

Part IV

Trends in Approach and Techniques

NEW DIRECTIONS IN THE SCIENCE OF MAN

by

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The American Behavioral Scientist



The Recent Past

Thirty five years ago, when the mean age of the public relations experts of today was zero, several scholars took it upon themselves to state the prospects for the social sciences. The historian declared that the age of social and synthetic history was upon us. The biologist said that we should learn ethical principles from the behavior of the lower mammals. The social psychologist was concerned with the instincts, and the relation of personality to society; he asked for more work on Watsonian behaviorism, Freud's psychoanalysis, and Pavlov's conditioned reflexes. The cultural anthropologist looked for some psychology to leaven the heavy bread of historical ethnology; he argued the problem of whether independent invention or cultural diffusion explained better the wide distribution of cultural practices.

The sociologist painted with a broad brush, indeed, but his outlines are somewhat alien to us today: he divided his sociologists into 1) geographical determinists; 2) biological determinists; 3) psychological determinists; 4) cultural determinists; and 5) social philosophers, idealists, reformers. Many of the people whom he nominated to these several categories are justly renowned in the development of the social sciences and would speak as true today as they ever did. The strange thing about this sociological classification was its emphasis on problems not usually encountered in the forward areas of social science today: I refer to such exceedingly broad questions as whether society and conduct are

determined by geography, biology, psychology, or culture. Not that they are untrue or unreal questions. But the contemporary social scientist simply has other fish to fry. Or when he does fry the same kind of fish, he uses different recipes. Our sociologist did, however, declare that more quantitative methods would be used as time goes on. He covered these methods much as a commentator in the age of dinosaurs would deal with the existing mammals.

What did the other social scientists see as problems of the future in this 1925 symposium that Harry Elmer Barnes edited? The economist, in retrospect, seems quite farsighted. He pointed to the promising growth of economic research institutes; he denounced the purity of economic science and asked for cross-fertilization with other behavioral sciences. He praised the school of institutional economics. Still he missed most of the exciting areas of concern of today.

The political scientist suggested that his field would become concerned with new types of governmental reform, such as the representation of economic groups in government. He believed law would be a favorite subject, which has not happened, and recommended a little more psychology and economics in the recipes of his colleagues, which has occurred. He foresaw more political statistics being gathered, and -- he gives one sentence to this point in a forty-five page chapter -- more surveys would be made. The jurist called for the courts to make way to some degree to admit social facts, and asked for codification of the law. Both have occurred. The expert on ethics called, finally, for a more naturalistic approach to morals and institutions. This has occurred and has been reacted against strongly. His appeal in fact echoed throughout the contributions of the others. I have only

skimmed off their more concrete prophecies. This was a group that believed in the social sciences, but was strongly inclined toward the reform of society as the major concern of social science. It was steeped in the language and names of 19th century social theory. The social sciences they reflected would, today, be looked upon as somewhat irrelevant, fuzzy-minded, and intent upon ill-considered grand reforms.

So thirty-five years ago. But not really thirty-five years ago, for these men were among the pioneers of their age, and several of them are still active and fresh minds. And when I speak of new directions today in the social and behavioral sciences, I am speaking of ways that are taken by a few men. That is, many scholars, and most adults, are a generation behind. I would not give you to believe that the picture I present to you here is typical of the social sciences today. I only pray that it be more accurate than was the picture that 1925 gave of today.

The most important and prominent difference between what scholars were interested in 35 years ago as new directions, and the new directions of social science today is in the new preoccupation with methodology. Progress today in the social sciences is no longer measured by the amount of new facts discovered. Or even in new relations discovered. In the first place, today we recognize social facts to be unlimited, infinite, and "matters of definition." A generation ago there seemed to be a strong unconscious, if not conscious, feeling that "we can get the facts." In the second place, wherever there is a contact of two facts, there is a relation. So why get excited if a relation is discovered? There are more

If 50 years ago we were to ask what social science was = great social theory = Comte, St. Simon, Marx, Pareto, Mosca, Mill, Weber, Spencer, Freud, Dewey, etc.

2) Exotic anthropology
3) Legal studies 4) Institutional history

Today: America leads in the social sciences: 85% of research is in the US
WHY? Method, technique, applied to the study of man.

principles in any trio of interacting persons than there are sociologists and psychologists with the Ph.D. So the real questions to the new social scientists are: How do you make the facts and principles work for you? How do you gather them neatly, divide them up, break them down, sum them up and apply them? In a word: "Operationalism."

The nineteenth century and its tag-end before 1914 was a great century of the human mind. If I implied otherwise, I regret it. For practically all important principles of behavioral science were put forward in a recognizable form in this period: we had Comte, St-Simon, Bentham, Malthus, Marx, Engels, Mill, Durkheim, Mosca, Pareto, Simmel, Tarde, Freud, Dewey, and a host of others.

The Past Present

What we did not have were the methods of social science. At least, they were not in the forefront. It was not thought that they would govern the development of the sciences. But then they came: the standard interview; the questionnaire; the depth interview; the controlled observation; the sample and probability theory, seen especially in the survey; testing; scaling; punched-card analysis; time and motion studies; controlled clinical therapies, including systematic counselling and guidance; content analysis; and regularized social planning. These were the great concepts that formed the core of progress in the social science in the post-World War I period.

I submit to you that the writers of 1925 simply had not yet lost their nineteenth century way of looking at human behavior. Therefore they did not see that the most important developments of all were the bodies of

+ looking down of disciplinary boundaries
E.g. cultural anthropology
social psychology
pol. sociology
decision-making
game theory

To P. 6.

technique that I have just referred to. The major outlines and relations of any science, natural or human, can be imagined by men. They have indeed. Nothing is new under the sun. What cannot be easily imagined is the step-by-step, systematic development of the science, and ultimately an extremely broad range of controls that the mature science will give man. These things the post 1914 American generation gave to us, and I believe that they also happen to be [^]along with jazz, the skyscraper, and the rich proletariat [^]authentic, important gifts to the world.

These techniques continue to develop. They are subjected to ever greater tests of reliability and validity. Their use spreads from one sector of society to another, and from one country to another. For instance, just as the science of the interview was being formulated in the United States in the 1940's, so that it might be systematically imparted to novices in a regular and reliable way, the idea of the interview broke the boundaries of the nation and spread all over the world. Every week brings us another study of a far-away land and a remote culture where an American or a native scholar has administered a set of interviews and evolved his findings from the accessible protocols. The other day I received a study of manager-worker relations in a Japanese factory, based on 283 interviews with workers. The latest issue of the British Journal of Psychology carries a fascinating comparison of the extraversion of American and British students. A student of mine has spent a third of his doctoral-thesis time perfecting a questionnaire to obtain the views of international lawyers and public servants as to whether the United Nations Assembly resolutions have a legal effect. At the same time, in America and then elsewhere, the interview, without

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even credit in a footnote, has become part of the format of a successful national news magazine, ^{of} and television programs with high audience ratings (another social science technique).

The Future Present

The story of these techniques has not ended. Indeed it has scarcely begun. But you here know something about them even if they are still foreign to everyday practice, ~~to everyday practice~~, to everyday institutions, to most of the people and to most of the world. There are more recent developments about which you perhaps know less. To them I am obliged to give preference and to them I shall now repair.

Psycho-chemistry and Behavior

The first to be named, like several of those to follow, is an intimate combination of natural event and human event. It is the investigation of psychology and psychotherapy by the use of chemicals and drugs. In a recent bibliography by Louis A. Gottschalk on the use of drugs in interrogation only 21 out of 137 entries were published before 1950. The last few years have seen a number of psychic phenomena induced or modified by the application of new drugs or by old drugs retried in new contexts. Difficult problems of psychotherapy have been overcome. Length of treatment in some types of mental illness has been reduced. Drugs have been used as aids to psychic therapy by symbolic treatment. They have been used to set up experiments in the function of neural systems, in research on perception, cognition, ^{and} disturbances of higher mental processes. The line between mind and matter, of which so much has been made during man's history, seems now

Quote
rabbit
study

to be dissolving as scientists work backwards and forwards and what was physiology is now psychology and what was psychology now physiology.

Is this sheer chemistry pushing out behavioral science? Will it be that a man who once spent years with his psychiatrist to ease his worries and psychosomatic symptoms, will only take a simple tranquilizing pill now and then?

Perhaps in some cases, but not because there is no need for psychiatry and behavioral science. Rather only because the behavioral sciences have picked up every promising tool, including drugs. A pill, after all, is like any other of man's millions of inventions since the dawn of his time. The pill is part of a social context. We must study man's behavior to know what the pill really is -- in human, not chemical terms. Not only must its direct effects be studied, but all the indirect consequences on society of its production and use.

Alcohol, after all, came before "Miltown." Yet it is astonishing what we do not know about alcohol. After drinking some people become exhilarated and volatile. Others become depressed and morose. Some talk volubly. Others shut up like clams. Each of many drugs has different effects. And the interesting and significant finding of a number of very recent studies is that the interpersonal context of the taking of drugs is an independent force operating upon the effects of the drugs.

The well-known placebo effect may be cited, whereby people ingesting inert substances show changed symptoms. The effects of authority (that is, doctors and psychiatrists), when drugs are administered, are evident, for when drugs are silently administered, as in foodstuffs, they have a different

reactions. The time ^{at which} ~~when~~ people are rewarded for submitting to a morphine injection test affects the type of symptom produced by the morphine itself. Lindemann and Malamud, experimenting with sodium amytal, cocaine, hashish, and mescaline, found out not only that each drug produced different effects, but also that the effects of each drug were modified by the patient's type of personality. So we go back to the beginnings of personality development where we started anyway. And drugs become a new factor to be considered in the training of personality, and also an experimental factor in studying personality.

Group Dynamics

A second direction of the new behavioral science is toward a compact theoretical-methodological science of human groups. Much of the field of group dynamics, as the most active and growing scholarly interest is called, is pieced together from the techniques of quantitative study referred to earlier: the interview, the questionnaire, the controlled observation, the test and scale, and so on. Furthermore, no one can deny that some of the vocabulary and most of the principles of group dynamics might be discovered under different labels in other parts of the storehouse of social science. Still something new, different, vital, and useful is imparted by the studies and work of those in group dynamics. A convenient handbook for the application of the methods of group dynamics in community affairs is Lippitt, Watson and Westley's The Dynamics of Planned Change. In this work, the authors carry the outside expert through the gantlet of forces besetting the community reformer. They base their recommendations largely upon the findings of the researches of the group dynamics movement.

Sociometry

Also working in the field of group study and control are the sociometricians. Sociometry has paralleled the rise of group dynamics. It seeks to discover the nature of groups by uncovering the perceptions that each member of the group has ^{of} ~~for~~ the others. It does so by questionnaires of the sociometric type. The sociometric questionnaire is a refined system of voting ~~and~~ ^{on} preferences, the answers to which can be manipulated mathematically, since they are standardized ~~and are quantifiable~~. The devotees of sociometry are also partial to sociodrama, which is a form of play-acting that gives one person insight into another and into his own actions through taking on the role of the other.

Recently, several studies of sociometry ^{type} ~~have~~ emphasized the continued vigor of the movement. Floyd Hunter's studies, Community Power Structure (1953) and Top Leadership U.S.A. (1959) are examples of how the sociometric idea can be employed in studying leadership in extremely large populations.

There is something of the cultist about the group-dynamics people, and about their cousins, the people who work in the field of sociometry. Perhaps the two may be reconciled by some of the scholars who have not become incorporated into their circles but receive their aid and share their interests and techniques in part. Certainly when one considers the efforts of the sociometricians and then those of the group-dynamics people, one senses a rapprochement to be inevitable. The sociometrician measures the group's parameters through the members' individual and subjective definitions of their relations with others in the group. The group-dynamics researchers are more intent upon objective observations and their measure. The group-dynamics students are more concerned with the work of the objective change-

agent, a person skilled in bringing about group change. The sociometrician is more concerned with sociodrama, social change by individuals practicing the roles of others and then modifying their own roles in consequence. The founders of both schools, Lewin and Moreno, were from Austria. The vehicles of their ideas became almost exclusively American and now have begun to move out into the world.

What benefits do group dynamics and sociometry give us? They give us first of all the clearest statements that we have of the pure variables that motivate and explain ^{the} conduct of human beings in groups. They give ways of measuring group relations and determining the effects of forces working upon groups. They enable us, by precise expressions and techniques, to compare the behavior of different groups. Hence, they enable us to build an applied science of group control. The uses are manifold -- in industry, armed forces, government, community organization, education, recreation, voluntary associations, unions, and politics.

Games, Decisions, Models

There is a second class of theory and method in social science that contains three elements. Ordinarily they are not treated together, but I am trying to arrange convenient categories and to point out similarities of approach. I have in mind here the growth of game-theory, decision-theory, and model-building. What do these three approaches have in common? Game theory is the framing of human competitive activity as a set of moves and countermoves relative to the same goal. Key situations in every social science can be viewed ^{that way:} ~~as such.~~ In politics, factional struggle; In economics, bargaining; In international relations, war, In psychology,

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It is easy to see how game theory and decision theory are connected. The "decision" may be viewed as a move in a game, and much of the anxiety over choices in every field is produced by the existence of an opponent whose moves have to be taken into account and countered. But decision is the broader term. It includes two bodies of information not ordinarily part of game theory. It considers the social process of decision-making, introducing thereby all that a group does to lend collective character to the ultimate decision. It is more profoundly interested in the irrational as well as rational psychology of the policy-maker.

The third element I referred to was model-building. Again we have some ancient parallels and precursors. Plato's Republic was one of the most perfect models ever designed. It was nondescriptive of the real world, was a tightly reasoned derivation of expected behaviors from the assumptions, and concluded

Models

with a set of operations that he would have us applaud and support. Today, models are talked about principally in economics but are increasingly discussed in the other behavioral sciences. We have models of the economic system, of the internal dynamics of a factory, of a civil defense system, of forms of leadership, of types of authority systems, of cultures. The model is no newer an idea than the atom, but it is pursued in the relentless, careful, and quantitatively expressed way that is the hallmark of modern science. For these reasons, it will succeed and bring new controls over data, and new types of data to fit the needs of the theory. That is the way science moves, when it has overcome its two primitive phases, the idealistic and the empirical.

One type of model that should be singled out for mention is the economic system model that has been involved in the ^{new national} theories of ^{Accounting} accounting, the Gross National Product, tax and spending predictions, comparative national progress rates, and new ways of planning social change.

— The model stated here, as in every area where model construction is occurring, is really a dozen different types, like Chevrolet and Ford models.

Each man, group, or agency working on the problem declares its own premises, pursues a logic that will lead where it wishes to go, and use the consequences of the model's projections for its own ends. I am sure that you have noted the continuous debate over what the Gross National Product should be composed of and interpreted to be. The central idea is simple: it is that the economy of a nation may be looked at as a whole, and that the economy can be conceived of as a continuous cycle, with inputs and outputs at ^{various} points in the process equalling each other. ^{in the final analysis} Yet the idea of national accounting has developed only in the last generation, because what seems simple in retrospect was, like most major inventions, difficult to conceive and to carry out in practice. There are still many who believe, with some reason, that the

whole idea of national accounting and the GNP, which lumps government expenditures with individual expenditures, is an invitation to greater governmental activity and unbalanced budgets. However, the concept, the tool, is likely to become much more accurate and clear as to its general meaning. More and better data will be gathered with the concept in mind, which in turn will make it more useful, until we shall ultimately be able to summarize compactly all the important transactions going on in an economy and make public policies that are more rational. Meanwhile, the same idea of a cycle of transactions can be used for studies of the use of the time of a population or group in psychology and social psychology. The energies of a culture can be perhaps registered and cycled some day, so as to give us the ready comprehension of social systems that Harvey's theory of the circulation of the blood gave to all students of physiology long ago. The dynamics of a factory, an insurance office, and the supply of a metropolis can also lend themselves to the input-output analysis and cyclic study.

Computer Programming and Manipulation

The refinement and use of models, of game theory, and in fact most complex methods of looking at human relations depend upon our ability to collect, store and retrieve data. These needs point directly in turn to the most prominent development in the social sciences, progress in computer technology. Not one but half a dozen major fields of research and applications are growing rapidly in the area centered around the electronic computer. The first one, the ENIAC, was completed in 1946. Hundreds are in use today.

Let us admit to begin with that the computer, or better, "the Computer System", has two major gaps. Someone must give it a job to do; it must be

programmed. Someone must feed it data, for it does not forage by itself. But then, it has marvellous capacities and is increasing them all the time while growing smaller in size. It can ingest data far beyond our capacity to feed it, both in speed and in quantity. It can sort the data into a great many pre-established categories. And it can seek out relations among the data Λ thousands of them Λ exactly, and with great speed. Finally, it can report its findings in one or more of several ways, or it can store its findings too in order to report them later on. In all of these operations, the machine does not go beyond the human imagination; it goes beyond human mechanics. At the same time, its mechanics are so beautiful that they inspire men to exercise the sluggish parts of their minds where they had never dared to let their imagination probe. Therefore, the introduction of computer systems into the behavioral sciences has encouraged us to carry out intellectual projects that we should have been mad to consider a few years ago.

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To begin with, there are the data storage, retrieval, and reporting functions of business and commerce. These include maintaining and reporting the payroll and inventory. An insurance company can computerize its files maintenance, its accounting, its premium billing, its reserves calculations, its actuarial processes, and its dividend calculations. Other businesses can computerize analogous processes. If this were all, perhaps we would not become excited by computer possibilities in the social sciences. This would be more speed doing the same well-known business operations. But first the speed is important for some of the data of social science such as recording and reporting the U.S. Census. The large volume of fact stored is important for the same kinds of operations and now some of the difficult

problems of the history of social science can get some relief. For instance, under way are new, more exacting and accurate Biblical exegesis and content analysis of the works of great literary figures and philosophers such as St. Thomas Aquinas and Shakespeare. The machine's ample memory and searching and connecting features become most useful in finding the full context in which such writers treat words referring to God, justice, and other ideas. Any index, such as you find in the back of most books, is a sample of the contents weighted by importance. The computer permits a much greater sample and many more concepts to be related in more complex forms. At the same time, we increase the data that can be classified, compared, and analysed.

Information Retrieval

A U.S. Senate Report last year reported that the AEC, the CIA, ASTIA, the Patent Office, and the National Library of Medicine were making rapid progress in developing systems of information retrieval. The CIA reports: "Efficient and economical storage and retrieval of information is by all odds the toughest of the information processing problems...For us this problem is particularly vexing since our document center alone receives thousands of different intelligence documents each week in numbers of copies running into the tens of thousands. This is exclusive of newspapers, press summaries, books, maps, and other such open material which is acquired by the library in an average of 200,000 pieces per month."

The CIA ^{has been} ~~is~~ using an IBM system of punched cards. It ^{is now} ~~will probably~~ moving into a more capacious and speedier type of machine system, ^{since certain} ~~as the~~ problems of introducing data into the system and classifying ^{it have been solved,} ~~it are evolved.~~

These are but beginnings. The ultimate target of automated information processing and retrieval is some two million persons in America whose business is consuming symbols, so that they may emit other symbols and give orders and advice. This is the intelligentsia of the country, and I hope that you will not think that I am flattering you when I say that your work puts you in their ranks. So are many other business executives, along with scientists and scholars.

The intellectual has only a certain amount of time and wants certain materials to fill it. He wants to scan with maximum completeness and economy the full range of raw data and theory in his special area, and he wants a closer inspection of what he needs most. He wants them in a separable format. If they are in another language, he wants them translated. For this service, he and a half-million people with similar problems might pay a thousand dollars a year. The sum involved would underwrite a new industry that would provide him with the full range of contemplated services. It would have a corps of prescription consultants, who, as insurance agents and medical men do today, would help to prescribe the mental diet of persons. It would have a publications search staff, worldwide library connections, reproduction facilities, storing and retrieval machinery, and mailing machinery.

Each week the subscriber would receive a packet of published materials. It would contain items he had been prescribed, by self-analysis and the advice of friends and experts. The elements would emerge from a giant computer system containing thousands of prescriptions like his own. As his needs changed, his prescription would change, just as now when he gets a new baby,

the computer at his office is instructed to deduct a lesser tax from his pay envelope.

One specialized branch of information retrieval by machine methods is likely to be an automated legal service. Legal research indexes are already efficient as indexes go, if only because lawyers unlike many professors are used to putting a premium on their time, and spend a lot of their time in searching precedents. Under consideration now are plans for coding large numbers of legal cases and judicial opinions so as to make them almost immediately accessible to an attorney seeking support on a particular legal contest. What this will do to the prestige of the lawyer, when the nature of much of his past work is realized, is uncertain.

*mechanized
Legal
Research*

Rapid printing & publishing

Machine Translation

The despair of a person who must sift information from a thousand sources is compounded by the fact that people are thinking and writing in other languages too. Yet the moment that the first computer was born, several men began to think of programming it for translating one language into another. From 1946 to this date the U.S. Government, the Soviet Union, and several dozen men in America, the USSR, England, and Italy have become the core group of developers and inventors. Americans have already programmed machines to produce rough and ready translations from Russian to English at a rate that would convert millions of words annually from one language to another on a single machine. However, the problems of MT are still great. The machine looks up words in a

dictionary rapidly and does a certain amount of grammatical restructuring. But, as Dr. Yngve of MIT said to us when we were studying the problem: "If I were pressed for a figure I would say that realistically we can't reach an accuracy of 50% at present. But even if we could achieve 95% accuracy what would it mean? Would it mean that we would miss the 5% of important new material and get the 95% of already known material?"

I have examined a little of the translated material from one machine and it seems to me that the work of a human translator would be greatly facilitated by it. Improvements will continue until we should probably reach a point by the end of the century when any person or group interested in a lengthy document should be able to ^{translate} ~~procure a good job~~ ^{have it done for} with a few hundred dollars ~~for~~ ^{by} one of several translating agencies. Speed, again, will be a feature of the process. A twenty-four hour service is not impossible for an ordinary book; in a few years, scanning devices will be able to read from the original type so that the book will not have to be specially prepared. Of course, the availability of translated works will only aggravate the problem of information glut and accelerate the use of information retrieval systems. In political science, ~~the same type of problem has occurred as the rest of the~~ ^{MT and IR are badly needed also because} world outside Western Europe has suddenly become important and challenged sharply the function of men who used to specialize in the government of France and England and called themselves experts on comparative government.

The perfunctory Ph.D. requirement in a Western European language will become even more perfunctory and probably disappear. I wish that I had the time here to go into the dismal future awaiting some of the departments in modern universities. They have been existing already only out of the precious-

ity of their interests. Now the absurdity of their position will become even more apparent. Hitherto, the language departments have said "Study French. You can learn much that is only in French". That argument has been drastically weakened but cannot yet be destroyed. When the translating apparatus is available, no one will be required on pseudo-scientific grounds to learn French. They will learn French because they love the country and wish to speak with Frenchmen. They will do the same for Thailand or Japan.

Changes in Scholarly Functions

A number of posts in departments of social science will be similarly transformed by this and other technical innovations. More and more the social scientist will be partly a technician. We should not regret this tendency. He has always been something of a technician. But now he must learn new techniques and he must answer questions not off ^{the top of} his mind, as the proverbial professor did, but by taking the problem under consideration, and setting the machinery in motion to provide his client with an answer, whether that client be a student or be a businessman.

*Strong
engineering
So, already in
the dept.
will have
the tech.
consultant.*

Automated Teaching

So we come to another important change about to occur in the social sciences, the change from one kind of teacher to another kind. Soon gone will be the old time lecturer, who, rain or shine, delivered his spiel. Be he a first grade teacher or a graduate school professor his occupational routine will undergo drastic change. A good part of his present-day routine will be lost to automated teaching devices. These devices may be fairly simple, involving no more than a rotating question-and-answer box that will permit a student to learn as fast as he can a number of fairly routine

facts and principles. On the other hand, the devices may someday extend to computers equipped with film, oral instructions, and the equivalent of means of asking and examining through so-called essay questions. The origins of the brisk movement towards programmed teaching by automatic devices go back largely to the short-answer quizzing that American educators evolved in the twenties and to the testing ^{of} equipment designs ^{for} the armed forces in the forties. The audio-visual experience of American education contributed ideas too.

The teaching machine presents individual students with programs of questions and answers, problems to be solved, or exercises to be done. At each step of the learning, the machine automatically permits the student to demonstrate his learning and then corrects him. Sometimes he is barred from further progress until he relearns and then is given the next problem. The variety of programming constantly grows and we can see little limit to it at this point.

What happens to the teacher as the classroom becomes automated? He, or she, becomes what a good teacher should be, if we are to take seriously what the history of educational philosophers tell us: he becomes a counsellor, a coach, a trouble-shooter; he exhorts and assists the laggard; he speeds along the talented. ^{What} ~~That~~ more can he ask?

Automated teaching devices are not alone needed in America. They may be especially useful in the underdeveloped areas of the world where illiteracy is widespread, the shortage of teachers is extreme, and the growth of the uneducated population more than keeps pace with the spread of basic education. Although automated teaching is destined to play a large role in the schools of the world, its function in factories, offices, and agencies is also likely to be great.

Social Sciences of Outer Space

At this point in describing the prospects of social science, we have achieved a sufficient ground speed to take off into space.

In a few years, a hundred or more satellites may be orbiting the globe. Some of these may be armed. Others may be for weather. Some will be for the telephone system. And some will be television and radio transmitters. The social consequences of these phenomena will be numerous. The weather satellites will help us control the weather around the globe. But then shall the decision about distribution of water rest with Brazil that will supply the water, the Sahara that will use it, or the United States that will bring about the transfer of annual average rainfall? No question but that a new group of questions will fall upon the policy-studying sciences of political science, sociology, jurisprudence, applied psychology, international relations, and economics, adding to the many now emanating from the underdeveloped countries of the world.

Business machines are now beginning to talk over telephone lines without human voices at speeds of up to 3000 words a minute. Within a decade they will be talking by radio via satellites over the whole world.

And to all the facilities of modern information retrieval systems for the mind-workers there will be added the probability of receiving and sending information via satellites. Unlike the radio and television frequencies of the present day, the channels of transmission from satellites can be exceedingly numerous, enough for all conceivable entertainment, educational, and message transmission purposes.

*Colonies
in
outer
space.*

If you wish to go farther into space, I am afraid you will have to leave me behind, for my interests are more mundane. Let me give you one bit of advice, however. Choosing people to colonize the planets is not easy. You do not want destructive types who might turn against the mother planet. You do not want too many of one nationality for fear of their allying with their country of origin against other earthly countries. You want people stable enough to endure long voyages, ingenious enough to cope with what they find, orderly enough to handle the complicated problems of a group of diverse origins and varied occupations. You should call upon a team of space specialists from political science, anthropology, sociology, psychology, industrial relations and geography before undertaking the voyage. Harold D. Lasswell pointed out some of these problems two years before Sputnik I (1957).

Additional Developments Mentioned

Back on earth now, I would emphasize that I have slighted many developments in the study of man. I have said nothing, for instance, about trends in applied Social Science professions such as journalism. I have not dealt with the necessity to extend education throughout life to keep pace with social invention and social change. The field of political science alone has a dozen shifts of emphasis occurring at the same time; for example, the governmental relations of corporations are now a matter of concern not only to corporations, but to political scientists interested in going beyond the older exposés of lobbies. Economists are crowding into the area of economic growth in under-developed areas. Research and development is booming in industry and government, and some part of it is behavioral science.

*150,000,000 a year in Fed Govt
will be 10 times this in another decade.*

Moreover, social science is spreading around the world. ^{Recently} ~~Just the~~ ~~other day~~, the Soviet Komsomol reported taking opinion surveys of its young people to discover their needs and aspirations. As with other branches of American industry, the applied social sciences have set up and trained their own competition in other lands, and now have to display a few fancy tricks to retain their wonted eminence.

The End Result

Now, regarding all these developments that we have traced, someone may say: "They are only details! The fundamental process of knowing man remains unchanged."

Of course it does, in one sense. Parmenides said 2500 years ago, "That which is, cannot perish, or change."

But then, as Heraclitus said, even earlier, "All things flow, nothing abides. Into the same river one cannot step twice."

In other words, to argue the point is not helpful. Man was as bloody a creature with the club as he is with the Bomb. Yet no one advocates that our 40 billions for defense be spent on the Mark I shillelagh. I do not affirm that we are bound to be happier with a better science but only that we must, in an existential sense, pursue a better science.

There are times, of course, when I am optimistic beyond warrant. Then I read with approval such statements, as I find even in the book of 1925 that I mentioned at the beginning of this talk: there the editor says:

It is becoming even more apparent that the complex difficulties of the present scientific and industrial age can in no way be competently dealt with by excellent intentions, single track schemes of social and economic reconstruction, metaphysical idealism or religious zeal, important as all of these may be in their respective spheres. Not only have the social sciences themselves been a product of the developments

of the last two centuries, but these very aspects of science, technology, industry and social relations have produced a social order which is becoming more and more evidently dependent upon social science for adequate and intelligent control, direction, and reorganization.

To put the faith more briefly, when we know all we can about man, we shall be better equipped also to control ourselves for good or evil. At the same time, we need not believe that the values emanating from the workings of social science are inferior morally to the ethical practices handed down to us from the pre-scientific age. The classical humane world has more to fear from Anti-Social Science than from Social Science. The applied Social Scientists, including the public relations expert and the advertising expert, are the shock troops of the new order. They should not break and run. They must maintain and continually improve their professional and scientific morale. Then, one day, in league with other progressive leading elements of society, they can help build a more charitable and orderly world.