THE SIGNIFICANCE AND FUTURE OF THE SCIENTIST'S CODE

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The theme of this second conference on the unity of the sciences is especially timely, for the scientific enterprise is under challenge as never before. In the words of a particularly forward-looking man, the poet and essayist Paul Valéry:

> Never has humanity known so much power and so much confusion, so much worry and so much play, so much knowledge and so much uncertainty. In equal measure does now anguish, now futility, command the hours of our days.

These words were written many years ago, but their force is even greater today, when the challenge has attained such proportions that one may wonder whether science as we know it can survive.

We live in a time in which the industrialized countries are experiencing unparalleled technological development, in large part the fruit of science. However, the benefits of new technologies are distribute in a grossly unbalanced manner, not only within individual industrialized countries, but also among the developing and industrialized nations of the world. Overcrowding and environmental degradation are already significantl reducing the quality of life in the developed nations, and give stark eviden of their inability to confront the problem of the future and its planning.

Excess population and famine are on the increase in some regions, while in others there are those who enjoy material goods and leisure as never before

Many are disposed to find the source of these imbalances in science and question the wisdom of continuing to support research on the scale established since World War II. Others look to scientists for help in dealing with these grave problems, upon whose solution the continued existence of our species is seen to depend. This reference to an evolutionary, biological framework accurately conveys the dimensions of the problems, I believe, for what we are witnessing is the virtually complete ascendancy of brutish, uncontrolled emergence. From the interaction of the individual interests of men, nations, and new technological capabilities emerges, not a more finely tuned system in which the needs of all are met more effectively but rather a wildly oscillating disequilibrium in which the disparities between those who have and those who have not are broadening As available sources of energy dwindle, populations grow, and rational allocation of food and other resources continues to remain unaccomplishable, the prospect of world-wide catastrophe appears on the horizon.

M. Self-management was coined the term narrowing now-core"

We need to find a means of establishing control over the processes of emergence so as to favor man's survival. A central requirement, it seems to me, is a new and potent ethic, one that might help to shape the development of nations, regions, and ethnic groups in desirable ways--that is, in the direction of greater humanization, the antithesis of blind, uncontrolled emergence. The ethic in question should identify the evils of uncontrolled development, and the inadequacy of humanization that does not seek, above all, to eliminate the threats to life and is not guided by the directed application of technology and positive plans for the future, with decent survival of man as the main concern. This ethic should also provide a basis for going beyond the competing ideologies and religions of our day--of capitalism and socialism, of Christianity, Islam, and Buddhism.

The fundamental question which I should like to raise in this

presentation is whether science, so successful in the pursuit of knowledge does not contain certain values which might be significant for the new ethic under consideration.

The contributions of my fellow participants in this Conference have important implications for this problem, for it presupposes a series of searching examinations--of what we mean by science; of the moral values we associate with it; of the principal challenges to the integrity of science; of the possible changes in the scientific enterprise in years to come; and of the choices we can make which may help to preserve the essenti features of the institution of science and disseminate its fruits more equitably. I shall deal with some aspects of these problems from the perspective of the code of the scientist and its complement, the institutio code of science.

II

"If you wish to discover the secrets of nature, you must be more human than other men," said the American poet Henry Thoreau. By developing and elaborating its characteristic rules of procedure, which serve both to shape the product, certified knowledge, and the conduct of individual scientists, science may well have succeeded in discovering the secret of this enhanced humanity. In seeking to understand the rules of procedure of the scientific enterprise, I find a dual approach to be most satisfactory. One approach attempts to express the institutional features of science; the other approach, by identifying the operating code of the scientist, provides guidance in recognizing and appraising the actions and conduct of our colleagues and ourselves. A general conception of the code of science, which first appeared in print in 1942, is the work of the sociologist Robert Merton, whose special subject has been the social science of science. Merton described four components of the code of science:

1. The requirement that the quality of a scientific work be judged only on the basis of its merits or significance; Merton referred to this principle as universalism.

2. The postulate that scientific contributions be judged only after the relevant facts, so far as they can be ascertained, are at hand; that is, the principle of organized skepticism.

3. The prescription that advancement of scientific knowledge, and not one's own self-interest, should be the basis of decisions in scientific work; this Merton referred to as the principle of disinterestedness.

4. The requirement that an individual scientist should not restrict access to knowledge gained through his or her work, since the scientific community has rights to that knowledge. This principle Merton described as communism, but to avoid confusion the term communalism might be more appropriate.

A quite different formulation was obtained when I reflected upon the code of conduct of which I had become aware as a young scientist and physician in training and observed in the actions of teachers and colleagues. On the basis of this personal experience--which I presented first at a colloquium several years ago and then in a paper written with the sociologist Harriet Zuckerman--the code of the scientist can be expressed by the seven following principles:

1. Intellectual integrity and objectivity. Scientists are obliged to approach the natural world and their own investigations of it with as much objectivity and care as they can summon. Of course, the presentation of facts in a form certifiable by appropriate observations presupposes choices on the part of a scientist. Such choices pertain not only to the hypotheses in relation to which the facts have meaning, but more particularly to the selection of means of presenting data according to their proper importance. The criteria applicable to such choices are those of good discernment and conscience, and these qualities, in turn, are related to the notion of honor, or inner-directedness--to use the term promulgated, if not coined, by the sociologist David Riesman.

2. Intellectual integrity leads directly to the second principl recognition of priorities. This principle affirms that other scientists' priorities in discovery must be respected as scrupulously and accurately as possible.

3. Tolerance. The scientist should not discard new ideas out of hand but rather should be receptive of them until it can be determined whether their factual bases are consistent with established knowledge or furnish links to new and valuable concepts. Scientists also express tolerance through dissent, provided that those who are in disagreement maintain mutual respect. Tolerance is implicit in the next principle:

4. Doubt of certitude. Scientists must approach generally accepted data and concepts with an ever-open, ever-questioning mind. The underlying philosophical attitude is that truth often emerges from the confrontation of contrary data or of incompatible theoretical interpretatio of data. Suffice it to say that assertion of this principle raises the problem of the advantages and danger of the principle of authority. The importance of authority as an influence upon the conduct of scientists has been emphasized by the biophysicist Michael Polanyi in his book Personal Knowledge. I cannot subscribe wholeheartedly to his view, as I consider doubt of authority to be a primum movans in the improvement of knowledge.

5. Recognition of error. Errors are to be recognized and acknowledged publicly--not because confession is good in its own right, but rather because doing so favors reason and progress in understanding.

6. Unselfish engagement. The scientist's motivation should be to extend knowledge, and not to secure personal gain or to promote the primacy of a particular philosophy or ideology.

7. Sense of belonging. Scientists should recognize that their work is part of a larger enterprise and that they themselves are linked to their colleagues through their contributions to this enterprise.

As I pointed out with Harriet Zuckerman in the report in which we analyzed these seven principles, the perspective from which they are

described is complementary to Merton's. The one description is couched in terms of the behavior of individual scientists; the other focuses on the institutions of science, that is, (a) the methods by which knowledge is certified as scientifically sound; (b) the bodies of knowledge obtained through application of these techniques; and (c) related historical traditions, cultural mores, and values.

III

Different though their conceptual bases and orientations are, both codes share certain qualities. In the first place, they are functional for the advance of science. And here I must emphasize that these codes, although containing descriptive elements, have a dominantly prescriptive orientation: Thus, the code of the scientist specifies the qualities which the scientist's conduct should exemplify, and the code of science, the qualities science should exhibit, if the ends of scientists are to be attained--that is, progressive knowledge and understanding of nature, including man himself within its realm. In addition to this instrumental, or functional aspect, the codes have ethical meanings, as may be inferred in part from the nature and intensity of the responses evoked by violations of the code.

I am not a sociologist, and accordingly, in what follows I shall refer primarily to the code of the scientist--without forgetting that since both codes apply to the same phenomena, what is true of the one code will sooner or later find its reflection in the other.

When situations or actions in which scientists participate are reconstructed retrospectively, more than one principle of the code of the scientist may be found to have been relevant. Most of the time, no doubt, the principles reinforce one another. At other times, the principles may be found to have competed with one another, or with still other principles. As one example, there are well known instances in which the

principles of unselfish engagement and sense of belonging give way to the requirement for secrecy--as in the case of matters related to national defense.

The outcome of situations in which the prescriptions of the code are in competition may be analyzed as though an additional standard had been applied to "weight" the principles of the code of the scientist as to their relative importance or order of priority. (It will be obvious that a standard determined by a retrospective analysis is a construct and does not necessarily correspond to actual elements in the scientist's process of judgment.) For reasons which I shall not belabor here, such additional standards are equivalent to implicit presuppositions of an intellectual process.

Three considerations follow from this:

1. The code of the scientist as formulated is ambiguous, in the sense that the application of each principle in every possible situation is not unequivocally entailed. In addition, the code contains the potentiality for disclosing or evoking ambivalence, that is, polarities in viewpoints. Such polarities, to give two examples, might include (a) the quest for certitude, the wish to integrate knowledge into one intellectual structure, versus the desire to remain open to all intellectually and factually defensible viewpoints, and (b) the opposition between those who work with the conceptual structure and tools of an established paradigm and those who would introduce a new major working hypothesis. To my way of thinking, the existence of such oppositions is inherent in any effort to introduce order among things of the mind and senses--concepts and observations--and the objects to which the observer addresses his attentions, that is--and I say it within quotation marks--"reality." It was perhaps Heraclitus who first directed attention to the difficulties of dealing with absolutes--save for the absolute of unending change and its consequence, the ever-present need for compromise between opposites.

2. The qualities of ambiguity or relative indeterminacy and ambivalence help to make understandable the vitality of the code of the scientist, since these properties enable science as an institution and scientists as individuals to respond and to adapt to pressures, both from within and from without the scientific community.

3. At the same time, the fact that "weighting" is implicit in the application of the code permits insight into at least a certain aspect of the mechanism of change in the institution of science. An excessive weighting of one or more components of the code would imply the possibility of underweighting or even ignoring one or more of the tenets I have cited, or of substituting other tenets.

IV

What are the potentialities for change in the code of the scientis Here I can only illustrate certain tendencies, but this may be sufficient to show that the question is not exclusively academic in interest. By way o background, I should like to point out that during the long period in which the code of the scientist took on its present form, the relationship between scientists and other members of society was comparatively stable. The enormously successful evolution of science now universally acknowledged to which the code contributed occurred for the most part in a setting in which outsiders rarely attempted to control science.

There are obvious and important exceptions to this statement, but I do not believe that they invalidate the observation that recent decades have seen the pendulum of history shift toward the opposite pole. The growing interdependence of science and other social institutions, marked by a profound transformation, qualitatively and quantitatively, of the interaction of science and society, has three aspects that are important in sounding potentialities for change:

First, society is straining to deal with the augmented capacity to control nature and man which increasing scientific knowledge and its burgeoning technological applications have brought about.

Second, scientists have become more aware of their responsibility for, and concerned about, the dangers associated with exploitation of new technological capabilities.

And third, as science and its applications have increased in importance, society in various guises and to differing degrees has penetrate science, with the result that the interconnections of these two domains have become extraordinarily multifarious and complex.

Turning now to the potentialities for change in particular facets of the code of the scientist, with regard to intellectual integrity, we may remark recent instances in which referees and other readers of scientific reports abuse their privilege by selectively disseminating the contents prior to formal publication, or by using the work for their own advantage. Coupled with this may be the abuse of rejecting the paper in order to gain priority for one's own or one's colleagues' work. These practices also affect the observance of the principles of organized skepticism and unselfish engagement and disinterestedness.

The latter is currently perhaps more severely challenged than any other of the imperatives of the code of the scientist. Questions are debated concerning the propriety of using scientific expertise for personal gain, the legitimacy of the scientist's wish for fame, and the position to be taken concerning the social implications of the outcome of scientific work. Deriving personal financial gain from one's work as a scientist would, if widely practiced, eventually call into doubt intellectual integrity and objectivity, as well as disinterestedness and organized skepticism. The wish to gain renown, if more generally accepted as legitimate, raises the possibility of increased plagiarism and greater recourse to secrecy, which is antithetical to unselfish engagement and the sense of belonging.

Joining with these new appearances--perhaps even the same phenomena captured under a different rubric--is the increasingly prevalent application in science of the mores of industry, with the attendant

problems of publicity and personal recognition. One of the main dangers of these tendencies is loss of cohesion among scientists, that is, of communalism and the sense of belonging.

There is increasingly, furthermore, a trend toward the position that scientists should concern themselves with the moral, ethical, and social implications of their work. Robert Merton has been outspoken on this point. He has noted the possibility that scientists, by insisting on preserving the principle of disinterestedness, i.e., of performing scientific work without regard for its social consequences, may come to create outcomes so undesirable that public support of science will diminish. And if disinterestedness must be discarded as a canon of the scientist's conduct, so too may autonomy from interference by nonscientists.

Communalism and the sense of belonging are in one sense or another challenged by each of the developments I have mentioned. Furthermore, the change in the scope of science--the trend toward increasingly specialized subjects of inquiry and the requirement for more complex and costly research materials and tools--affects the sense of belonging. Whereas in the past scientists were united by their sense of belonging, now they tend to be separated by trends toward specialization.

V

What do these stresses portend for the future of the code of the scientist and science itself? It is of course hazardous to venture firm predictions. It seems to me, however, that concern for the social consequences of scientific research and its applications is replacing disinterestedness as a primary value for a growing number of scientists. The canon of communalism is by the same token vulnerable. Although the relationships among the prescriptive components of the code of the scientist have not been fully explored, it seems probable that the principles individually and collectively reinforce one another. Therefore, changes in

one or more canons of the code might affect the other canons as well. If contemporary trends continue unabated, it may not be possible to conserve certain primary values in the code of the scientist. It is difficult to conceive how what would remain could still be considered to represent science.

In brief, the code of the scientist has been sufficient as a guide to action during the period of relative isolation of scientists from society. Because of its success, however, both in increasing knowledge and understanding of nature and in fostering new technologies in every sphere of consumption, science is no longer isolated from society. Since the operating code of the scientist includes no explicit prescriptions regarding the relations of scientists to nonscientists, nor concerning the conduct of scientists in extrascientific contexts, e.g., as political actors or as entrepreneurs, this code is not sufficient in the new situation of science and society.

VI

In what respects might the code of the scientist be modified to advantage? On the basis of the considerations I have reviewed, two modifications might be encouraged. First, the code might explicitly take cognizance of the fact that the scientist is an individual who lives in a nonscientific collectivity. The scientist has multiple allegiances, ones within the scientific community and others outside it. Guidance from the code in resolving conflicts among these allegiances is a definite need. Second, equally fundamental seems the consideration that what appears to be lacking in the code of the scientist is a principle enabling accommodation to change, both within science and in the relations of science and society. Such a principle might be termed an ethic of development.

What might be the sources of such an ethic? In one sense, a characteristic of the code of the scientist to which I referred previously

might furnish a guide. This characteristic involves the "weighting" or balancing factor, that is, the necessity to determine, in certain situatior the order of priority with which the tenets of the code are applied, or the type of compromise that may reconcile those who hold opposing ideas or who urge incompatible courses of action. One might propose that whateve the weighting or balancing that is achieved in instances in which the problems of ambiguity and ambivalence of the principles of the code arise, it should be compatible with the continued integrity and viability of the code.

This is, to be sure, a formal as opposed to a substantive principle. I cannot here undertake the analysis of what, under given conditions, is primary and what secondary in the code--the analysis that would be required to give the principle an operational meaning. To give some substance to this principle, it seems desirable to recognize that the problem of shaping development is not a problem in science alone.

VII

The technological applications of science have been seized with great avidity by industrialized countries, significantly hastening the pace of sociocultural evolution and initiating or reinforcing a host of changes affecting man's consciousness and expectations. More recently, developing countries have placed themselves on a path which, if not identica to that of the developed nations, nevertheless leads toward the goal of enormously amplifying human capability through advanced techniques for harnessing energy. In both industrialized and developing nations, these processes of evolutionary change are one-sided and unbalanced. Despite our more profound knowledge of nature and the greater use of natural resources to which this knowledge has led, the condition of affluence has not been matched by a more just distribution of these resources, either among individuals within a country, or among the nations of the world at large. Just as some individuals are favored within a socioeconomic system, so some countries have a disparate share of the world's riches. Moreover,

in most of the world, this material growth has not been paralleled by a rise in the individual's self-realization. Of the evil effects which attend increasing affluence, perhaps the principal ones comprise over-crowding, or overloading, which has consequences both for things material and of the mind, i.e., communication, information, decision-making, social organization, the ability to create, and the capacity to be open to the possibilities of the future. Thus a new social pathology is born of the unbalanced excesses of affluence.

In a word, what we are witnessing are the phenomena which I earlier characterized as reflecting blind emergence--an evolutionary process having strict analogies with processes of biological evolution. Unchecked, this blind emergence overpowers its antithesis, which, following Pierre Massé, I shall refer to as humanized emergence--that is, the attempt introduce order into chaos, at once defending the individual and organizing the collectivity. The ethic of survival as it comes to us from biology must be modified so as to guide us in the anticipation of our future.

Two potential candidates for an ethic are at center stage; in both science plays a crucial role. The one ethic is the ethic of knowledge According to this ethic--and here I translate a passage from Jacques Monod's book La Chance et la Necessité--"the only goal, the sovereign good, is not, we must admit, the happiness of man, even his temporal power or comfort, not the Socratic Know Thyself--it is objective knowledge itself. This is a rigid and constraining ethic which, if it respects man as the supporter of knowledge, nevertheless defines a value superior to man himself." Monod asserts, furthermore, that if science ignores values, it is in its own right an ascetic doctrine. Often it is noted that science enlightens action but does not provide a reason for acting; the reason for acting, in Monod's view, is science itself. Thus for God another absolute has been substituted, i.e., science.

The ethic of knowledge thus is a return to the "ivory tower" which stands supreme and is accessible only to the few, far removed from

the great current of humanity. The Promethean current is held superior to the democratic tradition and its associated values of freedom, the doubt of established power, the principles of sovereignty of the people and civil liberties, including freedom of thought and of expression, and the rule of law. Furthermore, this ethic, in fostering an aristocracy of the mind, reminds one of the great age in which Christian Dogma and the authority of the Church were absolute, with all the excesses that followed. How can one subscribe to an ethic that would equate the value of a man with the quality of his support of knowledge? What abuses might stem from rating him according to the knowledge he produces--especially when the knowledge in question is not necessarily oriented toward improvement of his condition?

A second contender for an ethic has been termed the ethic of development by Pierre Masse, who in a long life devoted exclusively to public service has been a technologist, an economist, an administrator, and a planner. His recent book, La Crise du Developpement, presents the fruits of his reflections, leading to the proposal of a new ethic. In this ethic objective knowledge is no longer the supreme good; it must be subservient to a greater aspiration, man's discovery of a vector for life, the arrow of a shared adventure. In this outlook the individual is not insignificant, and his life is not absurd. According to this ethic, man is free, with all the responsibilities attached to freedom, to apply the spirit of communalism and unselfish engagement, indeed, all other precepts derived from the code of the scientist that favor dialogue, i.e., exchange, compromise, and new synthesis on the part of opponents, to the problems arising from his interactions with other individuals, and within the social community at large.

The dominant means in this ethic of development is compromise, derived from the biological thesis that survival of the individual as of the species depends on accommodation between rigidity and plasticity,

between the imperious demands of the genes and an adaptability to the impact and pressures of the environment. This concept, in the new ethic, is extended to the society of men, to all situations implicating the person and the society. This complementarity in both biological and social contexts, each of which creates tensions with the other, I may note, is incompatible with the notion of sovereign good.

The goals sought by this ethic, far from being intellectual games, are those of helping in undertaking the successive steps required for an approach to the solution of the pressing problems of our time:

1) The promotion of abundance while avoiding its extension into superabundance or overloading of all spheres of human activity.

Creating consciousness of responsibility for the less favored nations and individuals and accepting, therefore, "sacrifices on the part of those who attempt to improve the fate of these individuals"--to use André Philip's expression.

Distribution of the fruits of knowledge in a more equitable fashion, both with regard to health and to culture.

Preparation for the advent of a mass civilization, helping those who cannot help themselves. Such a civilization cannot be built without negotiation and compromise.

The solution of these problems requires that directions be followed. There is no viable society without a common system of imperative If it is feared that the system of collective organization toward which we seem to be headed does not defend the individual, our choice must be inspired in priority with that defense. Therefore, "the imperatives required for the survival of the collectivity of men must be reduced to the indispensable minimum, a minimum inviolable regardless of the sacrifices

imposed on the individual," as Jean Hamburger has put it, in The Power and the Frailty. Ideally, the imperatives of an ethic of development should be compatible with modern scientific knowledge, find accommodation with prevailing religions and philosophies, be acceptable to people of all nations and races, and be capable of helping the individual to find a meaning in his existence, and society to maintain its cohesion.

The first exigencies of those who uphold such an ethic are: to defend freedom, to will justice, to respect all men. These exigencies characterize development, since there is no emergence without freedom, no humanization without justice, no fraternity without respect. To them must be added a sense of terrestrial solidarity, the modern form of honor. Without this quality in the hour of decision, there is no resolution of conflicts.

VIII

I have outlined certain of the qualities of an ethic of development as Pierre Massé has conceived it, and I have indicated the respects in which such an ethic seems preferable to an ethic for which objective knowledge is the final justification of activity. I have great admiration for Massé's conception, and would append to it only a few comments.

The first comment is as follows: In order to support and follow the precepts of a new ethic, man must be vitally concerned and motivated. His motivation rests essentially on the elimination of the threats to the bare necessities of life and to the respect for his identity. The attempt to eliminate these threats, a problem of considerable magnitude, is obviously related to concerted political action. It involves the relations of politics and ethics, a subject discussed recently by Cranston, but too far afield for us to consider here.

Second, it may be desirable to distinguish between the effort to analytically reconstruct or propose the content and structure of an

ethic and the living ethic which informs attitudes and shapes actions. It would be somewhat presumptuous to attempt to state the precise terms of this living ethic, since an ethic probably cannot be imposed but rather evolves as a natural process in which the necessary and the desirable are balanced.

Third, one may nevertheless indicate broadly some of the features one would hope to see united in the implementation of such an ethic:

A. To begin with, a positive conception of the interplay between the development of individual living forms--I take this term very broadly to refer to individuals of various species and also nations, ethnic groups within nations and within regions--and the development of the entire system in which these living forms are placed. Since development of any type takes place within a system, it follows that unchecked development of any one element is likely to be at the expense initially of other component of the system and eventually, of the entire system. Accordingly, one would like the ethic to stress the necessity for compromise between developing forms within the world-system, and to encourage the notion that the development of the total system is coordinate in ethical and moral priority with the development of any one component.

B. One would also like to see incorporated in this ethic the precepts of the code of the scientist, generalized so as to apply in the broader context of development. The reason for this is not that the code contains ethical values which ought to be promulgated; it is rather that the code has proved effective in what is perhaps the one unequivocally "successful" process of development of which we know, namely, that of science. The code, by helping to make possible the day-to-day work of the scientist, by prompting him to be aware of the larger context of his work, and by making possible dialogue between those who are in opposition, has been intimately linked to the growth of science; it need scarcely be added that the code has been observed mainly in the breach by those who profit (monetarily and otherwise) from the technological applications of

science. Accordingly, it seems to me that the code of the scientist offers the best means of making possible the dialogue and compromise which appear to be vital for a united world in development.

Here I should like to add two notes: (1) Constructive dialogue between those of contrary political and philosophical persuasions can occur as is shown by recent exchanges between Marxist theoreticians and Christian theologians. (2) Returning, for a moment, to the question I raised earlier, as to how the code of the scientist might desirably be modified, I should like to suggest that inclusion of the code as a fundamental elemen in an ethic of development is perhaps the major modification required to enable the perpetuation of the code as we know it. If this is to say that to survive, science must endeavor to extend its ethos and mores in a form effective in relation to the aspirations and problems of the wider communit of men, I shall not shun this consequence.

C. Finally, the ethic of development must concern itself with education, the importance of which is so clearly implied by the foregoing. Here, the aims of Prospective education, as derived from the thought of the French philosopher and educator Gaston Berger, are relevant:

Since it is man who must survive in a continuously evolving world, who must control progress, who makes decisions, and who must be respected, "one must," according to Berger, "think above all of man and develop a sense of the human which is not a mere orientation of the intelle but a profound attitude involving our entire being." Such an attitude requires not only reason, which constructs, and understanding, which assimilates experience, but also imagination, which "effects a synthesis in a single creative movement of intelligence and sensibility." It is clear that the qualities required are to see far, since transformation is rapid; to see in breadth, that is, to overcome the narrow channels of specialties; to analyze in depth; and to take risks; that is, far from avoiding them, to be prepared to confront them.

The guiding aims of an education that seeks to develop these

qualities should, among others, include primarily the following:

To adapt to the changing circumstances of a mobile world, and "to be happy in this mobility."

To learn how to analyze in depth the consequences of actions, accomplished or proposed, and of suddenly arising new situations.

To acquire an open mind, the art of making stimulating comparisons, and the skill of transforming chance events into opportunities.

To take advantage of the unpredictable and the unexpected, particularly in the interaction of opposing tensions, which may be the source of new things, qualities, or ideas.

To be ready to act effectively for what is believed to be desirable.

And finally, to invent means of communication and of dialogue which place understanding of others prior to judgment of them.

IX

And now a final word: In offering the foregoing reflections, my aim has been the satisfaction of one of the most honorable aspirations of man: To play the role of Maxwell's demon--to know, to sort, and to distribu and, in Valéry's words, "to look back and to look ahead, to recapture the past and to sound and to shape the future, to join in our innermost selves the oscillations between these images."

Dr Command has good ideas but has not integrated them into an organized pattern