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Men and Their Sciences

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The terms *evolution of man* and *history of mankind* suggest grandiose pictures of what in reality has been an essentially disorderly cavalcade of fumbling and tumbling human beings. On the basis of what we may consider a clumsy approach to a science of environment, men long ago started more or less methodically to collect facts and knowledge on certain objects and events, forming generalizations about that knowledge and utilizing it. But at no moment did men concentrate on an over-all plan of what phenomena and experiences were most important to them for observation, experimentation, and thought. It is characteristic of their primitive egocentricity that they did not, until much later, see *themselves* as objects for scientific study.

These various collections of knowledge were, in the end, termed sciences, not clearly separated from philosophy or religion; they were often accepted dogmatically, obediently, on authority—an approach we now consider entirely inadmissible. Abstractions were made on abstractions, until now a few scores of specialists seem to be the only ones who really understand what it is all about.

It is this picture of *many* individuals and *many* fields of observation that I stress in the title of this article (*1*), knowing full well that the phrase "man and science" would have been nearer a best seller.

By insisting upon the *individuals* as *reality-units* for the problems dealt with here, I am in no way taking the position of philosophic solipsism. My individuals are real from womb to tomb, and they do interact; this means that each specimen reacts to acts of another specimen. Bring all the specimens you like into the picture: they tick in unison or in dissonance, but in reality they do not become groups, states, societies, peoples, communities, countries. The reification of such concepts—treating them as [though] factual units—obstructs the use of the natural-science methods. Of what help are probability methods in regard to "states" or "scientists," as one deals with one concrete Hitler or Einstein in one concrete situation?

To make my approach quite clear, I take examples that may seem cynical. First, there is no reason to believe that the most beautiful feeling, a mother's love, will not be unfolded unreservedly toward a child she believes to be her child, even if it is not. Mother-love ticks in her. Second, the child will respond along certain reaction lines. It ticks too but differently. To understand mother and child, one needs no group concept. Third, we know of no innate urge for reproduction in man. There is lust, nowadays beautified to romantic love. But there is no native knowledge of a connection between the birth of the child and the act of love hundreds of days before. It has to be discovered or taught.

Let me jump to another larger and entirely different field—that of conflicts between so-called "states"—to see how individuals "tick" there. We speak of "tensions," say, between Moscow and Washington. From the viewpoint of the natural sciences, what is this tension? An electric or other current or wave down through the earth from the Kremlin to the White House? or a black cloud over the arctic? No, there may be tensions in one or many individuals in the Kremlin and in other places, and in one or many individuals in the White House or the State Department, and so forth. But in between? Only communication—or the lack of it.

No useful purpose seems served, nor any theoretical scientific problem solved, by the interpretation of a very common and handy word *group* until it is no longer recognizable. Using the word *group* blurs the reality picture of the many *individuals* on whom we have to work to bring about change.

When one clings to the group concept, one induces people not only to feel but to think in such terms as *state, people,* or *nation*—which include individuals who take no part in decisions (for example, infants, men and women naturalized only yesterday by a piece of paper or by marriage; people ignorant of what is going on, and traitors).

When we, then, turn to the individuals, we find that neither the physical sciences nor the social sciences have exhaustively accounted for the human being or for his relationship to his environment. There are enough unknown variables to keep the most enlightened scientist humble. But this ought not to conceal the fact that it is both inspiring and frightening to see to what use men have put their sciences. I shall not expand on the horror aspects of this subject, for we are all more interested in finding out how the scientists might work for peace and cooperation. I want to emphasize, as Don K. Price of the Ford Foundation has pointed out, that long-range policy decisions are in effect often made by scientists and technicians meeting together and developing basic ideas for the solution of the next emergency situation, ideas that the politician then takes over (*2*).

To this may be added the fact that through their inventions and discoveries, scientists in certain instances do in effect, although unintentionally and without fully seeing it, predetermine what the statesmen will later decide. The physical sciences are becoming ever more influential in man's social living, as is seen in the impact of atomic science on our entire life.

This situation coexists with another: there are not enough scientists who are qualified for *research* work for the tasks ahead. If the *application* of the results of scientific research were properly organized all over the world, the insufficiency of the number of qualified scientists and technicians would be no less striking.

The decision on what research should be pursued is made, to a great extent not by the scientists concerned but by those who hold the purse-strings. In other words, the scientists compete for money favors, and each one does so without

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considering whether a competing matter might not be more urgent or worthy.

Even in our time, the fields in which science has been developed have been selected with little systematic approach. For reasons of state, or the accidental occurrence of "genius," or a genius' chance interest in one field rather than another, or because of the interests of industries, some fields have been selected, some cultivated more than others.

This problem leads to a related one —whether certain scientific fields might be evaluated differently from what they now are. Many scientists maintain that they will have "nothing to do" with evaluation. This stand appears to confuse a mental condition essential to scientific thinking (namely, freedom of choice in research) with an evaluation or appraisal of such choice as less moral than a calculated rejection. These scientists have, as a matter of fact, by accepting their own field of research, made "value judgments" beyond this field.

The idea I want to suggest foremost may be expressed as the *scientific organization of science*. This sounds as if I were reaching for the stars. "Organization of science" rings of perfectionism; but, strange as it may sound, the method of bringing that "perfectionism" down to earth will consist in perfecting it by means of science itself. This is so because organization has become a field in which it is now possible to use scientific methods and scientifically acquired knowledge. Call in the specialists wherever possible! The creation of a *science organization service* would, therefore, be highly desirable. I shall return to this idea later.

Anyone who agrees that the scientific approach should be applied wherever applicable will, I believe, understand my desire to see scientifically acquired knowledge brought to bear on all our evaluations. This does not mean, though, that everything labeled "science" should be blindly adored. Some of the sciences as they are taught still have gross elements of "philosophy" in them. Part of the job will consist in making some existing sciences more scientific.

Initial planning must be very tentative and merely indicate the direction to be taken and the methods to be applied. Wherever scientific knowledge is insufficient, we must work with the mentality and morality of the true scientist—deferring judgment. That scientific methods are superior to political ones does not mean that we can dispense with the latter, or that we want a "dictatorship of scientists." There is much know-how in politics that scientists ignore and are now unable to replace with scientific skill. But, on the other hand, we must select as a field of great importance the progressive use of science in preparing political decisions. It seems fitting here to suggest that scientists everywhere try to induce their respective state parliaments to follow the example of the Parliamentary and Scientific Committee of Great Britain, which is alert to the relationships between science and politics. One day committees such as this one may then "compare notes" supranationally in conferences.

Some scientists fear that organization will deprive them of the leisurely dream world where the subconscious suddenly emits an inspiration that solves a hard problem or opens up wide new horizons. On the contrary, better organization must mean more freedom for creativity. Organization is not regimentation. Every organization must fit the purposes that it is intended to serve. (Military organization means regimentation within certain fields.) Organization means attitudes in individuals that make them function effectively. The organization of scientific work must, therefore, be suited to the scientific mentality, growing out of its very nature, and must aim at increasing in scientists their curiosity, inspiration, and "reverie." The atomic scientists who formed a team during World War II also continued afterward in organized research suited to their field and mentality. This field now appears to all concerned obviously suited for teamwork, but there are other fields the evaluation of which is likewise obviously suited for organization in a similar way.

The first field is *peace*. It is insanity on the part of a species to commit suicide, and we have reached the stage of military preparations for war that threatens race suicide. From a biological viewpoint, war has ceased to be selective and has become merely mass destruction. We not only have perfected the atom bomb and the hydrogen bomb, we also have G-gas; air-borne crop-killing germs can starve an entire population. This approach to the question of peace is thus, to my mind, entirely scientific. By this I mean that we are not dealing with war and peace on an abstract, humanitarian basis; nay, the motive is founded on a science—biology—which does not exclude other motives, such as the certainty that scientists would be killed by the thousands.

In the area in which peace-and-war decisions are made, generalizations, otherwise useful in the sciences, are very dangerous. Since these decisions are, in fact, made by a limited number of human beings (not by "the people" or "the state"), the best approach would be operational research on these individuals, with immediate application of findings. We would have to study closely the leaders who make the decisions, find means to remove the unsuited ones from power or prevent them getting power, and give the others all the necessary available knowledge. We must understand that, at each important political nerve center, it might be necessary to have not one scientist but 50 or more. During the 1954 Danube catastrophe, American and Soviet soldiers cooperated to stem the floods. May not the "soldiers of science" be permitted to contribute to the prevention of the much greater catastrophe of a world war?

A field such as the organization of science in the service of mankind seems to be a common interest in which East and West might meet in an endeavor to join hands for a positive peace program. (After all, Stalin admitted in an interview years ago that in case of a conflict between ideology and science, it would be ideology that would have to give way.) *In science fanaticism has no place.* The enormous sums spent by the Soviet Union on science, the ever-increasing number of scientifically trained men that they produce, must create to some degree a mentality with many elements common to that of our own scientists. Let us then face one fact: an affirmative answer from the Communist countries would be met with suspicion in many Western minds, but so would a negative one, and no magic formula will allay suspicion. But it seems worth trying to humanize the ideologies and, by such a joint enterprise as the scientific organization of science, make the issues more realistic—this is, more scientific.

Another obvious field for scientific study must be the scientists themselves. *Scientist* is a mere word denoting a certain aspect in a human being; if a scientist relinquishes scientific knowledge, applies other than scientific methods, meets problems in an emotionally upset state instead of open-mindedly, he is not, at that moment acting as a scientist. On the other hand, a man who does not have a title of professor or doctor may, when faced with a given problem, think entirely scientifically.

The mere fact that an individual is, thus, classified as "scientist" cannot free him from obligations of responsibility toward other human beings. Some scientists feel that, if they work hard and honestly without extra pay for overtime, they are not to be blamed for the consequences of their research, and that no one else should decide what they should study. However, their food, shelter, clothing, and so forth, are produced by others. "Science for its own sake" is, therefore, morally comparable to selfish dictatorship. When this is said, it must at once be added that no interference by incompetents in the scientific fields

should be tolerated. We cannot admit that some person highly "advertised"—like a Hitler, or a Mussolini, or a body endowed with authority—should know better than the scientists what fields should be cultivated. A better understanding of the value of pure research would result if scientists lead in the selection of fields. The scientists do not seem always to remember that their methods are far superior to political methods; they have every right to meet a challenge from political sides in a courageous spirit. But they must themselves take up the selection of fields and their cultivation as a *scientific problem.*

However, the proper place of science is not as an organ of *power* like the political, the administrative, or the judiciary. It is an element of *influence,* and we may well imagine this element organized in every "good" society on equal footing with the other three. Truth might well deserve this position anywhere. If this is agreed upon, there will be greater interest in finding out not only how we can organize scientific research and the application of results but also what can be done to improve the conditions of scientists. I am not thinking simply of their low salaries or unsatisfactory working conditions. I think also of such problems as how to educate children to think scientifically; how to select the children best fitted for scientific research and how to train them; the mentality and outlook of the scientists, spirit of teamwork, organizational understanding on local, national, and global levels; how to free scientists from much tedious work. Can geniuses be discovered—and what conditions will insure their maximum contribution? Can we, by artificial means, such as dehumidification of the air they are breathing, more oxygen, drugs, electric treatment, nourishment, hypnosis, or secretarial help, increase the total output of such brains? Often solutions to problems are said to occur to a person during sleep. Can something be done for such minds to produce more fertile sleep? I have often met the belief that the history of science proves that genius needs difficulties to overcome, needs poverty or conflict. Is this scientifically true? (*3*).

It is further of interest to find out why scientists select the problems they prefer. Are the selections due to their "personality," or are they accidental? What are the characteristics of scientific observation and thinking from a biopsychological point of view? What is going on in a human being when he is trying to penetrate a problem scientifically? What are we doing when we are thinking? Have we an instinct or propensity for thinking? And if so, what can we do to bring it into play at the right time and more and more? Many observations have been collected on the art of thinking, but these appear mostly in the books of self-made men and barely scratch the surface.

I shall make no mention of all the technical aspects of the scientist's life; fortunately a certain interest is taken in them by UNESCO and other organizations and institutions.

From the organizational point of view, the attitudes of scientists in regard to their tasks is of fundamental importance. Anthropologists, for example, commonly recognize the vast area in which their methods are applicable. They have a high code of ethics, which other scientists may well study. But they seem to think that it is all right to leave the question of where their methods and knowledge ought to be applied to each individual's own evaluation. From the point of view presented here, another outlook would be desirable. It is not enough that each anthropologist acts morally and that he accepts full responsibility for the foreseeable effects of the application of his methods and of his decision on where he would accept or refuse work. It is difficult but possible to develop an approach to the problem of selecting the fields and of deciding priorities that would approach making a science of the process of evaluation, instead of just being rigidly scientific and efficient within a more or less fortuitously adopted field.

The science of human relationships and human organization have grown to such an extent that they are being applied in practical life, in government, in industry, and in many other fields. It seems to me that the problem of organizing science might, with hope for success, be approached by means of what is known scientifically concerning organization. Scientists should themselves bring about their consensus, good will and organizational attitudes for active planning and cooperation in the selection of fields and their study. It is, I know, impossible to put up one unalterable menu, but this is the case in all existing sciences. We have to work on a tentative basis and always test our evaluations and hypotheses by means of the latest discoveries in any science within the framework of the general view.

More anthropologists are required. We should try to utilize the qualified ones we have for the study of the most important tasks, in the first place, *peace,* and concomitantly, the *organization of science* and the *mentality of the scientists.*

But there are other obvious fields, for instance, *bioeconomics.* We would have to start with man as the other natural sciences describe him, in a setting that may well be called ecological. In determining whether a demand should be met, the other sciences would contribute their knowledge. Instead of turning to statistics of actual consumption or production, economics would be based on the biological stages through which man passes. Economic measures would have to fall in line with the knowledge the different sciences can bring to bear on the problem. Therefore, the ultimate aim in economics would tend to be living at the optimum of the individual's biological capacity when he is functioning in a mentally and physically healthy way. In the present stage of our history, economic policies cannot avoid being influenced by elections, or whatever propaganda form or ideological or other pressure is dominant in the state concerned.

If it were true that cigarette smoking makes one liable to lung cancer (and I do not pretend to know), it can hardly be good bioeconomics to ease taxation on cigarettes; nor can the production of destructive arms be sound bioeconomics, however necessary it may be from a military point of view in a given world situation.

Further, an *interdisciplinary team approach* to economic problems is desirable. It may be short-sighted to eliminate dangerous insects if at the same time we kill the bees necessary for our food production. And it is of mixed advantage to be able to exterminate wild rabbits by means of a microbe, if by so doing we kill the rabbits that are raised for eating.

A science of work is indicated; it cannot be said to exist. Experiments on work, fatigue, and so forth, are carried on in physiological laboratories and elsewhere, but work plays such a role in the lives of human beings that it seems to deserve a science of its own.

Politics is another important field. Political terms are not precise expressions for clear concepts. They are often stereotypes, appealing to our emotions and not describing facts. A scientific study of the concepts used in politics, publicly well disseminated, examining and explaining what these concepts really represent (that is, human individuals in their interplay) might fundamentally affect internal, as well as external, policies in many countries. *Semantics* must come to play a greater role. Political *descriptions,* like other descriptions, must indicate what the symbols symbolize—that is, what realities they involve.

Another field of tremendous importance is *mental health* (*4*). There seems to be no human problem to which the findings of the mental-health expert would not contribute substantially, not merely to the wholesome personal happiness of the individuals, but also to the interplay that brings more and better results for all concerned.

But it must always be remembered that

selection of a field is a limitation in outlook. From the point of view of mental health, name-calling is bad, it creates resistance, hostility, aggressiveness. But the mental-health experts must understand that in politics name-calling is not simply a means of releasing one's emotions or hurting the emotions of the other fellow. It might unfortunately be used to stir effectively the emotions of constituents so that one can win an election or a following, and this may for other reasons have highest priority.

Sometimes organization would simply mean an extension of work already commenced or imitation of organization tried elsewhere. Some work is already done in a limited way, for instance by the Council of Scientific Unions, which surely does not have all the money it deserves. UNESCO has also tackled the question of scientific work, but more as liaison than as organized planning, and its budget is ridiculously small compared with what is needed. Furthermore, decisions in the general conference of UNESCO are primarily taken by people in their role as government representatives, although they may be scientists.

It may further be very desirable if other countries would emulate for instance the *scientific mission* of the United Kingdom in Washington. To begin with, smaller states may be content to have one science attaché.

If we start the trend for deliberate scientific development in organization of science with a nucleus (a special team consisting of experts in, for instance, social psychology, sociology, applied anthropology, human organization, semantics, history, physics, and a few others), we may safely leave to them to add to the nucleus, as needed, experts in other fields. What is essential is that decisions on the entire work be taken by men and women who are science-minded and have the vision and understanding of the task.

In many countries institutions exist free to choose scientific fields; such institutions, for example, as government funds under control of scientists or big foundations created by private individuals, and so forth, particularly in the United States. Such funds and foundations might be of great help, especially in the preliminary stages, and best if they acted in concerted effort.

Anyway the foundations should be consulted and included in planning for this type of science organization. The contributions of foundations to the organization of fields and the cross-fertilization of thought have been tremendous, and I am sure much could be learned from the experience of foundations. They would undoubtedly warn us against trying to swallow too much at a time. So would I. But I think that we have a safety valve against speed in the lag that always results from resistance to disturbances of a quiet life, communication difficulties, and the conservatism of opinions.

Apart from contributions from states and other units (without strings attached), it would be worth while to examine whether the *generosity of private persons and institutions* is used in the best way. It seems now a matter of chance what is chosen as an object for generosity. Would it not be feasible to have a well-advertised council to which prospective donors could turn for advice regarding the fields most in need?

Such a council evidently would have to be part of, or in close connection with the science organization service, the title of which would, at the same time, indicate that it would function only as a service. The process would in all respects be a self-perpetuating one, thrashing out fields and programs, testing their basis, organizing for research and application, simultaneously with discoveries and inventions leading to new lines of direction, always scientifically oriented and not based on power decisions. The program envisaged may well be furthered by an organized *exploitation of inventions* in the service of organization. There are cases where scientists have put their inventions at the disposal of research. This idea might be further developed to attract inventors as donors, for instance, via life-annuities.

The scientific organization of science would lead more and more *people to be research-minded.* Gardner Murphy, Dorwin Cartwright, and Jeromes Bruner state that "people who have once learned to think in research terms are never likely again to go back to the quasi-moralistic, the acrimonious, or the horse-trading approach to social problems" (*5*). This is not the least important thing; the research-minded approach is mentally healthy.

The foregoing discussion is, of course, a very limited sketch of what ought to be done and a rather hazy picture of certain aspects of the human situation out of which we have to draw the elements for scientific organization of the application of scientific methods and scientifically acquired knowledge. Due acknowledgment to others for similar thoughts (*6*) has been excluded by time and space limitations, and experiments going on, organization already in existence, left unmentioned. But I feel convinced that there is among the scientists themselves sufficient healthy cooperative good will to aim at teamwork for enormous expansion in the fields indicated.

In humility but with eagerness the scientists would thus develop their sciences toward the best possible aims, so that all would feel that men and their sciences belong together so intimately that we were one unit (rather than billions of divergent individuals), mankind, progressing in an ever more orderly way.

References and Notes

1. Based on an address given at the Fifth International Congress on Mental Health, Toronto, Canada, 17 Aug. 1954. The original and full text will appear in the Proceedings of the Congress.
2. D. K. Price, *Government and Science* (New York, 1954).
3. Certain studies are in progress in some of the fields, but they are relatively few and limited—nothing on a world-basis, either in regard to research or to applied science.
4. See my appeal "On active service for peace," *Bull. World Federation for Mental Health (London)*, Aug. 1950; also my "On methods of the social sciences in their approach to international problems," *Am. J. Psychiat.* 107, No. 9, Mar. 1951.
5. *J. Social Issues* 3, 65 (1947).
6. See, for example, H. von Euler-Chelpin, "Place of science in society today," *Sci. Monthly* 79, 365 (1954).

A bitter paradox underlies many aspects of our era. The marvelous achievements of science are being used to destroy the civilization which science has achieved. Learning has been directed to the obliteration of its own temples. The great ideals of human liberty are led to the sacrifice by those who would preserve them. But of all the paradoxes around us none is more disconcerting than the fact that we, living during one of the greatest upheavals of recorded history, have so little understanding of the historical significance of our own times.—FELIX MORLEY.