*Total*	*Educated*	*Uneducated*	*Total*	
1. Uttar Pradesh	Below 20							
	20-40							
	40-60							
	Above 60							
	Total							
2. Uttaranchal	Below 20							
	20-40							
	40-60							
	Above 60							
	Total							

2. Stubs and Captions

The headings of the different columns and rows are known as stubs and captions. They should also be properly given. Captions generally give the basis of classification *e.g.* sex, education etc. If some unit of measurement has been used, the same must be mentioned *e.g.* Rs. *P*. etc. Any approximation made should also be mentioned e.g. in thousands of rupees or " in 00,000 or persons."

3. Size of the columns

Proper size of columns not only facilitates proper entering of figures but also gives a smart and nice appearance to the whole table. The size of different columns depends upon total space available, the size of figures to be written in the columns. Generally the first column is the widest as it contains words instead of figures. The columns of total is generally bigger than others. Similarly if there are separate columns for rupees and paisas, the column for rupees must be bigger. IN any case the size of different columns must be proportionate.

4. Arrangement of items in rows

Several schemes of arrangement of items in the rows (horizontal) can be adopted. The following are the most commonly followed methods :

(a) Alphabetical arrangement, according to which the items are arranged in alphabetical order.

(b) Geographical arrangement, in which the items are arranged according to geographical location viz. according to cities, wards, regions etc.

(c) Historical arrangement, according to which items are are placed in chronological order e.g. population of a town in different years.

(d) Numerical arrangement, in which different numbers may be given to various groups and the items may be arranged according to number of the group, e.g. according to ward number, roll number etc.

(e) According to magnitude, in which highest number is placed at the top and the other items are arranged in descending order. This method is mostly followed in case of simple table e.g. production of wheat in different states.

5. Arrangement of columns

As in case of rows, so also in case of columns (vertical lines) different arrangements may be followed. The following are the general considerations :

(a) The first column is generally descriptive in nature and gives the names of groups about which the information has been supplied in other columns.

(b) The movement of eyes in reading, is from left to the right. Therefore, more important information should be given in left side columns.

(c) The figures to be compared should always be given side by side, e.g. males and females, educated and uneducated.

(d) If any percentages, averages or ratios have been computed, the same must be given side by side with the figures from which such derivatives have been computed.

6. Totals

The totals for different columns and rows have to be given separately. This affords a comparison of total and cross checking of the grand total.

7. Demarcation of columns

If the columns have been divided into a number of groups, and sub-groups, some arrangement is necessary to distinguish a group from a sub-group or ordinary column. This may be done by drawing thicker lines at the end of a group. Lines of different ink, or double lines may also be used.

8. Foot notes

If there is any thing special about the figures or the whole table to which the attention has to be specially drawn the same may be done by giving the foot note. The foot note is generally given to give the source from which the figures have been taken. If some figures are estimated, incomplete, old or in any way differ from the other figures, the same should be given in the foot note.

ESSENTIAL QUALITIES OF A GOOD TABLE

1. Attractive

The first and foremost quality of a table is its attractiveness. The table must look pleasing to the eyes. This quality can be achieved by various methods viz. a good size of the table, proportionate size of different columns and rows, writing of figures in the columns, general hand writing and cleanliness. The aesthetic sense the framer is the chief guide in this respect.

2. Manageable size

The size of the table should be manageable. As far as possible the size of the table should not be bigger than the size of other papers. It is larger, it will have to be folded and would wear out from the folds. It also causes inconvenience in unfolding and folding. The table should not cover larger space than what the human eye can grasp in one look. If the information to be given is too large, it is better to prepare a number of tables, and then to consolidate them afterwards in one table.

3. Comparable

The information should be so arranged in the table that it may be easily comparable. Comparison of data is one of the main objects of tabulation and great care should be taken to see that the data are placed in a comparable form. Percentages, totals or ratios etc. may be calculated wherever necessary for the sake of comparison.

4. Clear

The table should be so arranged that it should be clear even to a lay man. One of the main purpose of a table is to arrange the mass of data in such a form that their significance may be clear. But the significance does not become clear simply by arranging it in any form of table. It is only a well planned and scientifically displayed table that possesses these qualities.

5. Suitable for the purpose

If it is a special purpose table it must be suitable for the purpose in hand. In order to achieve this end it is desired to give only that much of information as is needed for the purpose, at the same time taking precaution that no important information is left out. Ratios, percentages and other derivatives must be calculated wherever needed.

6. Scientifically prepared

The table should be prepared in scientific way. Various precautions needed in the preparation of a perfect table have been given earlier. It is only when all these precautions have been taken that table would be perfect. For a detailed discussion of various steps previous pages in this very chapter may be referred.

METHODS OF TABULATION

Tabulation may further be classified according to method used in tabulation. According to method tabulation can be either (a) hand tabulation or (b) mechanical tabulation.

Hand Tabulation

When tabulation is to be done by hand the use of tally or score sheets is generally made. The classes into which the whole data has to be grouped are first of all determined, then the number of frequencies falling in each group is determined by putting score marks and counting them. An example will made the procedure clear.

Suppose it is desired to tabulate, the students of a class in different age groups. The first thing to decide is the class interval or range of each group. Suppose in this case it is 2 years and a beginning is made from 10. Thus different age groups in class intervals of 2 will first of all be written upon the tally sheets. Then one person will read out the ages of the boys one by one. The person making the

Specimen of Tally Sheet

Faculty................................ Scored by................................
Class.................................... Checked by...............................

Age	No. of Students						
10-12	𝍸	𝍸	II			=	12
12-14	𝍸	𝍸	𝍸	I		=	16
14-16	𝍸	𝍸	𝍸	𝍸	III	=	23
16-18	𝍸	𝍸				=	10
18-20	𝍸					=	5
20-22	III					=	3
22-24	I					=	1

tallies will decide the group in which the age will fall and put vertical line before it. This process will continue. The vertical lines will be placed in groups to facilitate comparison, and the fifth line instead of being vertical will be a slanting line cutting the four. When all the ages thus have been marked, the tally marks will be added and a frequency table will be formed. Great care should be taken in putting the tally marks. It is better for the sake of accuracy if two persons prepare separate tallies and compare them afterwards.

Mechanical Tabulation

Tabulation is also done through machines which is a quicker and more accurate method. Following process is adopted for the purpose of mechanical tabulation :

Coding of entries

First of all the entries in the collection slips or questionnaire are converted into code numbers. Thus in the example given above number 1 may be used for first group 10-12, number 2 for the second group 12-14 and so on. If the answers are not structured, the replies must be classified and graded and each group allotted a numbers. In Indian census of population, for example, four code numbers 1, 2, 3 and 0 are provided for unmarried, married, widow or widower and divorced respectively.

Punching of tabulation

The code numbers have to be punched upon special tabulation cards. These cards of standard size are made of thick paper and numbers are printed upon them. Following is an illustration of a punch card :

0	0	0	0	0	0	0	0	0	0	0	0	0
1	■	1	1	1	1	1	1	1	1	1	1	1
■	2	2	2	2	■	2	2	2	2	2	2	2
3	3	■	3	3	3	■	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	■	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	■	9	9	9	9	9	9	9	9	9

Suppose answer to question number one is coded as 2, so the digit 2 in the first column will be punched. Again if the code number of the answer to second question is 13, then figure 1 of column 2 and figure 3 of column 3 will be punched. Similarly coded answers to all the questions are punched. The actual Hollerith cards contains as many as 80 single numbers and thus 80 single figure coded numbers can be punched upon one card.

Sorting the cards

The sorting of the cards is done by electrical machines. Suppose all such cards in which coded answer to first question is 'one' have to be sorted out. All the cards would be put into the sorting machine and the electric contract will let all such cards pass out. They can, however, be counted and the frequency of coded answer 1 can be known if a double figure has to be sorted out, say 13, the cards with number 3 will be sorted first and later on from among them the cards containing number 1 will again be sorted out.

The sorting machines are certainly more accurate and afford rapid tabulation than the method of tally sheets, but a proper coding is the essential prerequisite for this purpose. In all large scale enquiries tabulation is now done by machines and it is only in very small surveys that hand tabulation may be resorted to. Besides tabulating machines computing and calculating machines are also used for statistical analysis. Such machines do away with the cumbersome and tiring process of arithmetical calculations.

ADVANTAGES OF TABULATION

1. Tabulation helps to present a clear cut picture of the complex mass of data and thus makes it easy to understand. According to Prof. Bowley, "After tabulation instead of the chaotic mass of infinitely varying items we have a definite general outline of the whole group in question."
2. Tabulation presents data in smallest possible space. This is very useful not only because some paper is saved but also because it gives greater clarity. The whole mass of figure is before the eyes and we can comprehend it in one single glance. It relieves the mind of undue strain in remembering all the figures. The entire data is before our eyes and we can clearly mark the significance and grasp its nature without much effort.
3. Tabulation makes the work of comparison easy. The correct method of studying the figures is to make their comparative analysis. We have to note how the measurements of the same unit have changed year after year, how one measurement stands in relation to the other, what changes in the ratios are brought about with the influence of time or in different groups. For example, if a study of data regarding the post-graduate students of city is to be made, we have to resort to a number of a comparisons to get a full picture of the same. We have to compare the number faculty wise, college wise, according to subjects offered, sex of the students, their results, incomes, ages and so on. All these comparisons are much easier by means of tabulation.

4. Tabulation is necessary for various kinds of statistical calculations. In finding out the various statistical measurements like averages, dispersion correlation etc. the data has to be arranged in form of various kinds of statistical series., Without such statistical tables these measures would not be possible.
5. Tabulation gives a significant form to classification. Even when data has been classified into different classes or groups, their significance is not clear unless they have been put in form of suitable tables. Thus whereas the classification is the theoretical basis of analysis the tabulation is its practical side.

LIMITATIONS OF TABULATION

The statistical table have certain limitations of their own. They contain only figures and do not afford sufficient space for their description. Thus information that is essentially qualitative in nature can not be presented in form of tables. The understanding of tables requires a special knowledge in the technique of understanding figures. To a common man the figures are least interesting and much less comprehensible. The tables in this way, however, attractively formed arr not only uninteresting but even repulsive to the eyes. A lay man can hardly make any head or tail out of a table. The tables are thus confined in utility to those persons only who have a specialized knowledge of the figures given in the table and need no theoretical background to make their significance clear.

The tables should, therefore, be used as supplement to descriptive analysis, unless they are very simple and compare one or two factors only. Complex tables must be simplified and also combined with description if they are to be any use to a lay-man. The use of graphs and diagrams is made to remove this complexity of tables. But inspite of every thing, tables are necessary for proper and scientific analysis. For a researcher they are an absolute necessity, and therefore tabulation forms an essential part of any research programme.

Under ideal conditions of precision and simplicity this presents very few problems since the statement of the hypothesis and the elaboration of the experimental design will automatically provide for the analysis of the data. Consider, for example, a hypothesis stated as follows: If lights are selected as visual stimuli in such a way that each is subliminal (not perceivable) to each eye taken separately, then if they are applied simultaneously (but still separately) they will be perceived by the subject. Such a hypothesis is so stated that either there will be perception or there will not. An analysis of the data would constitute no problem at all. If, on the other hand, the responses were such as to show not an absolute presence or absence but rather proportions or degrees of presence, the problem of analysis would become more complex. If, in addition, the proportions of those perceiving the light appears to be different among different types of subjects, e.g., men and women, or older and younger persons, the problem becomes rapidly still more complex.

In other words, the problems raised by the analysis of data are directly related to the complexity of the hypothesis. Suppose, for example, a study is carried on to test the hypothesis that family size is directly related to size of the home in which the family resides, with the results shown in the table which follows. Such findings would force a rejection of the hypothesis *as stated* and should lead to its reformulation in more specific, and hence more complex, terms. thus, it might be restated as follows: the size of the home is positively correlated with family size, *when the opportunities for choice are equal*. this, of course, requires a clear definition of what factors influence freedom of choice. Clearly, financial ability to buy or rent at various levels is such a factor, since size of home is correlated with its costliness. A retabulation, therefore, such as the following one might then appear. this type of finding would tend roughly to support the hypothesis as restated. If similar tabulations were carried

Family size	*Percentage of families residing in:*		
	Small Houses	*Medium Houses*	*Large houses*
Large families	25.0	55.0	20.0
Medium families	30.0	60.0	10.0
Small families	30.0	55.0	15.0

Economic level of family	*Percentage of large families residing in:*		
	Small Houses	*Medium Houses*	*Large House*
High	5.0	35.0	60.0
Medium	35.0	65.0	10.0
Low	40.0	55.0	5.0

out for "medium" and "small" families, and coincided with the above findings, then the hypothesis would be affirmed even more strongly.

However, economic ability is not the only factor which interferes with the choice of a home. In some areas being a member of a "non-Caucasian" race will inhibit choice through restrictive covenants. Therefore, it might be necessary to retabulate the above in terms of race. Thus such an analysis would lead to two racial divisions (white and nonwhite) within three economic levels (high, medium, and low) for three sizes of family (large, medium, and small). This would yield $2 \times 3 \times 3$, or 18 such tables. As will be seen later, it is not always necessary to perform the task in so cumbersome a fashion, but the logical problem must nonetheless be dealt with.

If all the relevant factors are known in advance, then there is no serious problem in analysis, for as pointed out in the earlier chapters, the experimental design would have gathered the data in only the crucial instances. There are two aspects of scientific research, however, which make the occurrence of so ideal a situation relatively infrequent. The first of these is the appearance of an anomalous empirical regularity or the absence of an expected regularity. Such instances require analysis not anticipated by the original design. Similar to this is the use of data, gathered for one purpose, for quite another problem. Both these represent what is called *secondary analyses*. From a very "pure" experimental point of view, such analyses are considered to yield answers which are "plausible" but not capable of being stated in the customary "probability" terms of science.

For example, in the case of the housing study referred to above, if race and economic status had been considered in the original design, the sample employed would have been so constructed as to contain an *adequate* and *representative* selection from all the various subtypes. that is, a satisfactory sample of each family size within each racial group within each economic level would have been secured. If this were *not* done because the later analysis was the result of an afterthought, it becomes difficult to assess the value of the old sample for the new purpose.

However, secondary analysis is not only common but necessary, and it is certainly of great value, even if it produces no more than plausible statements to serve as hypotheses for subsequent verification in more stringent terms.[1]

In a sense, then, problems of data analysis involve all the questions raised in the chapter on research design, for secondary analyses do involve the designing and redesigning of substitutes for the controlled experiment. this indicates that there are two types of questions about analysis which may be raised. One of them relates to the techniques of *representing the data*, and the other to the methods of *logically ordering* them so that questions can be raised and answered.

The first of these general problems cannot be treated exhaustively in a book such as this and are, in any case, part of the usual content of statistics courses. A few basic comments concerning the methods of representing the data will be make, but the major object of attention will be the logical processes involved in secondary analysis.

STATISTICAL REPRESENTATION

The frequency distribution. The simplest form of representing research findings is the frequency distribution or tabulation. All that is meant by this is the presentation in one column of different qualities of an attribute, or different values of a variable, together with entries in another column showing the frequency of the occurrence of each of the classes. The only problems connected with the preparation of a useful frequency distribution, or simple table as it may also be called, is to use common sense with respect to three things *At first*, the units entered in the left-hand column describing the qualities or values must be mutually exclusive, as well as inclusive of the vast majority of observations which will be made. Overlapping values or attributes can only lead to confusion. for example, in a study of Puerto Rico one of the authors found that besides Catholic, Protestant, and "no religion" categories, there were some who professed Spiritualism. this would have made no problem except for the fact that it appeared possible to combine Spiritualism with either protestantism or Catholicism. Therefore, instead of just adding a category, Spiritualist, it was necessary to add also Catholic *and* Spiritualist as well as Protestant *and* Spiritualist.

Second, the tabulation, to be of the most utility, must have *internal* logic and order. It seems quite obvious that, if one were tabulating such a variable as the height of men or the size of cities, he would tabulate in order either from the tallest or largest to the shortest or smallest, or vice versa. However, when tabulating qualities, where the order may not be so obvious, the need for a logical treatment is equally great. for example, one survey asked women for their reasons for buying a certain face cream. One tabulation of the results is shown in the accompanying table.

Reasons for Buying Face Cream*

Reasons	*Percentage of Respondents*
Recommendation	28.0
Beneficial to skin	21.0
Heard it advertised over the radio	18.0
Saw it on the counter	15.0
Reasonably priced	10.0
Scent appealed	8.0
Because of special skin conditions	7.0
Total	107.0

* This is not strictly speaking a frequency, but a percentage distribution.

First of all, since the total reaches 107 per cent, it is clear that this table violates the first requirement, namely, that the categories be mutually exclusive. Ignoring this fact, however, it is clear that there is no sensible order to the types of reasons given. How is it possible to improve the utility of the tabulation for analytical purposes? Since there is no continuum such as that for height or size, the procedure is to search for logical groupings of the responses. It is possible to discover three such logical groupings of the responses. It is possible to discover three such larger categories, and the use of the table increase greatly if it is modified in this way.

Reasons for Buying face Cream

Reasons		*Percentage of Respondents*
Pertaining to respondent:		28.0
Beneficial to skin	21.0	
Special skin condition	7.0	
Pertaining to product:		18.0
Reasonably priced	10.0	
Scent appealed	8.0	
Pertaining to way heard of product:		61.0
Recommendation	28.0	
Heard radio advertising	18.0	
Saw it on counter	15.0	

Not all tabulations will have a logical structure, but in most cases it is possible to find a logical order to use as an analytical principle, even in simple tabulation.

Third, when the left-hand column of a tabulation is a quantitative variable such as size of city or monthly rental value, the class intervals must be carefully and reasonably chosen. Schmid suggests three criteria for this:

"1. Ordinarily there should not be less than 8 or 10 and not more than 18 or 20 class-intervals, depending on the nature of the data and on the number of cases being studied. In order to obtain a clear understanding of the original data the individual items are frequently arranged in either ascending or descending order of magnitude. Such a classification is known as an *array*. After noting the highest and lowest values as well as the characteristic features of the data, the number of intervals can be determined more easily.

"2. every effort should be made to have intervals of uniform size. The intervals should not be so small as to lose the advantages of summarization or so large as to conceal the more important characteristics of the distribution. Moreover, if the class-intervals are too small, vacant or blank intervals might occur. If comparisons are to be made between similar data, it is advisable to select class-intervals of the same size for all the distributions. Whenever possible the class intervals should represent common and convenient numerical divisions such as 5 or 10, rather than odd divisions such as 3 or 7.

"3. After the size of the class-intervals has been determined, it is important that they be clearly designated in the frequency table. Each interval must have definite lower and upper limits, and must be expressed in such a way as to obviate any possibility of misinterpretation or confusion."

These seem like simple principles, and indeed they are. In practice, however, they are somewhat difficult, and many analyses of data have become difficult to perform or understand because of ignoring them.

Summarizing the frequency distribution. there are two general ways of stating a frequency distribution in simple ways. these are used singly and together, depending upon the problem at hand. One of them is to compute a value which represents the *central tendency* of the distributions. Such measures pre called averages and include among others the common average, technically known as the *mean*; the *median*, a value such that half the entries in a frequency table fall below and half above it; and the *mode*, or the value represented by the greatest frequency.

The other general type of summary of frequency distribution includes measures of *dispersion* such as the *standard deviation* and the *coefficient of variation*. These measures are used to compare the relative wideness of spread in any two or more frequency distributions. their characteristics, applications, and methods of computation can be found in any elementary textbook on statistics and will not be considered here. They are mentioned merely as being widely used ways of summarizing frequency distributions.

Comparing frequencies. A common and simple method of comparing frequencies is the use of the ratio. A ratio is merely an indicated or actual quotient which relates the size of one number to another. Their chief utility is to act as a relative measure and thus permit the comparison of otherwise unequal numbers. For example, if we wish to know the relation of the female to the male death rates at various ages, a series of ratios, as shown in the accompanying table, will help. this adds to the knowledge, shown by the second and third columns, that male death rates are generally higher than female, by showing that this female advantage is constant through life, except for being somewhat larger than usual at ages 5 to 9, and somewhat smaller at ages 75 and over. The figures in column four are actual quotients; they could have been expressed as 172 to 136, 24 to 17, 15 to 12, etc., but it is the actual quotients which are most useful since they reduce the right-hand figure to 1 in every case, thus allowing the comparison to be made easily.

A related method of comparing values is the *proportion*. This measure is a fraction such that the numerator is one of two

Deaths per Thousand Native White Population by Age and Sex in Cities of 100,000 or more, Ohio, 1930 *

Age	*Male*	*Female*	*Ratio of Male to Female*
0-4	17.2	13.6	1.26
5-9	2.4	1.7	1.41
10-14	1.5	1.2	1.25
15-19	2.4	1.9	1.26
45-54	12.3	10.0	1.23
55-64	25.8	19.9	1.30
65-74	59.1	45.9	1.29
75 and over	135.6	114.5	1.18

* Adapted from Warren S. Thompson, *Population Problems* (New York: McGraw-Hill, 1942), P. 228.

observed frequencies and the denominator the sum of observed frequencies. thus the previous table could have been expressed as the proportions of all deaths at various ages which were male deaths. Thus the ratios 1.26, 1.41, 1.25, etc., expressed as proportions would read 0.558, 0.585, 0.555, etc. When proportions are expressed in multiples of 100, they are *percentages*. Thus in the above example, 55.8 per cent of all deaths in large Ohio cities in 1930 between ages 0 and 4 were experienced by males, etc. Whether ratios, proportions, or percentages are used in the analysis of data is purely a matter of preference and of the way in which the researcher wishes to communicate his findings.

The purpose of using percentages (and ratios and proportions as well) is to simplify the problem of comparison. It is important, therefore, to see exactly what their use implies so that they will not be misused. First, they can serve to put *qualitative* characteristics into numerical form. Thus it is possible to compare two college classes on the basis of sex by saying that one class is 60 per cent male and the other only 40 per cent. this is a perfectly good comparison, but care must be taken not to translate this statement by saying that one is more *masculine* than the other and thus implying that masculinity is a quantitative characteristic. Such errors in logic are common and easily fallen into, but the consequences may be disastrous.

Second, percentages reduce two frequency distributions to a common base, as was illustrated above, thus making comparisons much simpler. It must be noted, however, that this obscures *absolute* comparisons, and sometimes it is these rather than the relative comparisons which are important. Zeisel gives an example of this problem[6] as shown in the accompanying table. Here the absolute and the relative figures produce apparently opposite results. The problem, then, is which is "correct." did city *M* grow more or less rapidly than city *N*? It is clear that this is a problem in logic. Thus it could be reasoned that, if the growth were "normal," we would expect the larger city to attract more people than the smaller and hence would say the percentages are the "significant" figure. If, on the other hand, the growth of cities depended not upon previous size but other factors such as the addition of new industries, then we might say that the larger city grew faster in the ratio of 200,000 to 150,000, or one and one-third times as fast.

Comparative Growth of Cities M and N 1941-1946

City	*1941*	*1946*	*Increase*	*Percentage Increase*
M	1,000,000	1,200,000	200,00	20.0
N	500,00	650,00	150,000	30.0

In other words, while percentages are a great aid to communication through simplification, they are also susceptible to misuse by obscuring significant facts. This underlines the importance of never presenting a table of percentages without also showing the actual numbers which they represent. This not only guards against the kind of misinterpretation of the kind described above, but also assures the reader that there is an adequate base for the calculation of a percentage. For example, the statement that three of a total of only four people interviewed favored the Democratic party becomes very misleading in the form 'three out of every four" or "75 per cent" of those interviewed favored the Democratic platform.

Bases for computing percentages. When a simple frequency distribution is turned into percentages it is usually for the purpose of making clear the comparisons between the several class intervals. In this case there is seldom a problem as to what the base of the percentages should be. One case, however, in which a difficulty may arise, is where the tabulation includes residual categories, or more than one dimension. An example will show this more clearly. If a sample polled in relation to a bond issue gave the results shown in the accompanying table, there would be a problem of interpretation. Thus if the base for percentaging were taken as the *total* sample, those favoring would be reported as 39 per cent; if the base were all *those replying,* the result would be 44 per cent; and if it were taken as *those who would answer and who had make up their minds*, it would be 56 per cent. It is very important, therefore, that

Responses to Question, "Do you favor the School Bond Issue Which Will Be Voted On in November?"

Responses	*Number*
Yes	97
No	78
Undecided	44
Refuse to answer	31
Total	250

the bale of a percentage be fully and carefully described to avoid confusion.

The more common problem arises whin a cross tabulation is used, for in this case, even though the categories are complete, it is still necessary to make a choice as to whither the percentages should be computed horizontally or vertically. Zeisel gives a general rule which can usually be followed, by stating that "*the percentages should be computed in the direction of the causal factor.*" This does not mean that one of the factors *must be* the actual cause of the other, but merely that in the mind of the analyst one of them is thought of as influencing the other. The illustration given by Zeisel makes this clear. First of all, percentages may be calculated to either the vertical or the horizontal totals. Thus the figures given in the first of the accompanying tables could be expressed in percentages calculated vertically, so as to appear as shown in the second table. Such a presentation shows the racial composition of two groups, those dying of cancer and those dying of some other cause. This is a clumsy way of presenting the analysis, since we are not likely to think the cause of death will affect materially the relative number of whites and Negroes. Rather it is more probable that the hypothesis was that for various reasons death accompanied by a diagnosis of cancer is more common for one group than another. Therefore the percentages should be computed horizontally, as shown in the third table. such an arrangement points directly to the desired Negro-White comparison, rather than requiring still further analysis as did the other mode of calculating the percentages.

Deaths form Cancer in the United states by Race

Race	*Cause of Death*		
	Cancer	*All Others*	*Total*
White	139,627	1,055,804	1,195,431
Negro	9,182	169,391	178,573
Total	148,809	1,225,195	1,374,004

Race	*Cancer*	*All Others*	*Total*
white	93.8	86.2	87.0
negro	6.2	13.8	13.0
Total	100.0	100.0	100.0

Race	*Cancer*	*All Others*	*Total*
White	11.7	88.3	100.0
Negro	5.1	94.9	100.0
Total	10.7	89.3	100.0

It will frequently be the case that this "causal principle" will not be applicable as clearly as in the above case. For example, suppose the number of years of school completed were being cross-tabulated with "economic worth" for a series of adults: would higher education be considered as the "cause of higher economic standing, or vice versa? clearly it should be viewed either way. The general principle, then is to compute in the direction of the factor which the factor which the analyst wishes to emphasis.

That the analyst's concept of causality or desire for emphasis is not always the sole determiner of the direction in which percentages should be computed, however, is shown by another principle stated by Zeisel. This principle is that percentages should be run *only in the direction in which a sample is representative*. The illustration of this rule deals with 8,000 persons in each of two states, with the results shown in the accompanying table. If these results are analyzed from the point of view that differences between the states are "causal" for differences in party allegiance, them the table would be percentaged horizontally, as shown in the second table. Such results would be "sensible" in showing that party *YY* was in a favorable position in both states, but especially so in state A.

If the original question were reversed, however, and it were hypothesized that the differences in the parties rather than the differences in the *states* was the "cause" of the distribution, the percentages would have been calculated vertically, as shown in the third table. If this table were an accurate analysis it would seem to say that 42 per cent of the votes of party XX would come from state A. If it is recalled, however, that the samples were representative of each state and not of the two parties, it is clear that these percentages are meaningless. Since we do not know the relative contribution of the two states to the total vote, no such percentages can be meaningful. Therefore where cross tabulation are representative in only one direction, percentages can be computed only in that same direction.

Presenting complex tables. Several examples have been given in which two-dimensional tables or simple cross tabulations have appeared. Often such tables are not adequate for the problem at hand where more than two dimensions must be simultaneously presented. The example of the size of houses given at the beginning of the chapter is a case in point. There it was pointed out that a complete presentation would involve at least six tables placed side by side. It is clear that such a presentation would be exceedingly confusing and thus poses the problem of deal with: size of family, size of house, and economic status. Suppose further that we are provided with the data shown in the accompanying table.

State	*Favor Party*		*Total*
	XX	*YY*	
A	2,500	5,500	8,000
B	3,500	4,500	8,000

State	*Percentage Favoring Party*		
	XX	*YY*	*Total*
A	31.0	69.0	100.0
B	44.0	56.0	100.0

State	*Percentage Favoring Party*	
	XX	*YY*
A	42.0	55.0
B	58.0	45.0
Total	100.0	100.0

One way of deducing the table is to remove one variable. Now any dichotomous percentage can be expressed by one figure only, since the second is then determined. If we say 65 per cent of a group are men it is not necessary to state also that 35 per cent are women. Thus if it s possible to turn any of the trichotomous variables into dichotomous ones, the table can be greatly simplified. So suppose the analyst's interest is in showing the problem of crowding, and he therefore rewords the table title and reenters the data as shown in the second table.

Relation of size of House of Family, by Economic Status

Income	*Large families*			*Medium Families*			*Small Families*		
	Small House	*Medium House*	*Large House*	*Small House*	*Medium House*	*Large House*	*Small House*	*Medium House*	*Large House*
High	5	35	60	5	70	25	10	60	30
Medium	25	65	20	10	65	25	40	55	5
Low	35	55	10	35	55	10	75	25	0

Percentage of Families of Various Sizes, by Income Groups, Residing in Small Houses

Income	*Family size*		
	Small	*Medium*	*Large*
High	10.0	10.0	5.0
Medium	40.0	10.0	25.0
Low	75.0	30.0	40.0

It would be possible to conclude from these data that income, more than family size, determined the proportion of small houses occupied.

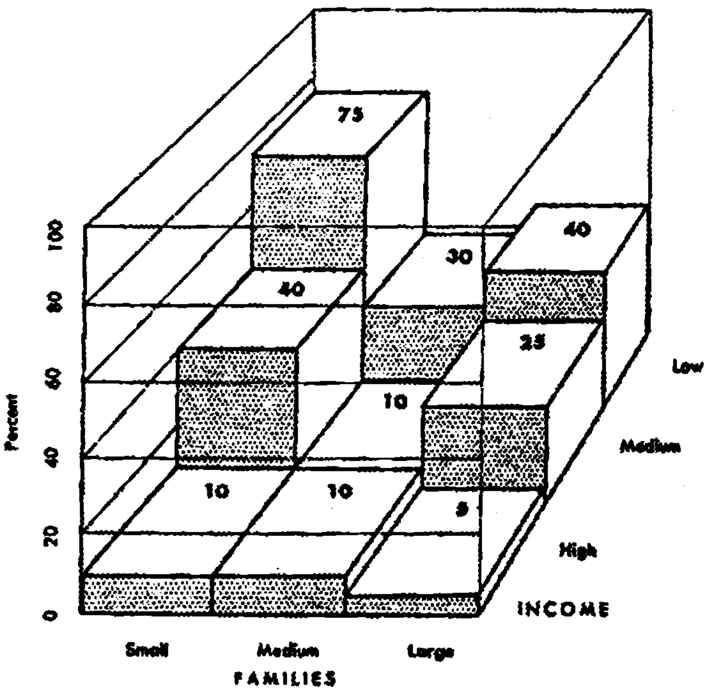


Fig. 14.1. Graphic presentation of a trichotomous cross tabulation (income and size of families) for families living in small houses).

Figure 14.1 graphically illustrates what such a tabulation actually does to the data by showing the three-dimensional character of the cross tabulation. However, turning a trichotomy into a dichotomy is difficult and sometimes obscures the real point. Another method of summarizing the distribution, it will be recalled, is the use of the use of an average. This table, if the values of "small," "medium," and "large" houses are known, can be simplified by the use of an average such as the mean, as shown in the following table.

Average Number of Rooms in Houses for Families of Various Sizes, by Income Groups

Income	*Family size*		
	Small	*Medium*	*Large*
High	4.7	4.6	5.7
Medium	3.2	4.5	4.4
Low	2.1	3.4	3.4

Again, the table becomes quite readable. The logic involved should be clear. In both cases the cell entries have been changed from frequencies or percentages, representing every category of the frequency distribution, into *single values, each standing for* the entire distribution.

General problems of presenting frequency distributions. This section has been concerned primarily with showing some of the ways of summarizing, simplifying, and presenting frequency distributions. Some of the more common problems have been spelled out and others indicated as belonging to the realm of statistics. With these in mind, the next section turns to some of the logical problem underlying simple analyses by cross tabulation.

LOGICAL ORDERING OF DATA

The cross tabulation of two or more attributes or variables is merely a formal and economical method of arranging the data so that the logical methods of proof may be applied. Thus, the methods of agreement, differences, or concomitant variation (correlation) may all be used in drawing conclusions from a cross tabulation. This should further underline the point made earlier in this chapter, that what can be gained through cross tabulation depends entirely on the logically design of the study and the insightfulness of the investigator. There are no "tricks" of cross tabulation which can guarantee that an analysis will provide the most significant and meaningful results possible.

It is possible, however, to discuss some of the modes of thought which lead to fruitful cross tabulation. first of all, the use of cross tabulation is, in effect, an approximation of the controlled experiment. This means that the analyst is really thinking in terms of cause and effect. That is he has in mind one or more variables, variation in which can be used to *explain* variation in another variable. These "causal" dimensions are termed *independent variables* and the values to be explained are called *independent variables*. It is because the analyst is really thinking in causal terms that there is a need for elaborating survey results through cross tabulation. If all that the analyst desires is an empirical statement of concomitant variation, simple cross tabulations will suffice. The need, however, to know the "meaning" of a relationship leads to asking many other questions which can be answered only by introducing other variables into the analysis.

Kendall and Lazarsfeld have given a classification of three types of elaboration which they call *interpretation*, *explanation*, and *specification*.

Interpretation. This is the process of stratifying a previous cross tabulation by another variable (called a *test variable*) under circumstances such that the test variable has occurred (1) subsequent in time to the independent variable, but (2) prior to the dependent variable. One other requirement is that the test factor be correlated with both independent and dependent variables. Such a procedure allows the further interpretation of an original relationship in terms of a third factor, in this case called an *intervening* variable.

This may be diagrammed as follows:

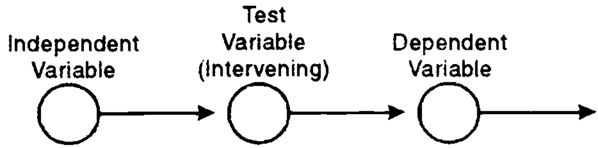


Fig. 14.2

For example, when the men students at a private university were crosstabulated by whether they attended public or private secondary schools and by their university academic records, those attending public schools showed a superior record. On the face of it, such a finding would suggest an explanation of the dependent variable (grades) in terms of the excellence of preparation in the independent variable (public versus private secondary schools). Anyone conversant with the admissions policy of private universities might suspect, however, that events could have occurred between secondary training and acceptance at the university which might give the finding an entirely different meaning.

Thus an intervening variable in terms of excellence of academic work in secondary school could logically be introduced. If there were circumstances in the application procedure which meant that public school graduates had to meet higher academic standards than private school graduates, the original correlation between the type of secondary school and subsequent grades would disappear. In this case, the test factor, high school record *would* serve to interpret the original finding since when men of *the same high school achievement level* are compared, the relation of type of school to undergraduate success would disappear.

Explanation. This is essentially the same kind of reasoning as interpretation in that it seeks to reduce an originally observed correlation through the use of a test factor. In this case, however, the test factor is an *antecedent variable* rather than an intervening variable. In other words, an observed relationship is independent variable and which is related both to it and the dependent variable.

This may be diagrammed as follows:

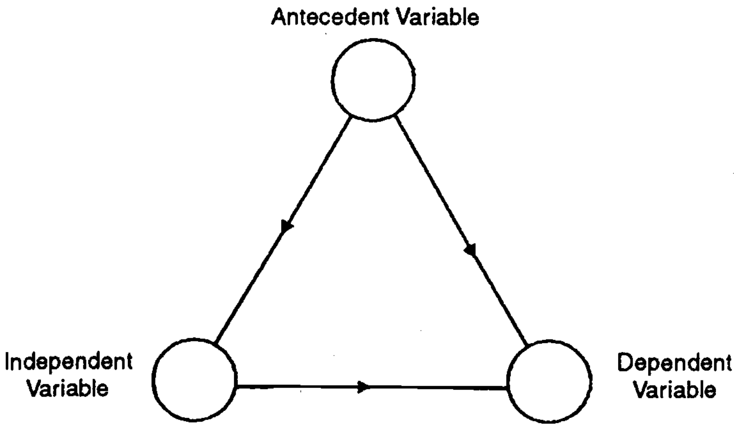


Fig. 14.3

For example, a study of birth rates in Puerto Rico produced a cross tabulation which showed a negative correlation between economic status and the birth rate. Both the variables in this case were measures of adult life experience, and since "causal" reasoning was involved, the question was asked as to whether or not there was some variable characterizing the earlier portion of the life history which might "explain" this correlation.

Consequently education was used as an antecedent test variable, with the result that correlation between economic status and birth rates all but disappeared when cross-tabulated separately for comparable educational levels. In this case, then, the use of a test factor "explained away" an original observation and substituted another for it. We should describe the relationship between economic status and birth rates in Puerto Rico as a *spurious* correlation. This raises the question, "How can actually a causal one and not merely another spurious correlation?" The only answer to this is to say that if the application of all known relevant test factors fails to reduce this correlation materially, the assumption of causality can usually be made.

Specification. Whereas in explanation and interpretation the question asked is whither or not the use of a test variable will cause the sharp reduction or disappearance of an observed relationship, the goal of specification is quite different. In this case the "causal" sequence is modified by specifying varying conditions under which the original correlation will exit in greater or lesser intensity. The example given by Kendall and Lazarsfeld uses the findings from *The American Soldier* shown in the accompanying table.

Educational Level

Rank	*High School Graduate or Better*	*Less than High School Graduate*
Non-com.	61.0	43.0
Pvt., Pfc.	39.0	57.0
Total cases	3,222	3,152

A crude measure of the relationship between education and rank is taken to be the difference between 61 per cent and 43 per cent. This value, called *f*, is 0.18. Now the question was asked whither an *f* value of 0.18 would be likely to be found under all circumstances, and it seemed logical that the answer was "no." That is, opportunities for promotion may not been the same at all periods of World War II. Hence a cross tabulation by length of service was made, as shown in the following table.

	Have Served for Less than two year		*Have Served for Two Years or More*	
Rank	*High School Graduate or Better*	*Less than High School Graduate*	*High School Graduate or Better*	*Less than High School Graduate*
Non-com.	23.0	17.0	74.0	53.0
Pvt., pfc.	77.0	83.0	26.0	47.0
Totl. cases	842	823	2,380	2,329
	f = 0.06		f = 0.21	

Since the *f*'s are quite different for the two length-of-service categories, the analyst can now state that the relation between education and rank is greater for those who entered the Army early than for those who entered it later.

Specification, then, is the process of describing the conditions under which a particular relationship may exist or not exist, or may exist to a greater or lesser degree. Like explanation and interpretation, therefore, it makes any "causal" analyses more acceptable and meaningful.

General aspects of elaboration. There seem to be two major problems with respect to this aspect of analysis. The applications of test factors in the three preceding paragraphs doubtless seem simple enough. The two practical problems, however, are (1) whether or not to elaborate, and (2) what test variables to apply.

With respect to the first problem it can be pointed out that unexpected consequences may impel the analyst to elaborate. If the findings conform to anticipation, there is little stimulus for further analysis. This is a somewhat dangerous situation, for it may result in the acceptance of spurious or uninterpreted relationships. As Kendall and Lazarsfeld put it:

"Our first concern is whether or not the relationship is a spurious one; consequently our initial efforts of elaboration are usually of the explanatory type. Once wi have gained some assurance that the original relationship is not a spurious one, we try to interpret the result or to specify it. We ask ourselves what variables might provide the links between the 'cause' and the 'effect,' or what conditions might show the original relationship to be even more pronounced than we originally saw it to be. The elaboration of a particular result can go on almost indefinitely. We are limited only by our lack of ingenuity in thinking of factors by which to elaborate the result, by the absence of data to check the relevance of factors which we have thought of, or by the difficulties of dealing with few cases as the process of elaboration is extended."

Elaboration, therefore, is a process which is limited only by the analyst, on the one hand: his ability, his patience, and his purposes; and, on the other hand, by the nature of his data.

Unfortunately, it is not possible to give concise directions for selecting the factors to be used as test variables. It should be recalled that the selection of every test variable actually constitutes the formation of a hypothesis which can be tested by the data at hand Therefore all the materials in the chapters on hypotheses and experimental design will apply here.

In other words, the ingenuity of the analyst coupled with his knowledge of the field in which he is working will be the major source of test variables. Two methods of inducing such hypotheses, however, may be mentioned. First, it would be possible in some studies to cross-tabulate routinely every factor with every other factor. In practice this is usually clumsy and the number can be cut down substantially by reference to existing theory. In any case wide ranges of cross tabulations will often suggest the selection of test variables. Second, the study of deviant cases will also often indicate the kind of interpretation, explanation, or specification which will improve the analysis.

In the most general sense it must be said that the whole process of analysis id not so much a matter of manipulative techniques as it is of the rigorous application of the basic principles of scientific method. The research worker who is fully acquainted with the problems of *designing* research will have fewer troubles in analyzing his data.

15

SCALING TECHNIQUES

The problem to which sealing techniques are applied is that of ordering a series of items along some sort of continuum. In other words, they are methods of turning a series of *qualitative* facts (referred to as attributes) into a *quantitative* series (referred to as a variable). The complexity of this undertaking, and hence its many pitfalls, can best be seen by considering what is meant by ordering items along a continuum.

If, for example, one wishes to measure the size of a series of families, no problem arises. Families are counted as having a certain number of members. All families which have seven members also have at least six, all those with three also have at least two, and so on. This is obvious and in the nature of the ordinal character of measurement. It is clear that no man can save his second thousand dollars until the first is accumulated. This is because the amount of money in the bank is a quantitative characteristics (a variable), and the comparison between two individuals or groups of individuals can readily be made.

"But", the student may ask, "why bother? What are the advantages of using variables instead of attributes?" The answers involve a number of considerations, but the basic outlines are clear. Sciences vary greatly in their reliance on mathematics. Many original papers in chemistry or biology require no higher mathematics on the part of the reader, while this is not the case for physics. All sciences, however, move in the direction of greater *precision*. This takes many forms, but one fundamental form is *measuring gradations*. Colors cannot be red, blue, yellow, and "in between." They must be *measured* so that every "in- between" color has a place on the color wheel, spectrum, or other scale. Putting it differently, rough categories yield only rough observational data. If a population is divided into "approve-indifferent-disapprove," three perfectly good categories result. However, the more we probe into the problem, the more "in betweens" are found. The classes become too crude. Thus, an increase in the number of ordered classes yields smaller and smaller differences between adjacent classes. This provides more *precise* measurements and at the same time orders the cases according to some principle which becomes more clearly recognizable as our probe continues. Furthermore, attributes are not amenable to mathematical manipulation. Variables, being expressible in a numerical fashion, are more flexible.

In sociology, much of the data consists of qualitative variables which must be so arranged that they represent a qualitative series. If for social standing, how shall this be done? Accepting, for the moment, that (1) material possessions, (2) amount of community participation, (3) education, (4) family background, and (5) amount of income are all elements entering into general social position, how is it possible to compare those who are low on (3) and high on (2) with those are high on (3) but low on (2)?

To take another example, suppose a problem requires the comparison of tow persons or groups with respect to their attitudes toward a political party. Some may oppose all the party's policies, some may oppose some of the policies and favor others, some may advocate its support only because of opposition to another party, and others may support the candidates of the party but condemn its policies. How is it possible to compare these people or groups on a scale of favorable or unfavorable attitudes toward this particular political policy?

The close reader will immediately see that it is possible to differentiate types *qualitatively* in both cases without necessarily implying that in the one case *higher social standing* could be identified, or that in the other case *greater opposition to the party* could be described. However, the development of a more scientific sociology calls for comparative, quantitative measurement and such qualitative analysis will not always suffice.

The problem of scaling has been encountered in such diverse areas as in the study of attitudes, institutional practices, housing adequacy, social status, neighborhood environment, and occupational prestige, and has been applied in a number of ways. Before presenting an analysis of these techniques, however, it seems useful to make some general remarks about the major problems encountered in this area.

GENERAL PROBLEMS

The following discussion will be confined to those problems which are common to all types of scaling. An exhaustive treatment would require the introduction of specific scales or scaling techniques. Some of these will be dealt with in the following chapter.

1. Definition of the continuum

With regard to the examples given above, the question might have been raised as to whether it is reasonable to suppose that there is such a thing as a continuum of social standing or one of favorableness-unfavorableness to a political party. This would obviously be a legitimate question, and it is one which can only be answered by careful logic, conceptual analysis, and empirical test

Scaling always hypothesizes the existence of a continuum of some kind. Its nature must be inferred from the character of the items selected to make up the scale. *Logically unrelated items*, therefore, cannot be included in the same scale without resulting in a confusion of continua within one scale. Consequently, the first step in scaling procedure, regardless of the technique employed, is a thorough knowledge of the subject. The student must systematically exploit his own observations and those of others though a careful study of the literature and through interviews with "experts" before he can begin scale construction. He must, in shot, find out what it is that he wishes to measure quantitatively.

To understand the importance of this step it should be pointed out that every scale is composed of items which are only a *sample* of the possible universe of items. Without the fullest possible knowledge of that universe the researcher can have no confidence in the representativeness of the items which he selects for his tentative list. If, for example, a scale to measure "housing adequacy" is contemplated, two basic steps are necessary: (1) the logical analysis in defense of the hypothesis that such a continuum as housing adequacy exists; and (2) a clear definition of what "housing adequacy" means. Both these steps, of course, imply a thorough explicit the rationale for item selection in any construction of scales. This is similar to the problems which were discussed in the chapter on concepts.

Another important point in defining the continuum is to bear in mind the nature of the population which is to be scaled. It may will be true that an attitude continuum exists in one group but not in another, or that those items which measure housing adequacy in California have no relevance in New York or Chicago. A scale, therefore, must be treated cautiously and must always be viewed as tentative whin applied in a new and dissimilar population. This, of course, is true whether the populations are separated spatially, temporally, or by social distance.

In general, then, scale construction and application require a high degree of consciousness of the logical problems surrounding the twin assumptions of (1) the *existence* of a continuum, and (2) the *representativeness* of that continuum achieved by the particular scale in mind. There are empirical tests which can be applied to check either assumption. The question of *representativeness* is checked by tests of *validity*, which will be discussed below. The *existence* of the continuum can be empirically verified in a number of ways which will be taken up in turn as the various techniques are discussed.

2. Reliability

A scale is reliable when it will consistently produce the same results when applied to the same sample. Just as a ruler which shrank or expanded materially when exposed to temperature changes would be useless, so would be a scale which yielded a different result upon each application. Three methods of measuring reliability are in general use.

A. Test-Retest

As the name implies, this means that the scale is applied twice to the same population and the results compared. The statistical technique of comparison may employ any of the common measures suitable for this purpose. Some form of correlation is generally used, however. A high level of association must be demanded before reliability cab be assumed. This method of measuring reliability presents a problem, however, which is rather difficult of solution. The very fact of first application of the scale, if people are the units being measured, may affect their behavior in responding to the second application, This effect can be measured, of course, by randomly dividing the original population into halves and utilizing a control-group procedure. Thus if an attitude scale were to be tested for reliability, the technique illustrated above might be used where only the shaded groups are tested. Thus, if A_1 shifts more from A than B_1 shifts from A, the assumption that the first administration of the scale has affected the second responses would be justified. If this occurred, doubt would be cast upon the reliability coefficient, since the amount of variation which was due to the original stimulus would not be separated from the amount due to the unreliability of the scale. Related to this attempt to avoid the effect of the first scaling is another measure of reliability, discussion of which follows.

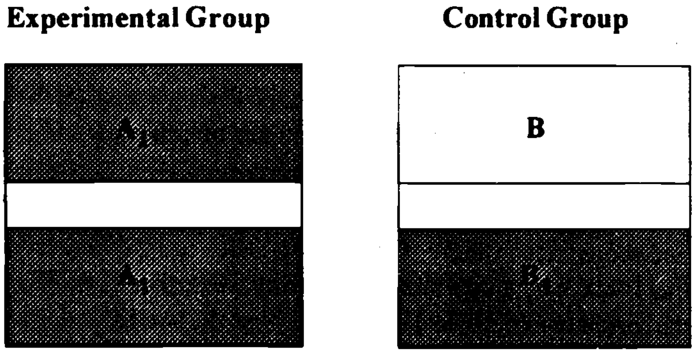


Fig. 15.1. A design for controlling test-retest reliability

B. Multiple Form

In this method of measuring reliability, two forms of the scale are constructed to begin with, and alternate forms are administered successively to the same sample. It is obvious that this does not completely solve the problem of first scaling effect since, if the two forms are sufficiently correlated to measure the same continuum, then their connection may will be obvious to the subject. Further, answering any series of answers.

The level of correspondence between the two forms must here, as in the test-retest procedure, reach a very high level of confidence to ensure satisfactory reliability. In general, the third method of measuring reliability is superior to either of these procedures since it does not involve two scaling experiences.

C. Split-Half

This measure of reliability is a modification of the multiple-form approach. One application of a scale id sufficient to secure the measure, since it treats two halves of one scale as if they were two forms, as in the multiple-form method above. The scale is divided randomly into two halves. This may be done in any way which is practical and yet assures randomization. Usually the simplest procedure is to separate the scale into two, using the odd-numbered items for one and the even-numbered for the other. This, of course, can be done only when the numbering itself has not involved a systematic principle. It is safer than comparing the first half against the second half since differential informant fatigue or cumulative item effect may lower or raise the true correlation.

Each of the two sets of items is treated as a separate scale and scored accordingly. The two subscales are then correlated and this is taken as a measure of reliability. A further step is to correct the correlation coefficient secured between the two halves by applying the Spearman-Brown prophecy formula $r_n = nr_1/[1 + (n - 1) r_1]$. This correction assumes that a scale 2*n* items long will be more reliable than a scale *n* items long, and since the length of the scale has been halved by dividing it into odds and evens, the full scale will have a higher reliability than would either half. Once again the coefficient should reach a high level before being taken as evidence of adequate reliability.

It should perhaps be noted here that this technique assumes that the scale as a whose hangs together, so that either half may be taken as adequately representative of the whole. This can be true only when two conditions are met:

1. There must be an empirical demonstration that the scale is a unity. This was mentioned in the section of this chapter on the definition of the continuum and will be further discussed under specific scaling techniques.
2. Each half scale must contain sufficient items to be reliable itself. A minimum number for this is probably 8 to 10, so the entire scale should bot be shorter than 16 to 20 items.
3. Validity

A scale possesses validity when it actually measures what it claims to measure. It can at once be seen that is very difficult to establish. Since, as was pointed out earlier, a scale measures a continuum which is inferred to exist from the items themselves, there are frequently no independent measures which can be used as a criterion of validity for the scale. Nevertheless every scale, to be useful, just have some indication of validity. The consequence of this is that much work remains be done with regard to validating scales already in use and with regard to developing techniques of validation. There are four approaches to the validation of scales, which are discussed below.

A. Logical Validation

This is one of the most commonly used methods of validation and certainly one of the most difficult to apply. It refers to either theoretical or "common-sense" analysis which concludes simply that, the items being what they are, the nature of the continuum cannot be other than it is stated to be. Logical validation, or "face validity" as it is sometimes called, is Almost always used because it automatically springs from the careful definition of the continuum and the selection of the items. For example, a test of "conservatism" might contain questions about attitudes regarding property, marriage, and the political system. Responses to these questions would be judged in terms of a common-sense definition of conservatism, that is, upholding the *status quo*.

On a question concerning "what should be done about communism," then, we might agree that the conservatives would suggest further restrictions, while liberals would be somewhat more lenient. We would thus feel justified in including such an item. However, empirical study may indicate that this item is of little use. Since some conservatives will be less strict, following a nineteenth-century conception of judicial protection of individual rights. And many liberals, bitter at what they consider a Communist betrayal of reform movements, may suggest that such protections be discarded. Thus it is not wise to rely on logical and common-sense validation alone. Such claims for validity can at best be merely plausible and never definitive. More than logical validity is required to fender satisfactory the use of a scale.

B. Jury Opinion

This is an extension of the method of logical validation, except that in this case the confirmation of the logic is secured from a group of persons who would be considered expert in the field within which the scale applies. For example, if a scale to measure the adequacy of housing were constructed, engineers, relators, janitors, architects, and housewives might constitute a jury to determine the validity of the scale. Since experts may error and since nothing but logical validity can result from this approach, it would seem that jury validation can be considered only slightly superior to logical validation.

C. Known Groups

This technique is a variant of the jury procedure. In this case the validity is implied from the known attitudes and other *characteristics* of antithetical groups, however, rather than from their specific *expertness*. Thus, if a scale were being devised for the purpose of measuring attitudes toward the church, the questions could be tested by administering it to one group known to attend church, to be active in church activities, and otherwise to give evidence of a favorable attitude toward this institution. These answers would then be compared with those from a group known *not* to attend church and also known to oppose the church in other ways. If the scale failed to discriminate between the two groups it could not be considered to measure this attitude with validity.

This method, while widely employed, always carried with it the danger that there might be *other* differences between the groups in addition to their known behavior with regard to religion, which might account for the differences in the scale scores. For example, the two groups with antithetical behavior patterns might also show differences of age, socioeconomics status, ethnic background, marital status, residential location, and political affiliation. There might also be differences with respect to liberalism, conservatism, attitudes toward various authors and works of art, etc. However, these could not be accepted as measuring attitudes toward the church, however correlated with that attitude they might be. We cannot assume that anything is correlated until we have a device for measuring the attitude. Thus there is always the danger that items which discriminate between the prochurch and antichurch *groups* might mot be the most significant for discriminating between prochurch and antichurch *attitude*.

Further, perhaps the known behavior under study might be associated with a differential inclination to agree or disagree on questions in general. As a consequence only very careful use of the known-groups technique should be made. Moreover, such measures of validity are always only plausible and never certain. Nevertheless, a high degree of plausibility may be all that is possible in the study of some problems, and for this reason the known-group technique of validation is frequently useful and should not be discarded for falling somewhat short of perfection.

D. Independent Criteria

This is the ideal technique, abstractly speaking, but its application is usually very difficult. Ideally, also, it would be called validation by an independent criterion. However, if there is already a single criterion available to measure the continuum in question there is little need to construct a scale. As a result several criteria of validity are generally used so that the scale will serve the function of measuring more simply a continuum that would otherwise be difficult to measure.

For example, if it is desired to produce a scale which will measure social standing, its validity may be measured by checking it against a variety of other factors such as rental value of homes, amount of education, residential location, income, family background, or other similar factors. On *the assumption* that the composite effect of these validating factors will be to measure true social *standing*, the degree to which the scale correlates with these indexes indicates the validity of that scale.

The great difficulty here lies in the fact that the independent criteria may themselves not be good indexes of the continuum which the scale seeks to define. This, of course, is in addition to the point made above that, if these independent criteria are available and reflect the continuum accurately, then there is little reason for the existence of the scale.

However, it should be underlined that where these difficulties are solved, validation by independent criteria is a powerful tool and is perhaps the most effective of all techniques of validation.

In general, it should be understood that the best practice is to employ as many of the four techniques as is possible. In fact, the logical technique should always be employed and made explicit. It will, however, seldom be convincing alone and should be combined with at least one of the other methods.

4. Weighting of items

This is essentially a problem in increasing the validity of the scale. Furthermore, it is not a problem in the construction of all types of scales. Nevertheless it is sufficiently different from the problem of validity as such, and it applies to enough types of scales, to warrant separate consideration in this section.

The problem is a simple one to understand, though its solutions are not always equally plain. It will be recalled that the essence of scaling is to combine several qualitative characteristics into a quantitative variable. Thus scales typically present a series of qualities which are either present of absent, and the combination of these provides the scale. The question frequently arises, therefore, whether all the items (attributes) are of equal importance. If this cannot be assumed, then the problem arises as to how this inequality can be allowed for; in other words, how to assign weights to the items.

Three methods are generally employed. Since the purpose of weighting is to secure a scale which will more accurately measure the continuum it purports to measure, it si not surprising to find these closely related to the techniques of validation.

A. Known Groups

If a scale without weighting the items has been seen to discriminate between two groups, its accuracy may be improved by applying the same test of validity to *each of the items making up the scale. Statistical* measures which will be discussed later can then be employed to weight each item in terms of its ability to discriminate between the criterion groups. By thus allowing for the validity of each item, the scale as a whole is improved.

B. Independent Criteria

This technique is essentially the same as that of the known-group method, except that the known groups are replaced by independent criteria. Thus the validity of each item is separately checked against the criteria is then employed as the weight for that item.

C. The Scale Itself

When a scale is established as reliable and valid, then the total first approximation of the score may be used as a criterion of validity for each item. The procedure in this case is the same as in the is the same as in the two methods above, so that the weighting of *each* item is a function of its relation to the scale as a *whole*.

5. The nature of the item

One of the questions closely associated with the validity of scales is that concerning the nature of the scale. There are many who feel that so-called "paper and pencil" tests do not coincide sufficiently well with other behaviors to make them valid instruments. It is felt that such scales structure the situation too arbitrarily to reflect accurately the feelings of the subject. So long as such scales show adequate validity, however, such objections need not be taken seriously. However, in certain cases this objection may be well taken and methods have been developed to deal with this problem. These are all considered as "projective" tests even though they may differ considerably in nature.

The essential nature of the projective item, versus the directive item, is that it avoids as much as possible any structuring of the situation. In this way it is hoped that the response made by the subject will be close to his "real" feelings and will not reflect some biases of prejudices implicit in the structuring itself of the directive items. Projective tests are, at present, most commonly employed by psychologists but are coming into use among sociologists. In the following chapter some examples of attempts to employ unstructured items will be given. at this point it is only necessary to make clear the fact that in some sensitive or controversial areas of study the problem of reducing the directive nature of items is a matter of importance for sociological research. The projective character of "nondirective" interviewing has already been discussed.

6. The equality of the units

In the opening paragraphs of this chapter, reference was made to the ordinal character of measurement. Thus the discussion this far has faced only those problems which are related to scaling as a method of *ordering or ranking* units on a continuum. In addition to the problem of whether one unit (person or group) is higher on a scale than another, there are also problems of *how much* one unit is higher or lower than another.

The nature of this problem can be clearly seen by returning to the early illustrations of family size or amount of money in the bank. Not only is every family with six members obviously larger than one with only three members, but it can be said to be *twice* as large, or to have three *more* members. Similarly the man who has Rs. 2,000 in the bank has more than the man who has only Rs. 1,000, but we can make the comparison more precise by nothing that he has *twice* as much. This is called the cardinal use of numbers in distinction from the ordinal or ranking principle. It means that the units of measurement can be added, subtracted, multiplied, or divided.

The question as to whether scale as they are applied in sociology can ever be thought of as employing cardinal numbers is often brought up. That is, for example, can one house ranked at the 96th percentile on a housing adequacy scale be thought of as being *twice* as adequate as one ranked at the 48th percentile? This could be true only if the housing scale had two attributes: (1) it would have to have a point of origin at the value zero; and (2) each attribute composing the scale would have to add an equal increment to the scale of adequacy, in the same way that any one dollar added to the bank account is the same as every other one already deposited. No sociological scales in use possess these characteristics. Various ways of dealing with the problem will be presented in the following chapter as indications of the awareness of the problem within the field and as attempts to correct for this shortcoming as much as possible.

It should further be pointed out that it is not necessary for a scale to possess either a zero point or absolutely equal units in order to be useful. These are desirable characteristics, but they are essential to sound scientific procedure.

STANDARDS FOR SCALING

The foregoing problems, which confront everyone attempting scale analysis, appear formidable indeed. In fact the scale which shows perfect reliability, absolute validity, a zero point, and completely uniform units does not exist.

There are two important facts for the student to bear in mind in regard to the accuracy of scaling: First, that care must be exercised to achieve as high a degree of reliability and second, that even when we do not make a scale which can be put in cardinal numbers, the techniques cab nevertheless be useful. Such scaling methods as are available range from great crudity to considerable refinement. The research situation will frequently determine the degree of accuracy which can be achieved. Any scale which is reliable and valid, regardless of its crudity of measurement, is better than no scale at all so long as no more refined technique is applicable.

DIAGRAMS

Statistical data not only require a careful analysis but also in attractive and communicating display. The figures are by nature uninteresting, dry and complex. They require not only specialized knowledge but also specialized interest to be properly followed. The work of statistician is not only to understand the facts himself, but also to put them in such a form that their significance may be clear to common man. In order to achieve this objective two methods known as graph and diagrams are used. The object of these two techniques is to present the quantitative data in such a form that they may appear to be interesting to the people and at the same time their significance may be clear.

Importance of diagrams

1. They present the complex mass of data in such a form that their significance can be very easily followed by other. For example, the figures for the expenditure of two families over different items may be difficult to follow, but when the same is put in form of sub-divided bars we can easily locate the significance.
2. They make the data memorable. The figures are dry and uniteresting therefore they easily slip from the memory. The diagrams and the pictures make them interesting and they are easily remembered for long times. For example, if the damage done to the crop by mice is represented by a big mouse cating away a major share from a plate, the fact would not be forgotten soon.
3. They make comparison easy. One of the primary objects of graphs and diagrams is to make the comparison possible. In comparing the absolute figures the significance is not clear, but when they have been represented by graphs or diagrams the comparison is very easy. Two graphs lines showing the price index numbers and index numbers of money supply will make comparison easier than figure were studied. Every a lay man can notice the rising or falling trend simultaneously and thus mark relation between the two.
4. Graphs and diagrams save time and effort in following. The significance of figures can be followed only after much strain upon mind, but in case of graphs and diagrams, it can be done by mere visual observation. They are therefore, often used by the researcher themselves for the purpose of comparative observations as in case of graphs of prices, temperature etc.
5. They are attractive and interesting and can be used for the sake of propaganda. For example, propagation of family planning

is best possible if two pictures of large and small size families are given. Similarly diagrams representing the progress made in different sphered during the plan period will attract more attention than figures, and can therefore, be used with greater effect in propagating the progress of the plan.

6. Graphs can be used for various types of statistical analysis e.g. interpolation or extrapolation, location of median, mode, correlation, line of best fit etc.

Rules for making diagrams

Diagrams are chiefly meant for others and therefore clarity, easy communication of significance and attractiveness should be given almost attention in preparing them. The knowledge of technique, understanding of the data and above all artistic sense of the framer are the most important factors that guide a person in preparation of diagrams. The following facts may, however, prover useful in this respect.

1. The diagrams must be attractive, well proportioned, neat and pleasing to the eyes.
2. They should be geometrically accurate. Various geometrical dimensions should be proportionate so that no wrong impression may be found.
3. The size of the diagrams should be in proportion to the paper. It should not be to big or too small. If more than one diagrams is made for the sake of comparison they should be proportionate.
4. Selection of right type of diagrams is essential. There are different types of diagrams each having its special characteristics. These characteristics should be kept in mind while selecting the type of diagrams.
5. The diagrams may be vertical or horizontal, but vertical diagrams should be given preference to horizontal ones as they are easy to follow.
6. The heading and scale must be given for each diagrams so that actual figures may be deduced from them.

7. Different colours, shades, designs should be used to demarcate different parts of diagram. They should be attractive and pleasing to the eyes.
8. The diagram should be simple and easily comparable. Too many details should not be shown in the same diagram. Thus number of comparisons should be kept sufficiently limited to afford simplicity. Where too many details are given, either they should be consolidated, or separate sets of diagrams should be used for them.

KINDS OF DIAGRAMS

Following are the main types of diagrams that are used for displaying facts :

1. One dimensional diagrams

(i) Line Diagram.
(ii) Simple Bar Diagram.
(iii) Multiple Bar Diagram.
(iv) Sub-divided Bars.
(v) Deviation Bars.
(vi) Sliding Bars.
(vii) Pyramid Diagram.

2. Two kimensional or Area Diagrams

(i) Rectangles.
(ii) Squares.
(iii) Cricles.

3. Three dimensional or Volume Diagrams.

(i) Cubes.
(ii) Cylinder Blocks.
(iii) Globs.

4. Pictograms.

5. Cartograms and Maps.

1. One dimensional diagrams

IN these diagrams only one dimension-the length, is taken into account for the purepose of comparision. The breadth or thickness is not considered. Even where the breadth is given it is used for the sake of beauty and attractiveness.

1.1 Line diagrams

In tghese diagrams only lines are drawn for the purpose of comparison. They are not thick and generally their number is sufficiently large so that thickness of bars can not be used. The various measurements to be shown should not have too much difference, so that the lies may not show too much dissimilarity in heights.

Illustration-1

The following data relate to expenditure on books by 20 graduate students of a college. Represent it by suitable diagram.

Expenditure in Rs. 33, 35, 41, 45, 41, 36, 32, 44, 34, 39, 33, 40, 31, 42, 36, 47, 38, 40, 30, 47, 37.

Solution

Arrange the expenditure in the ascending order as given below:

30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47.

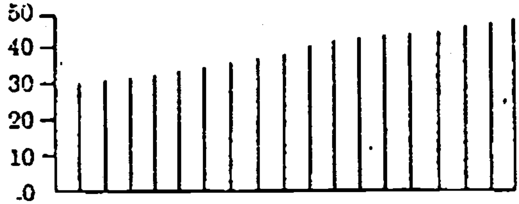


Fig. 15.2. Line diagram

1.2 Simple bar diagrams

They are similar to the diagrams mentioed above, but the lines are made thicker in form of bars. The breadth of all the bars is equal and should be kept in proportion to the height, so as to look attractive and well proportioned. They should be constructed at equal distance from eaech other. Such Bar diagrams can be used only in those cases where one comparison has to be made and the ratio between highest and lowest measurement is not more than 10.1. In order to draw bar diagrams, we should first of all decide the scale, which will depend upon the highest and the lowsest size. The scale should not be too big so that smallest bar may appear too tiny, and should not be too small so that the highest bar may reach out of the paper size.

Illustration-2

Represent the following data regarding density of population with the help of a bar diagram :-

Density of population per square Kilimeter in 1991.

Bihar,	U.P.,	Punjab,	Mysore,	M.P.,	Rajasthan,	All India
324,	300,	269,	153,	94,	75,	178

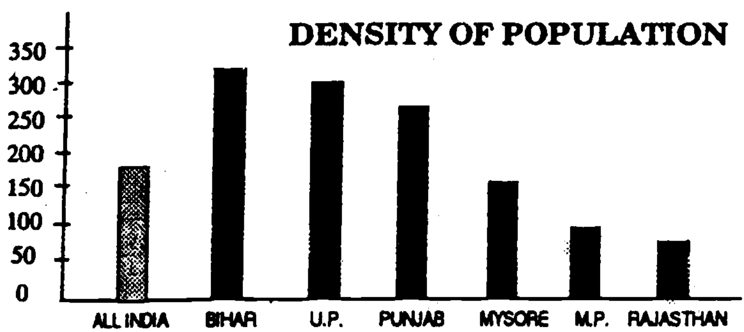


Fig. 15.3. Simple Bars

1.3 Multiple Bar Diagrams

When more than one comparison is made multiple bar diagrams are used. When two things are to be compared viz. the result of boys andn girls over a number of years they are best represented through double bars. In this case the bars will be drawn in the form of pairs. Similarly if the things are to be compared the bars drawn in the clusters of three and are knowns as treble bars. The method of drawing is the same as in case of simple bars.

Illustration-3

A percentage of literacy among males and females in some of the states of India 1991.

State	*Percentage of literacy* *Males*	*Females*
Delhi	63.71	47.75
Kerala	66.62	54.31
Maharashtra	51.04	26.43
Rajasthan	28.74	8.45
U.P.	31.50	10.55

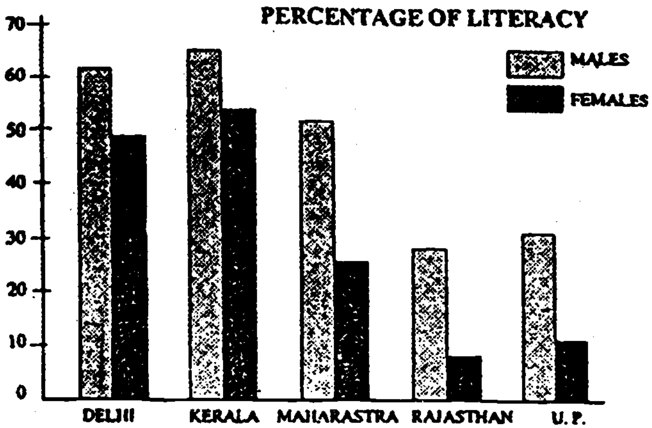


Fig. 15.4. Double Bar

Illustration-4

Registered crime cases per thousand of population in each of the three cities over a period of three years.

Year	*Kanpur*	*Cities* *Jaipur*	*Patna*
1994	25	20	20
1995	40	22	27
1996	48	16	33

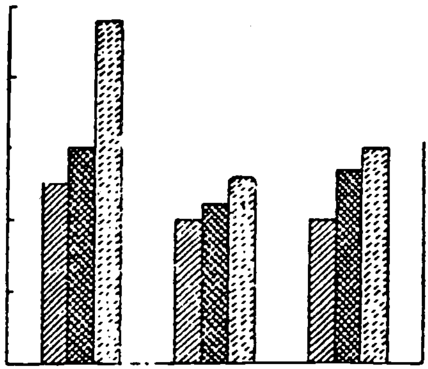


Fig. 15.5. Treble Bars

1.4 Subdivided bars

Sub divided bars serve the same purpose as multiple bars. The only difference between the two is that in case of multiple bars each part is shown independently and is represented by a separate bar, but in case of sub-divided bar each group are placed one upon the other. In order to draw these bars, first of all bars representing the total are drawn. Then each bar is divided into sub-parts as requoired.

Illustration-5

Distribution of students by sex and different faculties of a college during two years.

Year		*Faculty*		
		Art	*Science*	*Other*
1991	Males	350	100	150
	Females	450	300	150
	Total	800	400	300
1992	Males	450	500	250
	Females	550	300	250
	Total	1000	800	500

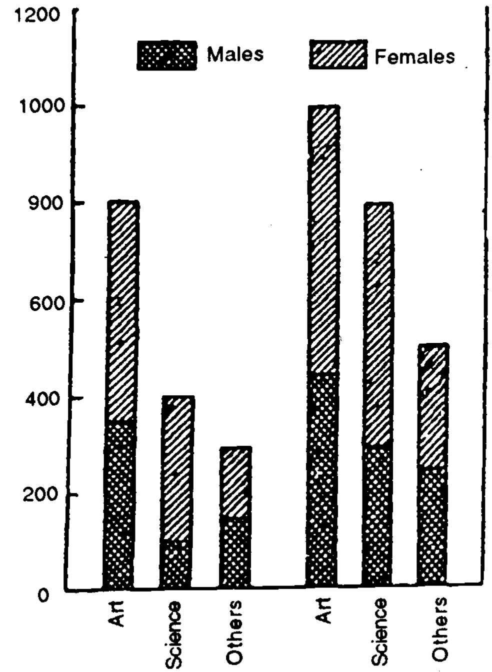


Fig. 15.6. Sub - divided bars

Illustration-6

Family budget of two middle class families.

		Family A	*Family B*
Total income		*400*	*600*
Expenditure	Food	220	300
	Clothing	72	72
	Fuel and light	20	30
	Rent	48	60
	Education and health	32	60
	Miscellaneous	28	48
	Total	420	570

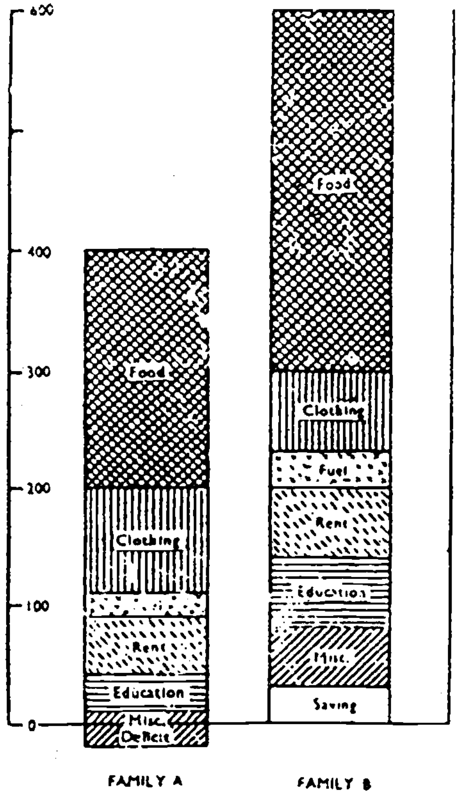


Fig. 15.7. Sub - divided Bars

Here in case of family A there is a deficit of Rs. 20 and when sub divisions are made the last division comes down below the base. In case of family B there is a surplus of Rs. 30 and hence some space is left out. The height of two lines is in the proportion of 400 : 600.

1.5 Deviation Bars

These bars are used to show the deviations or differences from a given number both ways. The differences may be towards positive or towards negative side. The base line is therefore, drawn in the centre and may be either vertical or horizontal. The differences of the item values are shown along the base lie on both the side. If base line is horizontal plus values are shown upwards ad minus values down wards. If base line is vertical plus values are shown towards the right and minus value towards the left.

Illustration-7

Change in the number of houses of 12 towns in U.P. from 1947 to 1957.

City	*Change*	*City*	*Change*	*City*	*Change*	*City*	*Change*
A	+ 160	D	+ 100	G	- 20	J	- 80
B	+ 150	E	+ 50	H	- 50	K	- 140
C	+ 130	F	+ 20	I	- 70	L	- 160

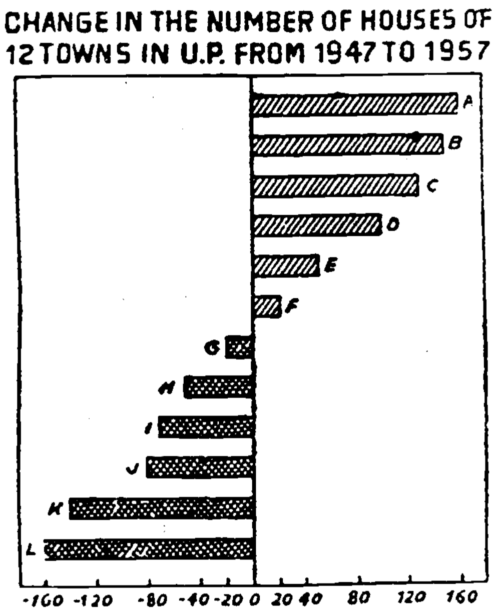


Fig 15.8. Deviation Bars

1.6 Sliding Bars

These bars are used to show the ratio of change between two parts of unit. The total in the case is thus 100, but the ratio of the component part changes. In order to show this change, a vertical base line is drawn. The total length of the bar is the same in each case but it is only shifted towards right or left to conform to the shifting ratios.

Illustration-8

Percentage distribution of students by sex in each of seven subjects in the faculty of Arts.

Subjects	*Males*	*Females*
History	76	24
Psychology	64	36
Economics	60	40
Philosophy	55	45
Geography	44	56
Sociology	40	60
Sanskrit	35	65

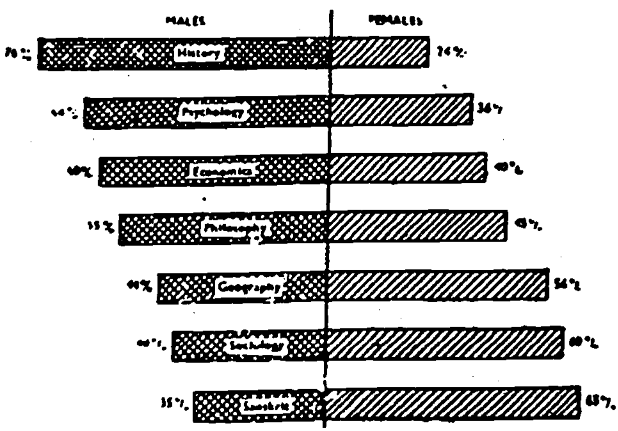


Fig. 15.9. Sliding Bars

1.7. Pyramid diagram

These diagrams are used to show distribution of males and females by age groups. As the ratio of males and females is almost equal and their number goes on diminishing in higher age groups, the diagram looks like a Pyramid. A vertical line serves as base line. On one side horizontal bars represent males, on the other they represent females.

Illustratioin-9

The following table gives the population of India by sex and age groups. Represent it by Pyramid diagram.

Age group	*Female* (*in millions*	*Males* *of persos)*	*Total*
75 and above	2.1	1.7	3.8
70-74	1.8	1.6	3.4
65-69	2.7	2.4	5.1
60-64	3.0	3.0	6.0
55-59	3.6	3.6	7.2
50-54	4.2	4.0	8.2
45-49	4.5	4.5	9.0
40-44	5.0	5.0	10.0
35-39	5.7	5.5	11.2
30-34	5.9	5.7	11.6
25-29	6.2	6.0	12.2
20-24	5.9	5.5	11.4
15-19	5.4	5.4	9.0
10-14	5.7	5.7	11.4
5-9	6.4	6.8	13.2
Under 5	8.0	8.3	16.3

2. Two dimensional or area diazgrams

These diagrams are used to show the comparison of the areas rather than simple heights. Therefore, their length and breadth are both taken into consideration. These diagrams are used when the ratio between the highest and the lowest measurement is more than 10.1. The main types of area diagrams are as follows :-

2.1 Rectangle

Rectangles are used generally in place of subdivided or percentage bars. The only difference betsween the two is that where as in case of rectangles it is the area that is compared and thus the

POPULATION OF INDIA 2001

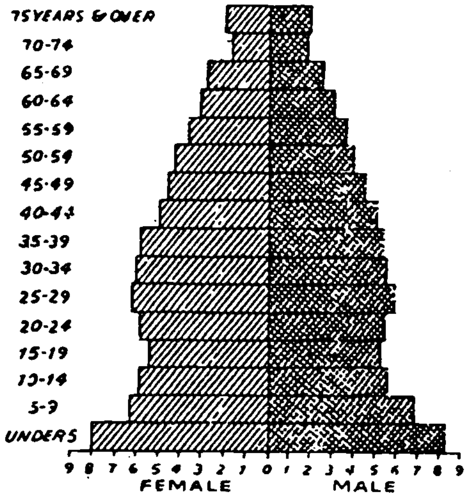


Fig. 15.10. Pyramid diagram

breadth is also taken into consideration. One example of this type of diagram is the representation of two or more family budgets of different incomes. The absolutes may convereted into percentages taking total expenditure equal to 100. In order to faciliate sub-dividing of the rectangle cumulative percentage amy be taken. The height of the two rectangles is the same, but the difference in total income is shown by the dcifference in the breadth. The base of breadth of the rectangle is kept in proportion to total income.

Illustration-10

Family budget of two middle class families.

		Family A	*Family B*
Total income		400	600
Expenditure	Food	220	300
	Clothing	72	72
	Fuel and light	20	30
	Rent	48	60
	Education and health	32	60
	Miscellaneous	28	48
	Total	420	570

We have already seen how this data can be rerpesented with the help of sub-divided bars (see illustration 6). In order to represent by sub-divided rectangles we shall first convert the data into percentage Rs. 400 = 100 in case of family A and Rs. 600 - 100 in case of family B. The data would now appear as under.

	Family A Amount	%	*Family B* Amount	%
Total income	400	100	600	100
Food	220	55	300	50
Clotghing	72	18	72	12
Fuel and light	20	5	30	5
Rent	48	12	60	10
Education and health	32	8	60	10
Miscellaneous	28	7	48	8
Total	420	105	570	95

The two rectangle will be equal in height since the total measurement in both the cases is 100. The basis of the two will be in the ratio of 400 : 600 or 2 : 3. After each rectangle has been drawn it will be sub-divided on the basis of the percentage of each group. In case of family A the percentage of total expenditure is 105 % showing a dificit of 5 %. The last group will therefore come below the line. In case of family B there is a surplus of 5 %. There will be gap to the same extent.

2.2 *Square*

When only one aspect is to be compared and the ratio between the highest and the lowest measurement is more than 10 : 1, it is shown by means of squares. The basis of the square kept in proportion to square roots of various measurements. thus in order to draw the squares the square root of the values if first taken, then base of squares is determined proportionately.

Illustration-11

Population of 4 cities of India according to census of 2001.

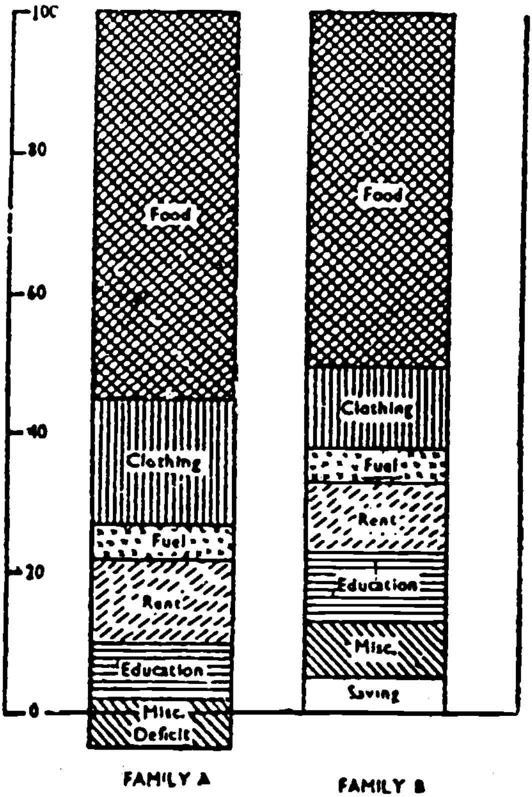


Fig. 15.11. Subdivided Rectangle

City	Bombay,	Delhi,	Kanpur,	Nagpur
Population in 000	4164	2644	498	643

Solution

City	*Population*	*Square root*
Bombay	4416	64.4
Delhi	2644	51.4
Kanpur	948	30.8
Nagpur	643	25.2

The basis of the squares will be the ratio of

26 : 20 : 12 : 10

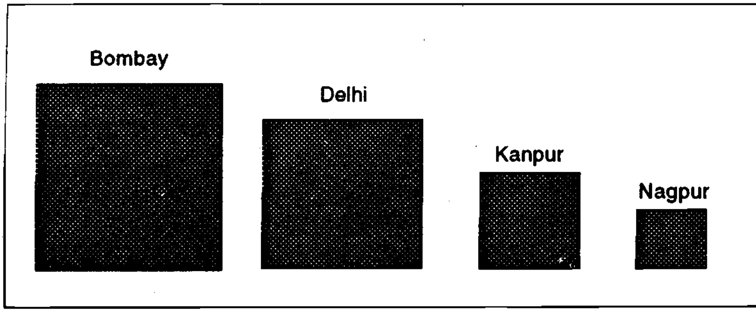


Fig. 15.12. Squares

Circular Diagrams : They are sometimes known as pie diagrams and are similar to squares. They are of two types (a) simple circles and (b) sub-divided circles. Simple circles can be used interchangingly with squares. The side of the squares would in this case represent the radius of the circle.

Illustiation-12

Land area of four countries.

Country	*Land area (in crores of acres)*	*Square root*
Russia	590.4	24.3
China	330.5	17.9
U.S.A.	190.5	13.8
India	81.3	9.0

In order to draw the circles we shall first of all take the square root of the four figures which is 24.3, 17.9 13.8 and 9 respectively. The radii of the circles will be proportion of square root.

2.4. *Sub-divided circles*

Like bars the circles can also be subdivided. Two types of problems may arise in such cases. (1) When only one circles is to be sub-divided. In the first condition a circle os any size may be drawn and the problem is one of sub-division only. For this purpose the angle value of each sub-part has to be found out. We know that

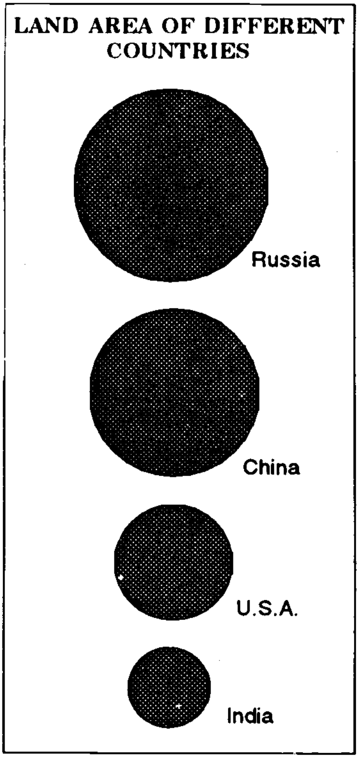


Fig. 13. A Circular Diagram

value of all the angles on any point is equal to 360. The following formula will therefore, apply for finding the angle value of each sub-groups.

$$\text{Angle value of sub-group} = \frac{\text{Value of sub - group}}{\text{Total Value}} \times 360$$

When the values of all the angles has been thus determined their total may have to be slightly adjusted to make the total equal to 360.

Illustration-13

Population of India by major linguistic groups

	Language group	*Percent of population*
1.	Hindi, Urdu, Hindustani	42.0
2.	Telagu	7.5
3.	Marathi	7.6
4.	Bengali	7.0
5.	Gujrati	4.6
6.	Kannada	4.1
7.	Maluyalam	3.8
8.	Oriya	3.7
9.	Others	19.7
		100.0

The angle value for 1% will be $\frac{360}{100} = 3.6$

The angle value of each language group can be determined by multiplying each percentage with 3.6.

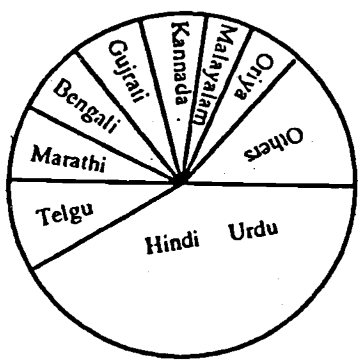


Fig. 15.14. Sub Divided Circle

When two or more circles are to be sub-diveded we are faced with two problems : (1) What should be ratio between their radii and (2) how should they be sub-divided. For the first measuremtnt we have to find the square foot of the total measurement in each case. These will servre as the basis for the radii. When the circles have been drawn they will be sub-divided on the basis of angle values of each sub-group as given in the illustration.

Illustration-14

Heads	First Five Year Plan		Second Five Year Plan	
	Provision	Angle	Provision	Angle
1. Agriculture and community development	357	54.36	568	42.48
2. Irrigation and Power	661	101.16	913	68.34
3. Industry and Mining	179	27.36	890	66.66
4. Transport and Communication	557	84.96	1385	104.04
5. Social services	553	81.36	945	70.92
6. Miscellaneous	69	10.80	99	7.56
	2376	360.00	4800	360.00

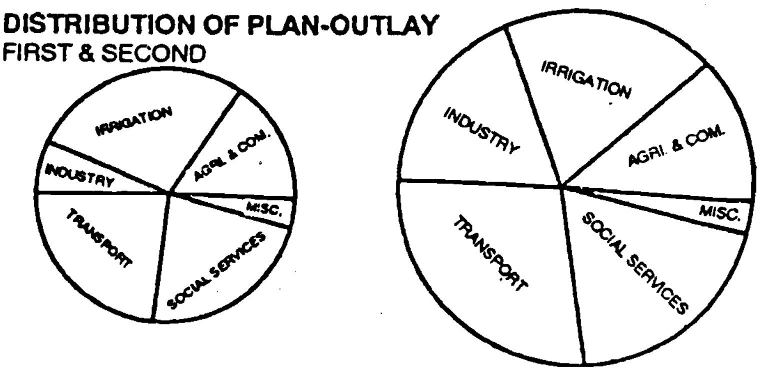


Fig. 15.15

3. Three dimensional or volume diagram

The diagram is used when only one points is to be compared and ratio between the highest and lowest and lowest measurement is more than 100 : 1. In order to draw these figures cube root of various measurements is taken. Then sides of each cube is taken in proportional to cube roots.

Illustration 15

Rerpesent the following data regarding the out put of coal in four countries diagramatically.

Country	*Out put in tons*
U.S.A	581729
U.K	247795
France	54884
India	24185

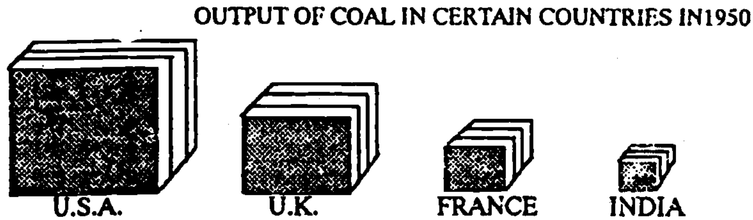


Fig. 15.16. Three dimensional or volume diagram

4. Pictograms

Diagrams representing different data may be expressed in form of pictures also besides the geometrical figures mentioned earlier. Pictures although less precise are never the less more attractive and interesting. Various kinds of pictures are used. They depend upon the nature of phenomena to be represented. The measurement is expressed in pictures either by means of number of by the area. Pictures are now used in maps, graphs, schedules etc. Following illustration will make the point clear :-

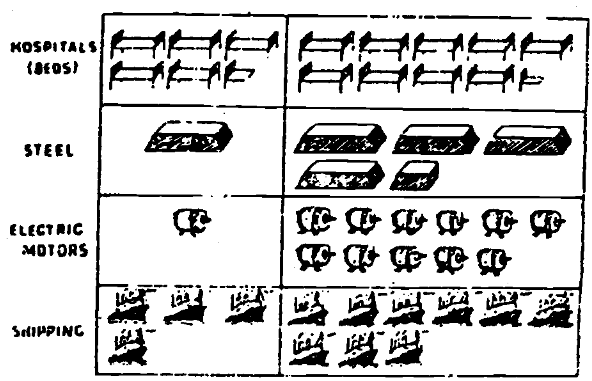


Fig. 15.17. Pictogram

5. Cartograms

They are used to represent regional data on maps. Thus if crops. industrial centres. languages. population etc. are to be shown according to their distribution on area basis. it can be represented by means of cartograms. An illustration of cartograms is given on the next page.

SOCIOLOGICAL MAPS

Maps have a special significance in sociological research. They are used not only fro display and presentation of facts but also for ready reference and easy visualisation of the investigator. The maps show the distribution of various social and allied factors oveer a certain area. It is thus a spatial scatter of sociological facts, but following four types are more important among them :-

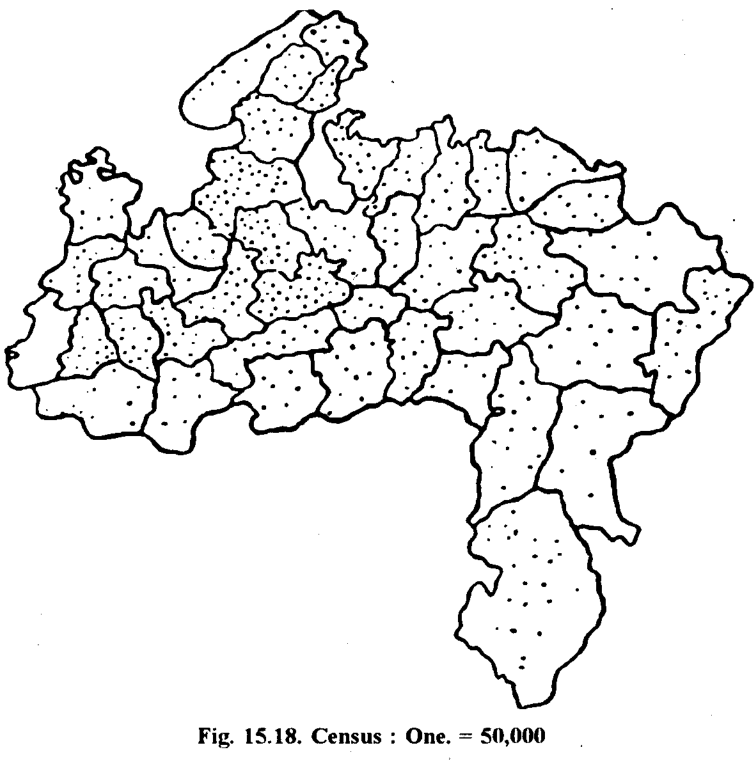


Fig. 15.18. Census : One. = 50,000

1. Base maps.
2. Sport maps.
3. Cross hatched maps.
4. Diagramatic or graphic maps.

1. Base maps

This map protrays the physical ans social background of the area under study. It, therefore, geves a complete patterning of the social phenomena in the physical and spatial background. Among physical phenomena roads, lades, villages, fields, parks, railroads, schools, Churches etc. may be shown. In case of social phenomena the nature of population living, lffices, factories, etc. may be shown. Thus, by looking at base map it is very easy to form an idea of the distribution of the social phenomena understudy. For example, if type of population, viz. labour merchants, office worders etc. is predominently concentrated in certain areas it will help to select sample on ecological basis.

2. Spot maps

They are also known as point symbol maps, and are used to show the frequency of one or more social phenomena scattared over the area, e.g. distribution of graduates, Muslims or grain shops over a certain area. Spot maps are shown by following different methods :

The first and most common method is size. The frequency is indicated by bars, double dimensional diagrams like circles or squares and three dimensional diagrams like cubes, cylinder or globs. Thus for example, suppose it is desired to show the distribution of Muslims in the city of Kanpur, in different checks, circles big and small may be shown in the areas according to proportion of Muslims.

The second method of showing freequency distribution is by means of numbers. According to this the frequency is not shown by size (length, asrea or volume) but by numbers. Thus, for example, if it is required to show the small circle, triangle or any other sign may be used to indicate 10, 12 or any other number of graduates, and required number of signs may be drawn over the area.

The third method of showing frequency distribution is by density. It is similar to the previous types. The only difference is that in this case generally small dots are used. Thus density of population may be shown by means of dots, each dot representing a certain number of persons. These dots when plotted on the map will make idea of density in different areas, very clear.

When density or frequency distribution of more than one factor has to be shown viz. distribution of population according to sex or religion different symbols may be used for them. Thus for example if it is proposed to show the relative frequency distribution of Muslims and Christians, spwcial signs, say, a cross for Christians and a crescent for Muslims may be used. Each symbol may, however, be used to indicate a certain number of people.

3. Cross hatched or shaded maps

These maps are used to indicate ratiosd rather than absolute figures as in case of spot maps. Thus, for example, it amy be desired to show the comparative study of spread of education in the cityu of Kanpur. Any symbol indicating the number of educated would not make the comparison clear. For this purpose, the percentage of educated among the total population in different areas would be calculated. The wholw percentage range would then be divided into a few groups and each group would be shown by a particular shade or design. Thus, if class interval of 10 is taken, the whole percentage range form 0 to 100 would be divided into 10 parts and areas coming within a particular group would be demarcated by particular shade.

4. Diagramatic maps

Maps may also be made with diagrams superimposed upon them. Thus, if it is desired to show comparative strength of graduates in different areas of a city they may be represented in from of solid bars standing in the area shown upon the map. The map thus looks like the area and the bars or any other figure, generally solid, seems to have been placed upon it, like blocks of wood placed upon a paper.

5. Limitations of Diagrams

The diagrams have following limitations as tools of statistical analysis :-

1. The diagreams give only a rough idea of the measurement of the phenomena. It is not possible to get an idea of the exact measurement through them. The diagrams, are therefore, meant only fro layman. For an expert they have very little value.
2. The small differences in large measurements can not be shown. In fact the diagrams can show only the proportionate difference between two measurements. Thus, when proportionate difference is low, it can not be located even if the absolute difference is high. For example, difference between 10,000 and 10,099 is sufficiently big, but it can not be clearly shown by a diagram, as the proportionate difference is very low.
3. Diagrams can at best show one or two kinds of comparisons. When multiple comparisons have to be made they prove unsuccessful. Thus, data from a complex table cannot be presented accurately by means of diagrams.
4. The comparative prasentation by diagrams is not possible when the difference between two measurements is very great e.g. 1 : 10,000.
5. Diagrams are not capable of furthur analysis. They are only useful for visual observation. In this respect graphs are more accurate.
6. The significance is misinterpreted if the diagram has not correctly been shown. A large difference may appear small when area diagrams are used. If the same is shown by bar diagrams the difference would appear too great. The diagrams are not, thus, complete in themeselves as figures are. For making out the significance clear, they must be presented in a proper manner on a proper scale.

GRAPHS

Display of facts can also be made through graphs. Graphs are generally used for representing continuous series and time series. Diagrams are meant generally for others. They carry very little details and are only rough guides to the significance of the data. Graph is more accurate and at times mathematically precise. It is equally useful for are searcher as well as a layman. It is used for calculating many types of statistical measures like median, mode, correlation, interpolation etc.

Construction of graph

Graph is drawn on a special paper known as graph paper. This paper contains squares of one inch size drawn in red ink. Horizontal and vertical lines are also drawn in blue at a distance of 1 inch. In order to draw graph two straight lines are drawn towards extreme left crossing each other at right angles. The vertical line is known as *axis y* or *ordinate,* while the horizontal line is known as *axis x* or *abscissa.* The point of intersection is known as *point of origin.* The lines are drawn on graph paper by plotting the points. Every point has two sides, one along the axis of x and the other along the axis of *y*.

2. Scale of graph

A proper scale has to be selected on both sides. Horizontal line or axis *x* is generally selected for representing independent variables and time series, while vertical line is used for measurement of dependent variables. In selecting the scale the range of measurement is taken into consideration. The scale must be written on the graph so that actual measurement may be found out from the graph.

3. Charting of values

Usually two types of sense are charted on the graph:

1. Time series
2. Frequency series.

Charting of time series

When a statistical series indicates a change on the basis of time it is known as a time series. Daily attendance in a hospital, week end price quotations, monthly births and deaths or annual population figures are typical examples of *time* series. While plotting time series, time is shown along horizontal line while values are shown along the vertical line. Various points are joined together to show continuity. The curve attained in this way y can be used for interpolating or extrapolating values.

False base line

Sometimes we have to plot such values as are large in magnitude but difference between them is very small. In such a case if we take a small scale to depict the differences very large space may be needed for plotting the whole data. On the other hand if a large scale is taken the periodical difference may not be clear. To avoid this difficulty we take up a false base line which means that in case of vertical scale we do not start from zero but, from a higher value which is usually the minimum in the series. Sometimes we start from zero but take the next step as the minimum value. Between these two we draw a line showing discontinuity.

Selection or scale

Before the data are plotted on the graph, they must be given a scale value, indicating how many units of data are represented by 1 inch on the graph. The following points need special attention in selection of a proper scale:

(1) What is the magnitude of the figures to be piqued. The space of the graph is limited and the whole data have to be shown within this space. If, therefore, the data consist of large figures a bigger scale will have to be selected to accommodate all the figures.

(2) What is the magnitude of difference between' individual units. The scale should be so selected that this difference is sufficiently apparent. In other words if such differences are small in magnitude the scale selected must be small.

(3) What is the relationship between the values of x and *y*. According to *Bowley*. "It is only the ratio between the horizontal and vertical scales that need be considered". If the vertical scale is unduly smaller than the horizontal scale, the curve will be more flat and the fluctuations will be less visible. If on the other hand it is unduly larger the fluctuationals will be over magnified:

(4) The scale should, as far as possible be in the multiples of 5 or 10. This makes planing easier.

(5) If rate of change is to be displayed ratio scale, rather than ordinary scale should be used.

Illustration-I

Crime cases per thousand of population in Kanpur

Year	*Crime cases per 000 of population*
1992	12.5
1993	14.0
1994	12.5
1995	14.5
1996	15.5
1997	15.5
1998	17.5
1999	18.5
All India average for the period	15.5

Time series data can be used for interpolating figures. Two different methods are used for this purpose. According to one method value for any intervening period is known by drawing a perpendicular on the required point of time cutting the curve. For example if ten yearly population figures from 1901 to 1961 are given and it is required to estimate the population for the year 1935, a perpendicular will be drawn at this point. The point at which it cuts, the curve will be the population for the period. For the purpose of extrapolating, the last end of the curve is extended, upto a point whose value is to be

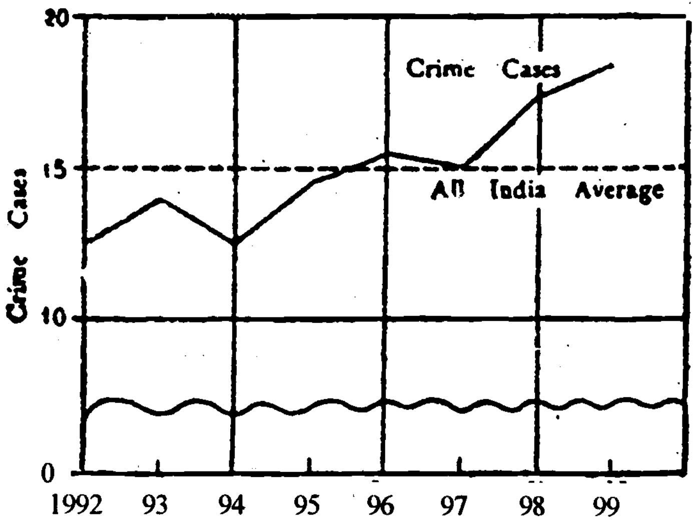


Fig. 15.19

known. According to the other method a trend line is drawn passing through the curve and values are interpolated or extrapolated from the trend line.

Illustration 2

Plot the following data regarding the population of India during the past 7 censuses and also find the population in 1941 and 2001.

*Year**	*Population (in, 000,000, persons)*
1941	236.3
1951	250.7
1961	250.0
1971	277.4
1981	316.9
1991	359.2
2001	436.4

* Assumed Data

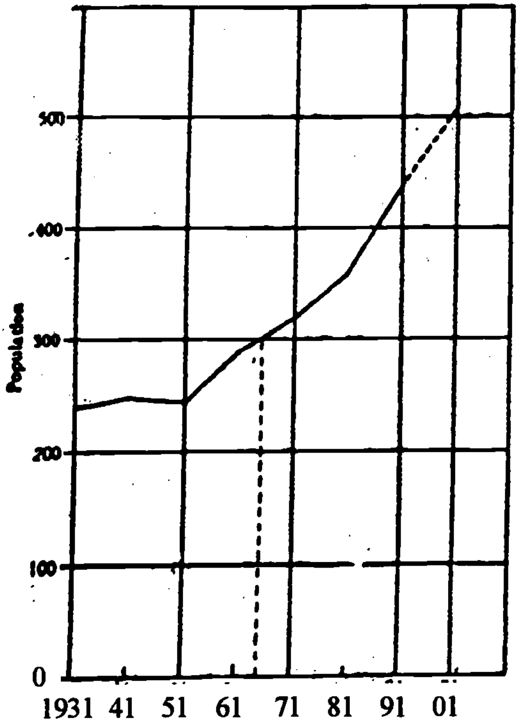


Fig. 15.20

Zone Chart

the charts are used to show the range or minimum and maximum values. They have been found useful in presenting temperature, quotations of shares etc. Small bar connecting the upper and lower size limit is drawn. If the middle points of those curves are joined, the curve so formed will be known as zone curve or range curve. For illustration of Zone Chart see figure.

Band Curve

In case of ordinary curves, the magnitude is not very clear to the eyes. To make this significance clear the areas below a curve is coloured or shaded with separate designs. If the curves are not overlapping the shaded part will appear like several bands. In this technique the difference between the magnitudes of different curves is very apparent. For illustration of bank curve see the figure below:

MAXIMUM & MINIMUM TEMPERATURE

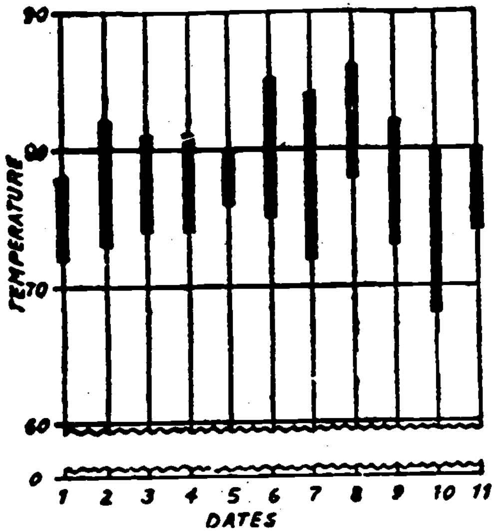


Fig. 15.21

EXPORT OF COTTON GOODS

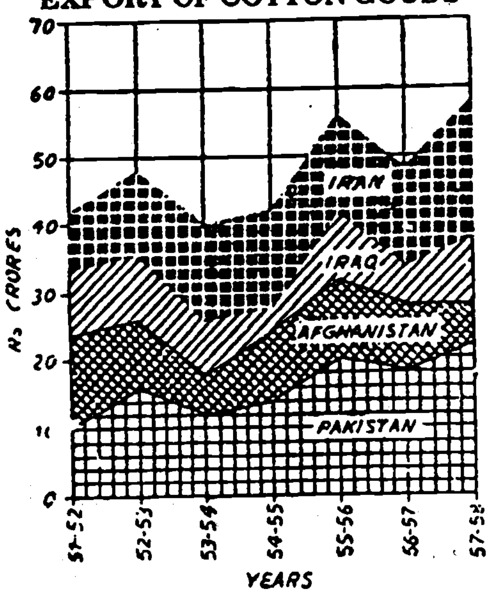


Fig. 15.22

Charting Frequency Series

Frequency series can also be chartered graphically. They are sometimes used for calculating various statistical measures such as Mode, Median, Quartiles etc. Following are the main types of frequency series that are commonly represented through graph.

Histogram

Histogram is drawn to represent relative frequency size of different groups. It is presented in the from of rectangles, one rectangles being used for each frequency group. the base of the rectangle represents the size of the class-interval while the height represents the frequency.

Illustration 3

Age	*No. of students*	*Age*	*No. of Students*
10-11	5	15-16	24
11-12	8	16-17	14
12-13	17	17-18	6
13-14	27	18-19	4
14-15	32		

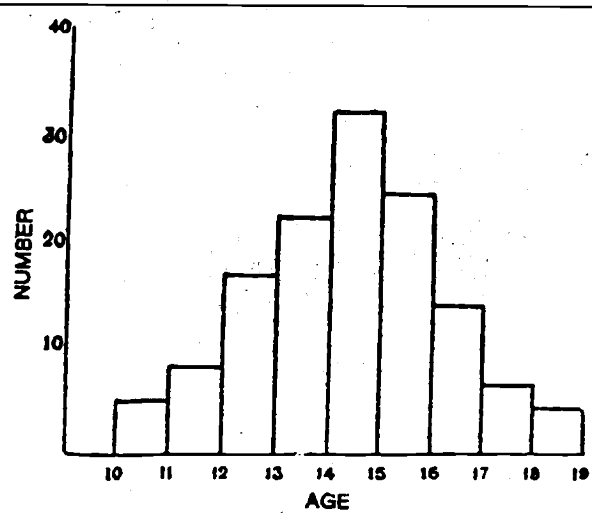


Fig. 15.23

Frequency Polygon

Frequency polygon displays the same aspect of data as histogram. In fact the area of two is identical. The only difference between the two is that while the histogram depicts each frequency group separately the polygon does it collectively.

Frequency polygon can be drawn both from the histogram and from the data directly. The process for drawing a frequency polygon from a histogram is as follows :

1. Draw histogram of the frequency distribution.
2. Mark the mid points of the tops of all the rectangles and connect them with the help of straight lines. This will give us a curve with sharp corners at each joint.
3. The two extremes are now connected with the base in such a manner that they touch it at half the distance outside the extreme rectangle.

Illustration 4

The data in the illustration 3 can now be presented in the form of a frequency polygon as follows :

When the polygon is to be charted directly from the data without first drawing the histogram following procedure is adopted:

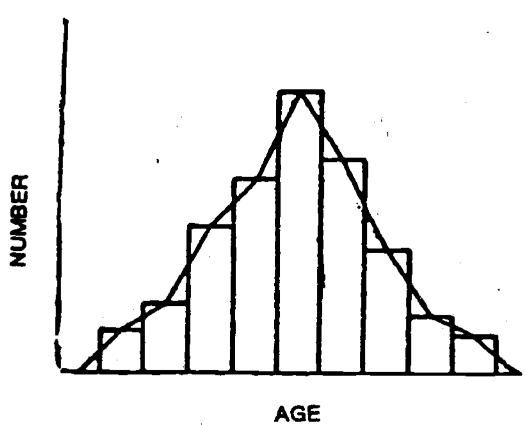


Fig. 15.24

1. Find out the mind-values of class-intervals and mark them on axis of x. Place frequencies along the axis of y.
2. Plot the various points taking mid values as the value of x and frequency at the value of y.
3. Connect these points. The extreme points will now be joined to the base in such a way that they touch it at a distance equal to half the class interval of the extreme items both ways.

Frequency curve

When the ruggedness of the polygon is smoothed out and a well shaped curve is evolved it is known as frequency curve. The idea behind the curve is that if infinitely large number of items are taken the large differences in values that give rise to the ruggedness of polygon will be removed and a shaped curve will be formed. The curve is generally drawn free hand from the polygon. In fitting the curve care should be taken to see that only angularity of the polygon

Graphs

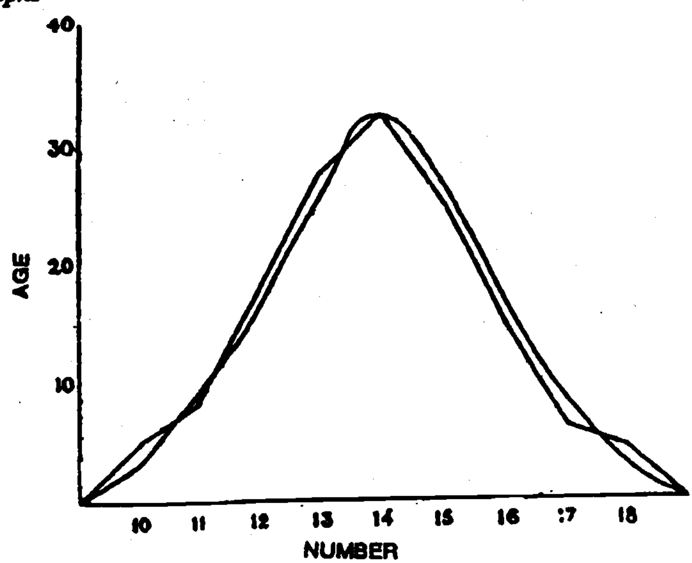


Fig. 15.25

is smoothed out and no change is introduced in the general shape of the curve. In other words the curve should resemble the polygon in every respect except the angularities or the ruggedness of the polygon.

Location of Mode from the Histogram

Histogram can be used for locating Mode graphically. The following procedure is adopted for this purpose :

1. Locate the highest rectangle in the polygon.
2. Connect the top right corner of this rectangle with the top right corner of the rectangle, immediately on the left. Similarly connect the top left corner of the highest rectangle with top left corner of the rectangle immediately on its right.
3. Draw a perpendicular line passing through the point of intersection of these two lines. The point were this perpendicular touches the base is the value of mode.

The value of mode so arrived at is equal to the value arrived at through the following formula : =

$$z = l_2 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

Illustration 5

Locate graphically mode from the following series.

Class limits	*Frequency*
0-10	10
10-20	14
20-30	20
30-40	10
40-50	6

Cumulative Frequency Curve

It is also known as Ogive. This curve is drawn to show cumulative rise or fall in the frequencies. Ogive is of two types one-less than curve and the other-more than curve. In the first

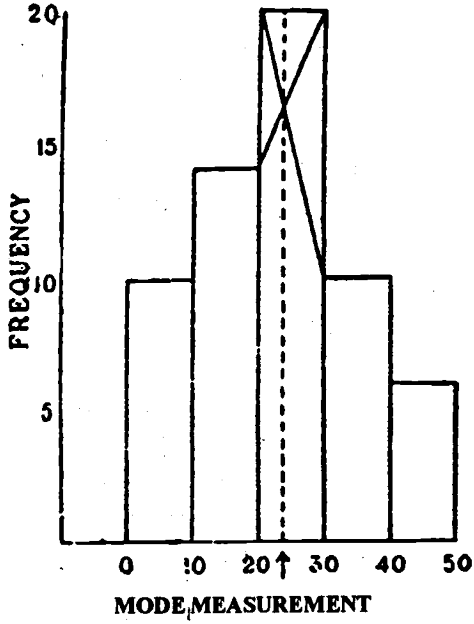


Fig. 15.26

case the curve has a rising trend while in case of latter the trend is a falling one. In order to draw these curves we have first of all to convert the ordinary frequency series into a cumulative frequency series. The various values are then plotted on the graph.

In order to determine the frequencies of cumulative frequency curve. Various frequencies cumulatively added. In case of less than curve the cumulation starts from the top, while in case of more than curve it starts from the bottom or the highest values.

Illustration 6

Size	*Frequency*	*Size*	*Frequency*
0-5	2	20-25	13
5-10	4	25-30	8
10-15	6	30-35	5
15-20	10	35-40	2

The above series will be converted into cumulative frequency series as follows :

Less than series		*More than series*	
Values	*Frequency*	*Value*	*Frequency*
Less than 5	2	More than 0	50
Less than 10	6	More than 5	48
Less than 15	12	More than 10	44
Less than 20	22	More than 15	38
Less than 25	35	More than 20	28
Less than 30	43	More than 25	15
Less than 35	48	More than 30	7
Less than 40	50	More than 35	2

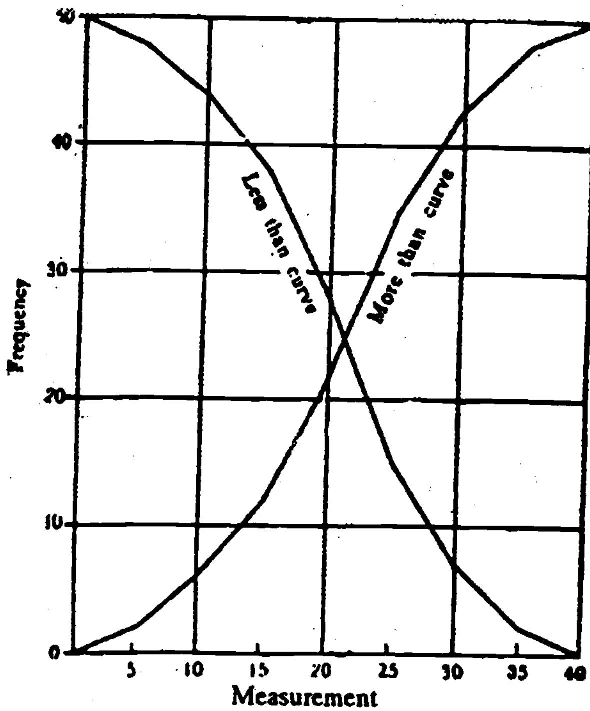


Fig. 15.27

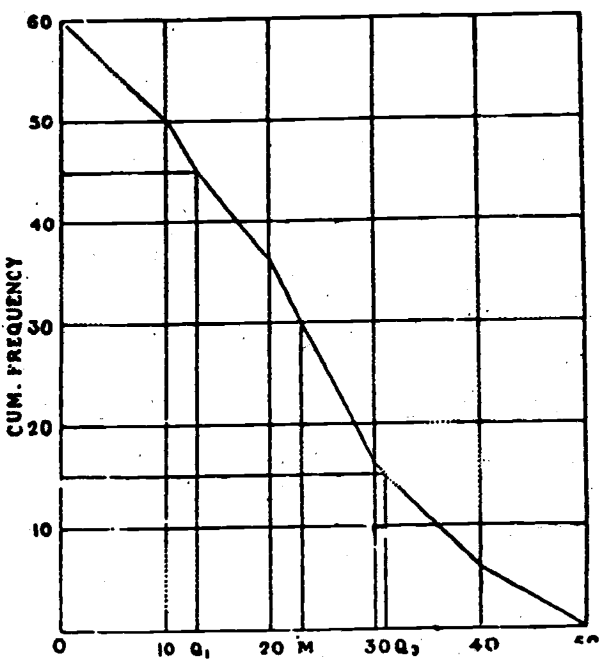
Determination of Median and Quartile from Ogive

Median and quartile etc. can be located from the cumulative frequency curve (preferable less than curve). The procedure in short is as follows :

1. Locate the middle and the quartile items by using the formula

   $\frac{n}{2}, \frac{n}{4}, \frac{3n}{4}$ etc.

2. From these points on the axis of Y draw a line parallel to the base meeting the graph line or Ogive.
3. From the meeting points draw perpendicular upon the base. The points where these cut the base will be the values of Quartiles and Median.



MEASUREMENT

Fig. 15.28

Illustration 7

Values	: 0-10	10-20	20-30	30-40	40-50
Frequency	: 10	14	20	10	6

Solution

$$\text{Middle item } (m) = \frac{n}{2} = \frac{60}{2} = 30$$

$$\text{First quartile item } (q_1) = \frac{n}{4} = \frac{60}{4} = 15$$

$$\text{Third quartile item } (q_3) = \frac{3n}{2} = \frac{3 \times 60}{4} = 45$$

The values of these items will be graphically determined as given in the figure 15.28.

16

RESEARCH REPORT

The research task is barely completed until the report on it is written. The most brilliant findings that a study may have happened to come upon are of little scientific import unless they are communicated to others.

This phase of the research process calls for a set of skills of a some what different order as compared to those required by the earlier stages of research. Much of the thrill of research discovery may have worn off by the time the researcher shifts his attention from analysis of data to the preparation of the research report. Nevertheless, the communication of findings, so that they enter the general store of knowledge, is an important part of the researcher's responsibilities and this would receive the same attention as the earlier stages do.

Perhaps the most important point to be kept in mind while writing a research report is its intended function. The purpose of a report is communication with an audience and not with oneself. Although this statement may appear redundant, it is seen that many social research reports give evidence of a struggle for clarification of the author's thoughts and are not designed to communicate ideas meaningfully to an audience about the problems that it would find of interest.[1]

The prerequisite to communicability is that one must be clear about the persons for whom the given report is intended. It is understandable that a report directed to fellow social scientists will be different in certain respects from a report whose purpose is to inform the general public. Whatever the audience, two general considerations must weigh heavily in the minds of the researchers engaged in reporting their researches.

(1) What does this audience (or consumer) want or need to know about the study?

(2) How can this information be best presented?

In this chapter we shall address ourselves to the question of how to present a research report for an audience. The suggestions in this regard shall be directed primarily at the preparation of a detailed report, such as a thesis or a monograph. We may begin with the question of what a research report should contain.

The audience for whom the report is intended, needs to know enough about the study to be able to place it in its general scientific context, and thus, to judge the findings may be taken or to what extent these should be depended upon as guides to future scientific activity and social action. The report should advisedly allude to the following aspects in order that necessary information is afforded to the readers.

(1) An introduction informing the problems the researcher was investigating and the rationale or justification for selecting the problem for investigation.

(2) A discussion of methods/procedures employed by the researcher for sampling out respondents, collection of data and data analysis.

(3) An elaborate presentation on what the findings of the investigation have been, followed by a discussion devoted to what the findings mean or signify at the level of theory and practice and what these findings point to as worthwhile problem-areas for future investigations.

(4) Abstract comprising a brief summary of the introduction and an interpretation section.

(5) An alphabetical list of books and articles cited in the various sections of the report, customarily subsumed under the larger rubric of 'References.'

(6) Appendix (desiredly) comprising copy of the questionnaire schedule used, scales or stimuli employed (as in controlled observation), tables of data which are not so important in relation to the study as to find a place in the body of the report.

It may be visualized that there are two possibilities about the final shape of a research report. The first possibility is that the report will closely bring out what the researcher had in mind when he planned the given study. The second possibility is that the ford of the report will be prompted by the researcher's active concern for making it the most meaningful document in the context of the findings that have surfaced.

A good research report is understandably the latter since it makes the most sense in relation to the findings a given study has thrown up. It needs to be appreciated that a study is not irreversibly destined at the time the problem of research is formulated. Quite a few times, during the progress of the study, a more adequate statement of the problem itself may come to be developed, new hypotheses may emerge or unforeseen relationship may meet the eye. Hence, the original manner of problem formulation while providing the basic point of reference for the report can always afford some room and margin to accommodate subsequent developments.

The conventional view of the research process held by most persons is that the researcher starts with a formal theory from which he derives some hypotheses, analyses the data collected to see whether or not these hypotheses are confirmed and lays down this sequence of steps in his research report. If research were to proceed in accordance with this neat plan, research reports might well be documented beforehand and the section on results of study could be prepared in a skeleton form awaiting appropriate figures and facts to occupy their designated places. Research barely ever proceeds according to this plan and hence the researcher must be thinking of the report in full view of his data.

There is much more to data analysis than merely checking to see whether the research hypotheses are confirmed and testified to by the data. It also involves, perhaps more importantly, exploring the data to see some interesting results not originally anticipated show up. For instance unexpected differences in attitudes toward an issue may be discernible when the data plainly show, for example, that nativity of respondents has an unmistakably strong positive association with the character of the attitudes. It should be remembered that some results may be more informative than mere confirmation or rejection of hypothesis. Some reporters may like to mention these findings tentatively in the report with a view to bringing out their potential use while others are for more intensive research.

But quite a few reporters may feel called upon to focus their reports around these new findings or discoveries, sometimes even ignoring their original hypothesis. Of course, if the study was specifically planned to test certain hypothesis from a formal theory or if these hypothesis were in the nature of propositions arousing wide general interest for certain areas then the confirmation or rejection of these hypothesis would remain the central focus of the report. It should also be noted that few people would be concerned about knowing whether hypothesis of the researcher were disconfirmed; confirmed hypothesis, understandably, would sustain their interest. A report should not advisedly become a personal history of the researcher's failure to prove the correctness of his speculative notions. The basic purpose of the research report is to inform the concerned audience what the investigator has to learn as a result of his research exercise about matters relating to social reality.

If the research results suggest some instructive and enlightening frame for the presentation of the study, it would be very desirable to adopt the framework in which findings offering new insights into the social-human realm become the center-piece of present action. Report-writing is not a mechanical process; it is largely a matter of good judgement. The judgement typically dawns upon a researcher when he thoroughly understands his data and appreciates what is so outstanding about them.

Now turn to discuss the content of a research report. Each of the sections of the report will be discussed in the order suggested above, at some length.

(i) Introduction

The research report should ordinarily start with a statement of the problem selected for investigation. The reporter should introduce the background and nature of the problem under investigation. Although quite a few times the study might be posing a simple empirical question about human behaviour or might be directed toward a practical problem or some policy-issue, the researcher must place the question or the issue into a larger, theoretical or practical context. This helps the readers to appreciate why the problem is of a general significance and theoretic import.

If the enquiry was planned with a view to making some contribution to certain aspects of social theory, the reporter should summarise the theory or conceptual scheme within which the reporter/ researcher is working. regardless of the nature of the study, it is important that an intelligent but, may be, a non-professional person would be able to understand the nature of problem and appreciate its larger relevance. The report should not contain a lot of jargon except when there is no feasible alternative to it, certain constructs warranting its use. The reader is not always prepared to intelligibly appreciate the problem of research, he is often not conversant with the relevant theoretic structure. Hence, it is important that the general reader is gradually led up to the formal theoretic statement of the problem. Intelligible examples are necessary for illustrating theoretic ideas and the technical terms.

It is extremely desirable that a summary of the current state of knowledge in the area of investigation is presented, once the problem of the study is explained.

The summary should comprise allusions to the previous researches conducted in the problem-area, and pertinent theories relating to the phenomena (if any). A researcher must have familiarised himself with the previous work in the field before designing the study. Most of the literature search should have been done by the time the researcher is ready to write the report. If the researcher was required to recast his study in a somewhat different framework than his initial problem would warrant, he would need to give references he had not previously consulted. That is, he will be obliged to go back to the literature which in the light of the above shift has become relevant. Review of previous work should comprise only the pertinent findings and insights relating to the issue the researcher is dealing with. If such a review article already exists, the researcher will do well to simply address his readers to the review article and present only the bare highlights in the report. Books and articles need to be cited with the author's last name and year of publication.

Towards the end of the section on introduction, it is desirable that the researcher introduces his own study in a brief overview. This affords a smooth transition into the method section which follows the introductory section.

(ii) Method of Design of Study

The readers of the report do like to know in detail how the research was carried out and what its basic design was like. Suppose the research involved experimentation, the readers would like to know the nature of experimental manipulation; the method and points at which measurements were taken and so on. The readers also need to know, in case of the descriptive and exploratory studies, how the data were collected, the nature of questions asked, the strategies adopted by interviewers during the collection of data, the training they had and the recording procedure adopted for recording of responses. The readers also need to know how the observations or replies to questions were translated into measures of the variables with which the enquiry was concerned, in the main, *e.g.*, what questions were asked to estimate the degree of 'commitment' or alienation.

In regard to the sample covered by the study with a view to arriving at general conclusions about the population which the sample supposedly represents, the readers are expected to be told about the general character of the subjects, the number of them covered by the sample, mode of selection etc. Information on these points is crucial for understanding the probable limits of generalizability of the findings, i.e., whether there is any justifiable basis for extending the sample findings to the population. This information can betray the biases of the researcher in selecting the subjects for the study. Thus, the claim of the researcher as to generalizability of findings to population at large could be evaluated. Although meaningful studies based on a small number of cases barely representing a specifiable population are possible, nevertheless, the number of characteristics of the respondents on which the findings are based must be plainly reported so that readers are enabled to arrive at their own verdict regarding the applicability of the given findings to other groups similarly placed in the social structure.

If the researcher has conducted a complex experiment, the report should include some description of the study as it was seen from the viewpoint of the subjects. This would involve a description of the subjects, the experimental setting, and the variables assessed. The sequence of events in a chronological order also needs to be presented to the reader, who, in a sense, is carried through the experience as though he was a subject.

Even if the reporter customarily reproduces the complete questionnaire/schedule or testing scales in the appendix to the report, a summary of stimulus items, a sample of questionnaire items and scale-items should be included in this section of the report. All this goes a long way toward giving the reader a feel of what it would have been like to be a subject. This has an important bearing on the interpretation of study results, and understandably, the reader is placed thereby in a position to judge the worth of the study results. In quite a few studies the subject/participants are called upon to co-operate actively in the research enterprise. The report should advisedly make a mention of how the participants in the research were compensated for their time and effort and if there was deception practised on them in the course of the study. Such unethical practices like decention or misinformation about the procedure cannot unfortunately be dispensed with in certain studies. The readers need to be told how these human participants were told about these practices afterwards, the amount of freedom afforded to subjects in the matter of withdrawing their participation, subjection to threats, concealed observations of them, strategies for protecting their anonymity etc., should also be faithfully reported.

(iii) Results of the Study

In simple studies the results are often discussed as they are presented. The section is closed generally with statement that informs the conclusions reached as also the qualifications imposed upon them by the conceptual and practical difficulties faced by the researcher in executing the study-design in a manner he would ideally have desired.

But if the researcher wishes to present different kinds of results before he is able to integrate them or draw any inferences based on them or if he wants to discuss certain matters in the final discussion then the discussion section is better presented separately. Of course, even here there cannot be a pure results section without an attendant discussion. Before the researcher can present his main results there are, in the main, two preliminary things that must concern him. Firstly, he needs to present proof that his study has ensured the conditions for testing the hypotheses and/or for answering the research questions. For example, if the study required of the researcher that he produce two groups radically differing from each other in the character of their emotions, the report must demonstrate that the ratings on the two groups were conclusively different and it was not that the difference occasioned as a matter of chance. In case the investigation required observers to record behaviour of the judges entrusted with rating the responses, the report should present quantitative proof of reliability of the recordings or ratings.

The result section should usually begin with a discussion on the safeguards and strategies adopted by the researcher to negate bias and unreliability in the course of the study. It is quite possible that some of these matters would have already found a place in the method section. It is equally likely that in some studies discussion on these matters is rightly postponed to the final discussion section, where researcher tries to adduce alternative explanations of the study results. What should be included at the beginning of the results section so that the readers are satisfied that the stage was successfully set for testing the research hypotheses, is a decision which would be governed by an understanding of the overall state of study results. No hard and fast rules lead to this decision.

Secondly, the method of data-analysis is a matter to be dealt with at the beginning of the results section. The researcher needs to describe the procedure adopted by him in converting his observations into data that may be readily analysed and the procedure adopted for coding and articulation of different observer's ratings. The readers must be told next, about the statistical analysis itself. If this analysis was unconventional or unorthodox and warranted certain statistical assumptions, a detailed discussion giving out the rationale for it, is called for.

This could be the place in the report to afford the readers an overview of the results section, if it is fairly complicated.

The general rule of reporting research findings is to commence with the central findings and then move on to the more peripheral ones. This rule is also applicable to the sub-sections and it is advisable that the basic findings are stated first, followed by elaborations of them, as needed. If the beginning is made with the most central results, the progress in reporting should follow the line suggested below.

(1) The researcher should remind the readers in a conceptual mould, about the question he is asking. For example, is democratic classroom atmosphere more conductive to learning by students as compared to the authoritarian atmosphere?

(2) Secondly, the reporter should remind the readers of the actual operations performed or the actual behaviour measured (which

was assumed to be the empirical referent of learning or democratic atmosphere, in our example).

(3) The answer to the question which surfaced as a result of the study should be made known to the readers immediately and unequivocally.

(4) Relevant supporting numbers or figures, substantiating the study result should be given out; $x^2 = 11.2$, $df = 2$. This should be followed by an elaboration of the overall conclusions Limitations imposed upon these conclusions by certain factors which might have operated to produce results that may not be expected in a larger class of such situations should be honestly spelt out.

(5) It is necessary that every finding involving a comparison, e.g., between democratic and authoritarian classroom atmospheres, between certain groups or relationship between variables should be accompanied by its statistical level of significance. Failing this, the readers would have no basis of knowing whether or not the findings may be attributed to the chance factor. The inferential statistics though important, do not constitute the core of the narrative and should be subordinated to the substantive results. The real purpose of descriptive statistics or indices should be to present to the readers the behaviour of people as vividly as possible. Effective reporting aims at giving to the readers a 'feel' of the observed behaviour.

(6) Ordinarily, in a detailed research report intended for a knowledgeable readership, every finding considered sufficiently important as to merit some emphasis should be accompanied by a table or graph or figure showing the relevant data. Thus, the reader is in a position to grasp the findings by reading the narration or by looking at the tables or figures. Naturally, the tables or graphs need to be captioned clearly indicating what they are all about. The narrative text should be such as to address the readers to the tables or figures, embodying results of interest.

As the writing on the section on results progresses, the reporter should continually keep summarizing and updating the readers' fund of information lest they should be required to look back time and again, to keep in touch with the major points of the researcher's thesis. Towards the end of this section, is demonstrated the statistical reliability of the results. It is often useful to illustrate how particular individuals covered by the study behaved. Besides the illustrative function, this adds richness to the study-findings.

(iv) Discussion

Especially for the more complex studies having more abstract and extensive implications, discussion constitutes a separate section. The section on discussion forms a coherent narration with the introductory section of the report. Concerns of central importance to the researcher in view of his problem and hence embodied in the introduction section should appear again in the discussion for the discussion proceeds from the specific matters about the study through the more abiding and general concerns to the most inclusive generalisations the researcher wishes to make.

The discussion should begin with a clear statement of what the researcher has learnt, in the main, from the study. It is very appropriate at this point to place on record the support and non-support of the hypotheses initially posed in the introductory chapter. Each of the new statements made in the discussion section should contribute something fresh to the reader's understanding of the problem. The inferences that may be drawn from the findings should be clearly presented. These may often be at a high level of abstraction. If this be the case, the conceptual or theoretic linkages would need to be explicated.

Example : If the investigator has found better performance in terms of learning on the part of students, in classroom situations characterized by a 'democratic' atmosphere (democratic atmosphere in the classroom may be said to be characterized tentatively by the freedom allowed to students in respect of choosing the problems for discussion, electing the discussion leader, counter questioning the teacher, etc.), the investigator may conclude that in other situations where such freedom is allowed to participants, *i.e.*, of choosing their problems for discussion or electing their own discussion leader, etc., similar effects will be seen. However, the researcher may wish to carry his inference to a higher level of abstraction, especially if there is some partially developed theory to which it may be possible to link his findings or if there have been other studies in which the specific phenomena are different but these can be understood in terms of the same abstract principle. For example, the investigator may find that the teachers in general feel dissatisfied or unhappy despite the improvement in their salary scales because the 'others' in comparable jobs whose salary scales too were subjected to an upward revision appear to them to have benefitted more by this scale revision. The investigator may treat this state of affairs (characterised by dissatisfaction among teachers despite improvement in salary scales) as an instance of the more abstract concept of 'relative deprivation.' On the basis of this abstract concept, the researcher may be able to link up the finding of his study to those of some other study which reported that in a community hit by a natural disaster some people who had themselves suffered loss of property and bereavement went out to help certain other families because the loss and bereavement suffered by these families as viewed by those who went out to help was much greater compared to their own. This phenomenon though different from the earlier one in concrete content, can be understood in terms of the same abstract principle which explains the dissatisfaction among teachers despite the increased objective gain. The people who had incurred loss and bereavement in the second example compared their losses to those of the 'significant others' in the community and found that their own losses were much less or that they were much better compared to the 'others,' and hence developed sympathy for these 'others' although objectively viewed, they themselves needed to be sympathized with.

The questions that still lie unanswered may also be alluded to. It is quite in order at this point to compare the results of the study with those reported by other investigators. the possible short-comings of the study should be honestly brought out. The readers must be told about the conditions that might have limited the extent of legitimate generalization. Here, the readers should be reminded of the characteristics of the sample studied as also about the possibility that it might differ from the 'population' or 'universe' to which the researcher might want to generalize. The specific characteristics of the method employed by the researcher which might have influenced the results or some factors that might have led to atypical results merit mention. The researcher should not, however, try to invest long involved theories to explain away every 'bump' in the data.

On the contrary, if the study results suggest the beginnings of a new theory which injects amazing clarity into the data and affords a very meaningful view of the problem-area. it would be advisable to rewrite the entire report beginning with the new theory. The aim of scientific reporting is to provide the most informative, instructive and compelling framework tor the study right from the first sentence.

(v) Summary or abstract

In a way, the title of research report itself serves as part of the summary or abstract. Ideally, it conveys the content of the study as accurately and clearly as possible. A potential reader can on this basis decide whether or not to go ahead to read it. Those titles that mention both the dependent and independent variables are obviously the most informative ones.

(vi) References

The section on references comprises a list of all books and articles cited in the text of the research report. These books and articles are arranged alphabetically according to the author's last name, a format that corresponds to the way in which they are cited in a book. The reference should clearly indicate the name of the author, the title of the book or article, the journal in which it appears, the publisher, place of publication and the year of publication.

(vii) Appendix

The appendix to a report consists of copies of materials used in the study, like questionnaire, attitude scale, stimulus materials, drawings of apparatuses, etc. This is expected to help a person who would like to replicate the study. A second appendix might contain tables of data which are too extensive and seemingly too marginal to be included in the body of the report. This is in the nature of a good turn done to the potential researchers, for this enables them to explore the researcher's data in fine detail and to answer certain questions about the results that might not have occurred to the researcher.

The Style of the Report: We now turn to consider certain basic aspects relating to the style of a research report. The obvious criteria for good reporting are accuracy and clarity. Making the report interesting and writing with flair and 'style' is a subsidiary virtue. Accuracy and clarity must be the principal goals.

It greatly helps to work from an outline. The standardized format detailed above will, of course, go a long way towards organizing the report but a researcher will more probably produce a more coherent report without wasting much time and energy in frequent rewriting if he first organized his main findings. The researcher would do well to check the logic of the sequence of presentation and carefully examine it for any omission of consequence. It is often helpful to start penning the results section first. It is also useful to maintain a constant correspondence between the introduction section and the one devoted to final discussion, to maintain a smooth conceptual narration. It is important that even a non-professional should be able to comprehend on reading the report what the researcher did and for what reason, despite his non-conversance with statistics, complex manipulative study designs or the substantive area of the research problem. Hence, reporting should involve minimum of jargon and use of intelligible examples of concepts.

Advisebly, the reporter should read and re-read his own writing taking the role of an intelligent but non-professional reader. He should at each point, feel called upon to ask himself whether he has himself understood the concept he is trying to employ in his report, whether it is unambiguous and so forth. It is a difficult feat to take the role of a non-professional, naive reader, yet it is an overriding requirement in report writing. It may be very helpful to have someone else (friends and reviewers, especially those unfamiliar with the subject-matter area) read the draft and comment upon it. If they find something unclear, their observation needs to be respected. As unclarity detectors, the readers are generally never wrong. The chances of producing a good draft in first writing are small indeed. Good reporting requires a great measure of compulsiveness in attention to details. Since the purpose of a report is to convey information rather than to achieve a literary goal, the reporter can avoid wastage of time by writing the first draft as quickly as possible. Once they are there on paper, he can go back and rewrite the sentences and paragraphs. Rewriting often implies restructuring; not just polishing the sentences. Sometimes such a restructuring involves a thorough recasting of the report, even going back to do more data-analysis in support of an argument the researcher is presenting.

A few decades ago, it was conventional to employ third person passive voice in a scientific reporting. This happily, is no longer the norm and the report-writer is free to use the first person and resort to the active voice. The research-reporter may refer to himself as I or we (if there are two or more). It should be noted here, that constant use of 'I' or 'We' may distract the reader from the subject matter. Hence, it is advisable to employ the 'first person' sparingly. frequent solicitations directed at the 'readers' are also undesirable.

Is the use of past-tense more desirable as compared to the use of the present tense? the answer to the question can only be used while reporting the previous findings tabled by others and while reporting how the researcher conducted his study (*e.g.*, the groups were measured before the introduction of the experimental variable) and the specific past behaviours of the respondents covered by the study. The present tense is better used for results that are before the reader and for conclusions of a generic nature (like, thus the parental incomes determine the aspirations of children about incomes from jobs).

It is evident that language can perpetuate stereo-typical notions, hence the reporter is expected to avoid writing in a fashion that reinforces questionable attitudes and assumptions about different communities or people as also the sex roles. Many a time, the use of masculine norms and pronouns are used to refer to both sexes. Such usage like the generic term 'man' intending to connote both men and women is misleading. Researches show that readers visualise and think of male persons when such forms are used. Sadly, language has not caught up with this new awareness. Alternatives too are not totally satisfactory. In most contexts, the simplest alternative is to use the plural like persons or individuals. The reporter must be accurate in his use of pronouns when he is describing his own research or those of others. Readers need to be informed about the sex of the interviewers, observers, experimenters and participants. It is improper to omit or conceal their sex-identity.

Knowledge of sex is quite often crucial. Certain words or terms have a gender-slant, for example; 'manning the project' or 'husbanding resources.' Such terms are better avoided. it should be noted that the use of certain adjectives betrays a bias when their use denotes not different behaviours on the part of men and women but the customary social biases current in evaluating. Some verbs also carry latent bias and inadvertently reveal a stereo-type. It is important that the reporter meticulously avoids sex-role stereo-typing when selecting examples about the sex of home-makers, nurses, doctors, school teachers and so on. The report should not inflict injuries upon the sensible modern view that women's vital needs are similar to men's.