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INSTRUMENTAL KNOWLEDGE IN POLITICS*

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The following remarks are not meant as a reply to the paper by Professor Bahrtdt; they deal with the same subject matter of "The Scientification of Politics", but from a different viewpoint.

Mr. Bahrtdt has discussed the obstacles against the alliance between politician, scientist and administrator on the field of political practice. Not without the defeatist's mockery and not without some malignity we have heard yesterday that scientists going to Washington as decision aides do not accomplish very much nor do they count as happy people.

The reason: if the scientist stays true to his own principles then he cannot offer very much direct help to the politician. If, however, he is offering politically relevant advice he is abandoning the foundation of his qualification and nothing will then distinguish his advice from that of "ordinary" people. It is his trade to reliably and systematically inquire what is the case - and not what ought to become the case. Neither in politics nor elsewhere is there anything like a "scientifically correct" decision which could be derived from some "objective" theory.

At the same time the state of the world demonstrates the hopeless inadequacies of the practices of political decisions. Though mankind has learned to master its fate in many other domains, politics is as treacherous a terrain as ever.

*Translation of "Instrumentelles Wissen in der Politik", in H. Krauch (ed.), "Wissenschaft und Politik", Studiengruppe für Systemforschung, Heidelberg, 1966; pp. 183-209.

It could be a characteristic property of political decision to have to rely on a vague irrational basis by necessity. It is conceivable that politics is a necessarily hazardous game with poor chances where, over and above, cheating belongs to the rules. If this were true one would have to put up with the fact that chance, stupidity, prejudice and violence will rule over and over again, interrupted only occasionally by events of far-sightedness and wisdom. Therefore, if science cannot help, does this mean - by principle the impossibility of improving political institutions and practices in a systematic and rational manner?

Fortunately, we do not have to answer this question affirmatively:

-Until now, no upper boundary for "the rationalizability" of human behavior in human affairs has been identified.

-The uselessness of the scientist as a political decision-aide could be just the consequence of misunderstandings and mis-organization (for example, the politician could have wrong ideas of what the scientist can do; or the scientist could have unrealistic ideas about the nature of political decision; or there could be a confusion of responsibilities, etc.).

-It is conceivable that only the contemporary types of scientists and of politicians as they have developed within the pattern of the division of labor in our culture are not very apt to improve the political decision systems. Science and politics are also subjected to "automatic" and to consciously planned change. It would be short-sighted to take their contemporary forms as invariant or even as logical necessities.

For these reasons, it cannot be taken as proven that it is impossible to design better political decision systems and to implement them. And, therefore, it ought to be tried.

In the following I want to investigate some aspects and difficulties of such a program. To begin with, we must clarify what we wish to understand by an "improvement" of a decision system. I propose a pragmatic, quasi-technologic, and preliminary definition:

- A decision system is the better:
- the better its decisions produce the desired effects,
- the less frequently undesired side- and after-effects occur,
- the larger the number of potential decisions which would lead to desired consequences.

This concept is very weak and very neutral because it does not provide any explicit standards for the evaluation of a decision system - at most it provides a rule for determining such standards in any concrete case (for example, the system could be designed in such a way that it, together with its decisions, produces a prediction about the consequences to be expected; with this prediction could be compared the course of events as observed later on. If connected with the operating cost of the system, this definition determines "efficiency": even a police state could, in the eyes of its rulers, be a "good" system in this sense.) The quality of the system is measured with reference to the intentions and the preferences of the actor who is running it. Nonetheless this weak concept is not unjustified. This is best demonstrated by the damage caused by ignorance and short-sightedness over the course of history, by "bad" decision system in the sense described - decisions made without ill will or intent, not desired by anyone.

As any kind of responsible action, political action relies on estimating and evaluating its potential consequences: a political decision problem consists in determining and weighting the practicality of the various relevant possibilities of action in view of their consequences, and to base one's decision on the results.

Now, any solution to such a problem requires knowledge: a picture of the present situation (the "is-state"), expectations with regard to future developments, knowledge about causal connections which link expected consequences with potential actions, and, above all, knowledge about "ought-to-states".

It seems worthwhile to enquire about the basis of this knowledge in the contemporary practice of political decision making.

In a study of a similar question, Kenneth Boulding¹ develops a classification of knowledge according to its degree of systematics. He distinguishes five levels:

1. The category of empirical knowledge. This is the knowledge of relationships learned from experience or from others without having asked questions about the validity of this knowledge or being able to provide answers. These are the automatisms and rules of thumb with the help of which we master most of our daily problems. Here belongs the knowledge of a car driver but also that of a professor in the faculty meeting.
2. Mechanical knowledge. It enables us to build a house according to plan, or a blueprint, or to interpret and to apply an ordinance. It is the capability of understanding symbols as instructions and to carry these out.
3. Technical knowledge. It enables the engineer to design a machine, i.e., to produce a blueprint. In order to do this one does not necessarily need theoretical knowledge: one can design a pendulum clock without knowing anything about the laws of the pendulum.
4. On the level of theoretical knowledge is explained how a set of truths or rules of actions follow from a general principle. Theories explain relationships "behind" the phenomena.

5. Finally, Boulding mentions the level of theories of theory construction, the knowledge about systems of theoretical systems. It is the knowledge of how to bring knowledge to a 'higher' level, of how higher knowledge can be planned and be critically controlled. Boulding considers this level as under-developed.

For different areas of human activities the bases of knowledge are located on different levels of this scale. Thus, the scientific innovation system has in some cases reached the fourth level, and some areas occasionally even the fifth. The technological system is reaching up to the third, and occasionally its principles are anchored on the fourth level. Administration and management dispose of knowledge of the third level: working out an ordinance and certain planning tasks in economic enterprises frequently have engineering knowledge as a foundation.

Political decision systems, however, rely almost always on knowledge of the first level. "By and large, ships of state are steered like automobiles" (Boulding) - though with higher risk. One could hardly say that there is much engineering knowledge (not to mention theoretical knowledge) of social and political systems from which directives for action and for their steering could be derived.

This disparity of knowledge is generally lamented. Some people say that the scientific-technological innovation system has outraced the other facets of culture and has started to dictate the course of events disproportionately. Others argue that the social scientists have squandered their opportunities in useless quarrels about academic doctrines instead of systematically pursuing the stony path to better theories of social phenomena. According to this viewpoint, today the social scientists do not need a Newton or a Darwin but a Galileo or a Pasteur.²

With good evidence it can be postulated that a phenomenon may be mastered the better it is understood,³ for more thorough understanding is likely to increase the ability to predict, which in turn very likely enables one to better aim one's decisions. Therefore, one would argue, the higher the knowledge basis is located on Boulding's scale, the better it can function.

The Boulding scale could, however, be irrelevant, or it could be just incomplete: the wisdom of government could require a substrate which is available only to the blessed personality, some kind of "sixth sensorium" beyond the reach of rational penetration. There is, however, little evidence in favor of this conjecture. The lords of the lonely decision, the adorers of irrationality, have not done much good. Anti-rationalism can be considered as run down, and there is a universal demand for better political systems which are equipped with more reliable fuses against human weaknesses and accidents.

This insight is not at all new, and in this century there are at least two great prototypical attempts to establish more rational political systems.

One is the planning apparatus of the Soviet Union since the middle of the 20's, constructed on the basis of a very general theory of society and history, ranging at least on the fourth level of Boulding's scale. The long development, however, from the New Economic Policy to the 5-Year Plans, the history of the General Plan and the controversies about the priorities of different segments of the economy was a sequence of painful failures, of cruel measures, of catastrophes, and of declared and explicit plan-revisions. It proved impossible to imply concrete decisions from the ideological basis by mere exegesis. The planning model contained three

political decision parameters for which "true" values could not be algorithmically derived from the theory. Instead, they became the objects of political controversy even among those who accepted the basic model. This basic model was not adequate for the complicatedness of the object system to be controlled; it did not describe all those factors which proved to become relevant, and many predicted causal relationships proved to be simply false.

Consequently, not every decision model which has the formal structure of the fourth level of the Boulding scale is automatically good for this reason.

Nonetheless this experiment resulted in a success: in spite of all setbacks and terrible concomitant effects, in spite of the 2nd World War and the recent relapse into the cult of the genius, the Soviet Union is today a leading industrial power, a master example of a successful socialist planned economy. And the planning techniques have been improved and refined since then, for example, by so-called "cybernetic" precautions.

The second great experiment is taking place in the United States. Here, politics, science, and technology are interwoven in manifold ways, although they are not at all integrated or even reconciled with each other. They are together under the same yoke in order to produce politically and militarily relevant innovations on a large scale, but also in order to solve acute problems of action. This symbiosis is not the product of a planned and clear design based on a theory. It was, rather, developed, or has "grown", within the last two decades because it has proven somewhat successful, and because there was no alternative way in sight. As an ideological basis one could at most identify the almost preconscious conviction that science and technology are the pacemakers and guarantors of progress, and that they are therefore useful.

In this symbiosis the scientists and the engineers find themselves in different roles:

- as researchers on their own field who perhaps themselves have proposed and chosen their problem. Nonetheless all this happened to fit very well into the framework of a big government-sponsored project, e.g., the space program.

- as an engineer who designs and installs systems for given purposes: a rocket defense system, a Mars probe, a data retrieval system for the central Internal Revenue Service, or a reform for law enforcement and penitentiaries, or a method for guerilla warfare.

- as an expert advisor who helps the politician form his opinion, but who also proposes political actions or who analyzes and interprets the course of political events ("Kremlin astrologist"), or who works out strategies.

- as a manager and administrator of research and development, he plans and programs projects, he allocates brain power and money.

None of these roles is compatible with the pure ideal of a scholar in the 19th century. In spite of this, many of those involved in one of these activities are nursing just this self-image. In all cases - at least according to the theory - the scientist or engineer plays the role of a dependent aide for action while the possessor of the political mandate has the prerogative of setting the goals, the power of decision, and the responsibility. For obvious reasons, however, a clear separation between the preparation of a decision and making a decision is impossible. For everybody who prepares the decision also delineates the decision space, which means stating the set of alternative actions - and he "weights" the pros and cons of the various alternatives. What is left over as freedom

of decision? Or: how can the non-expert politician control his expert? He can only trust him or not.

All these discrepancies are causes of uneasiness and of concern about democratic control of the political decision system. The scope of this symbiosis is gigantic. A substantial percentage of the American innovation capacity is allocated to it. Vast regions of the country are living on research and development for the federal government. There are numerous institutions which think for the government. A strike of these intellectuals could paralyze the U.S.A.

This attempt to couple a political system to the innovation system is not concluded yet, and in no case should one consider it a failure. In spite of all internal contradictions, and of all mistakes and relapses into the atavisms of imperialistic power policy, and of all social injustices the great catastrophe has not taken place as yet. It may be a vain and idle speculation, but it is a horrifying thought to imagine what would have happened if the political style of earlier times would have further prevailed. In general, the cooperation between politician and scientist seems to have had mediating and balancing effects.

What is the consequence of these two "experiments"? In any case they and their imitations have imprinted the course of events irreversibly. The scientific-technological innovation system has become a dominating political factor; in east and west scientists are joined in political practice, and no one will set them free again. They have been called because political problems have become too complicated for "common sense"; but possibly these problems have become even more complicated for this very fact. There is no return to the idyl of the decision-making genius; the naivety of governing has irreversibly gone. What remains is the

naivety of those scientists who believe that the world will be already improved by their service to knowledge alone, the opportunism of those scientists who do the scientific work of their clients without questioning its utilization; and there remains the general uncertainty about the role of science in modern society.

Questions: If political decision systems can be improved, how can they be improved; how can the basis of knowledge for political decisions be raised; who is capable of attacking this task remains unresolved.

Certainly, the traditional sciences are not designed for the generation of such knowledge because every science deals with a particular aspect, with a 'partial reality' which can be described by a standardized and rather stable set of descriptive parameters. The reliability of this knowledge is paid for by narrowing the scope of its validity.

Just the contrary is characteristic for political reality. Problems are continuously changing their frame of reference; no situation is sufficiently described by the same set of variables as any other situation (at most there are weak and treacherous analogies); in each political situation there are unique and typical factors. Consequently, within a particular science there cannot exist any models which describe all relevant factors of a political decision problem. Economics, sociology and political science can contribute only partial truths which the politician may use as components of the mosaic of his decision model, of his image of the situation. But even the sum total of such scientifically based constituents is, in general, not sufficient to construct a complete situational model; moreover, in any concrete case it is not at all clear whether a certain scientific piece of knowledge is applicable or not, whether the conditions for its application are given or not. Depending on one's interpretation of the situation, different theories will become possible and relevant.

All these traits put the politician rather into the neighborhood of the engineer than into that of the scientist. Indeed, the particularities of the scientist engaged in political affairs are nothing unusual in the experience of any engineer. It is not unrealistic to emphasize the design character of political action: the objects are "social systems", that is, institutions, rules, and relations serving their "users" as means for mastering their affairs. And in the political process there is quite a number of analogies to typical engineering tasks, like "maintenance", "repair", "modification", "design", "programming", and so on.

Most of the systems the politician has to deal with have 'grown', and have not been designed on a drafting board. Therefore, the politician is mainly concerned with their preservation, further development and continual improvement. Occasionally, however, there are new designs; Solon, Jefferson and Lenin can be considered "polit-engineers" who have conceived of and implemented fundamentally new designs.

Comparing the tasks of the politician with those of the engineer, Popper analyzes the concept of "social engineering". He distinguishes between "piecemeal engineering" and "Utopian engineering."⁴ The former is the policy of small steps, each of which is supposed to produce a controllable change. Nonetheless, these steps can be oriented towards long range objectives. In contrast, the Utopian social engineer intends to redesign the "whole" from its foundation, drawing his principles from some mechanism which he has understood as governing the course of history and which tells him which state of the world is the absolutely right one. He feels obliged to support the fulfillment of this fate by assisting the course of inevitable necessity. Popper demonstrates that this endeavor is doomed to failure at once for purely logical reasons.

On the other side - according to Popper - more modest piecemeal engineering offers a rich field for developing better and more rational modes of procedure. Here, it is the task to develop social technologies which avoid the pitfalls of scientism, i.e., the application of unadmissible scientific analogies to social phenomena. As an example for applying a social technology, one finds frequently mentioned the success of Keynes' theory for the practice of economic policy in the 30's, which, indeed, has the character of knowledge of the third level, with some foundation on the fourth level. Very likely, this success rests on the fact that from the very beginning this theory has been designed rather for the practice of economic policy than for the satisfaction of scientific curiosity - in a time when economics could still be considered a quite separable domain of reality. In the meantime the applicability of this theory will be much reduced since there have been fundamental changes in the mechanics of the economic process as well as in its interactions with other social phenomena.

Here, it may remain an open question as to what extent any reasonable decision can be incremental, that is, merely modifying.⁵ Instead, the question to be raised is, on what kind of knowledge is the piecemeal engineer to found his actions.

To this end it is advisable to introduce a further classification of knowledge (though it may not be a very distinctive one). It is the distinction between factual knowledge and instrumental knowledge. Both kinds exist on all levels of the Boulding scale, and both types can be very specific or very general. Factual knowledge relates to what "is the case" ("Yesterday the Dow Jones index fell 3.4 points", "Force equals mass multiplied by acceleration"). Factual knowledge can be specific for a situation, or it can express a general rule.

Instrumental knowledge, on the other hand, relates facts and modes of action with regard to the attainment of goals. It consists of recipes, heuristics, rules, techniques, and methods which enable us to manipulate our situation. For example, the knowledge of how to gather information, how to construct a situational model, how to deal with risk and uncertainty - but also the rules of diplomacy belong to instrumental knowledge, as well as the technique of designing election campaigns. Of course, this kind of knowledge is always based upon factual knowledge about causal relations, expanded by the knowledge of action possibilities, and of desired or at least acceptable situations.

In the simplest case instrumental knowledge has the form: "Whenever this and that is the case, and this and that is to be accomplished, then this or that action is appropriate."⁶ Instrumental knowledge is related to classes of situations; this very fact, however, has been used above as an objection against the practical usefulness of the knowledge produced by a single scientific discipline. One significant distinction has, however, to be made: the reference class of instrumental knowledge is characterized by the traits of the decision situation and not by those of the object of decision. Decision models are characterized by the kind and the extent of the actor's information, by his attitudes towards uncertainty and risk, and by the "general mechanics" of the object system (as conflict type, degree of determinateness, structure of behavioral pattern, etc.) - and not by the phenomenological, "natural" classification of the object system. For this reason such decision models become applicable for very different object systems.

Above, it has been argued that the desirable and not impossible improvement of political decision systems is equivalent to the production of "higher" instrumental knowledge. Because the difficulty of decision

is due to the fact that significant parameters of a specific situation have to be related to goals and "relevant" action alternatives, there is a need for procedures which permit the consideration of a larger number of better controlled variables and conditions and their manipulation with better understood principles.

And in fact this need for higher instrumental knowledge, as felt by military people, politicians and managers, gave rise to developing those hybrid "science-technologies" which can be summarized under the name of decision technology. Operations research, systems research, planning and decision theory belong in this realm. Their objective is the development of action models in which situational parameters, objective variables and alternative actions are related to each other in order to arrive - with the help of appropriate procedures - at acceptable or even optimal object situations.

There is no doubt about the usefulness of these approaches. Particularly on the level of lower and intermediary management, and from the rationalization of repetitive decisions according to a fixed scheme they have proved their immediate practical usefulness in a multitude of cases.⁷ Nonetheless, with some justification it could be criticized that hitherto in really important and unique decisions these models have hardly offered any help. Thus, until now the n-person game character of social interactions, the complexity of objectives of an institution, the problems of different ranges of anticipation have hardly been understood or considered. The models which are available today are psychologically meager because they cannot represent the picturesque facets of interesting decision situations.

This objection, however, is as little valid as an objection against Newton would have been because he couldn't give a general solution to the three body problem.

The present direct results of decision technology in view of the practice of political decisions may be modest; but they have been most useful and helpful for clarifying the structure of decision processes. Thus, e.g., the significance of the instrumental character of required knowledge bases has become clear.

Let us assume that these considerations which here could only be outlined are valid, and let us try to identify some of the main difficulties and shortcomings of existing political action systems which can be explained by the lack of appropriate instrumental knowledge. Removing these shortcomings is likely to contribute to the improvement of these systems in the technical sense: to design better institutions, to find better procedures and to delineate clearer goals. For most of these questions, there is no solution in sight, though several of them have been treated systematically from different standpoints.

To begin with problem identification: how does a certain state of affairs become the object of political action? In no case do political problems present themselves as necessary and self-evident. At any time every political decision system has an "agenda", the length of which is very limited because of the limited capacity of dealing with problems. All subject matter of political concern is placed on such an agenda.

Problems are created, selected, socialized, traded, kept alive, changed and occasionally they are solved. During these processes it cannot be avoided that frequently the wrong problems happen to get on the agenda - as realized afterwards. To use the analogy of Professor Bahrdt:

the scientist may chase a hare of his own choice and - in case he doesn't catch him - he may look for another one; but to the politician it can happen that he is chasing a hare without realizing he has a lion on his back.

These processes of problem identification are hardly understood and frequently they are beyond democratic control. There are no provisions for early recognition and diagnosis of problems and there are no procedures as yet to anticipate better the consequences which result from disregarding a certain problem. How little care is taken with the "law of action", ("gesetz des handein ") i.e., the freedom of setting problems is best demonstrated by the present situation in Germany where questions of reintroducing capital punishment or state-of-emergency legislation exhaust the political capacity of the country, at the same time when the important issues of reconciliation with the Eastern neighbors or the emergency state of education are not placed on the agenda at all, or at most with inferior ranking.

Closely related is the problem of appropriate discourse about political events. Around any political problem a mode of speech is developed, a way to conceptually structure it and to anchor it into a context. These discourse systems which are specific for a problem serve as the vehicles of discussion and deliberation; they describe the reference basis in terms of which different standpoints and positions are delineated. I am far from preaching that all problems can be solved by mere semantic manipulations alone: conceptual structuring of the problem, however, mirrors the possibilities of thinking, and, therefore, sets the possibilities for action.

"Conceptual cages" (Ch. S. Peirce) restrain our capacity of distinction and therefore our understanding of the situation. Thus, the East-West conflict is an example of too coarse a discourse which is understood as dichotomic, as dominant and finally as immutable. The formula "Communism = promotion of world revolution = incarnation of evil", though vastly simplifying, may suggest a comfortable dichotomic world picture where good and evil can be clearly distinguished from each other; not utilizing, however, the distinction between "Communism₁" and "Communism₂", means waiving discriminative possibilities which certainly would be not unfavorable for softening the hardened dualism. This happens although certainly since Hegel it has been known that any frozen alternative sooner or later will be overplayed "dialectically", and that those who are the last to realize such a development will be the losers. It may be asked if such dialectical conversions cannot be overplayed themselves by helping and accelerating these processes.

There are many examples of how scientifically developed conceptual distinctions have found their acceptance in the common vocabulary of political discourse. Thus, "fail-safe", "mini-max strategy", "overkill" have become ubiquitous concepts; and the traditionally binary alternative "war vs. peace" has been replaced by a fine-graded scale of concepts which makes it possible to describe the relations between two states in steps of many nuances - an accomplishment of institutions like the Rand Corporation. These concepts have not "grown" but they have been consciously constructed in order to widen our conceptual distinction and consequently the scope of actions.⁸

A further difficulty lies in the reconstruction of appropriate situational models which contain all significant factors and their mutual relationships, and which display all relevant action alternatives with their likely consequences. The capacity of our brain to realize simultaneously numerous connected rational relations is very limited. The strength of formalized models lies in their aptness for displaying more complex and more comprehensive relationships than the "unarmed mind" ever could. Such models do not rely on quantifying everything; they may contain logical or topological variables. There is nothing mystical about such constructs, nor do they have to be based upon inadmissible simplifications: they are nothing but replicas of our understanding of a situation, and they are meant to help to anticipate alternative futures. In spite of thorough efforts, however, the capacity of manipulating such models is still very limited, in particular with regard to search procedures of well-defined but complicated decision spaces.

Of particular importance are simulation models, which permit one to "play through" the consequences of alternative actions under different assumptions. Here one does not search for an optimal decision according to a previously established measure of evaluation. Instead, several different alternatives are tried out in order to see whether the resulting situation would actually correspond to our expectations. The prototype of these methods are the sandbox games of Army general staffs. Their advantage is obvious: if under a broad spectrum of different assumptions a certain conflict does not look very promising, it is not necessary at all to carry it out in "hardware". The art of lively, illustrative, flexible and complex mapping of a course of events into a harmless laboratory situation is in rapid development, and their usefulness for

matters of foreign policy and military purposes has been probed under a variety of conditions.

A condition for constructing reliable situational models is the availability of sufficient and reliable information. The difficulty is to know which data one would like to have, how to obtain it, how to judge its reliability, and how to interpret it. The best statistical office and the most efficient secret service cannot answer these questions once and forever because data collection requires a guiding hypothesis - a model of the situation which gives direction to search; in particular, since political decision problems - as discussed above - are characterized by the uniqueness of the set of categories relevant in every practical case. On the other side, only motivating information can lead to the establishment of a situational hypothesis.

This circularity cannot be avoided by simply collecting "all" information for any conceivable demand: for theoretical reasons, already, the perfect universal information system cannot exist, and any attempt to establish it necessarily leads to huge unstructured masses of data without practical value. In addition, the government that wants to know "everything" is likely to violate the democratic principle of guaranteeing maximal privacy.

In this connection we encounter a whole series of related difficulties. How can a politician check the credibility of expert advisors? How should he assess the manifold of possible interpretations of "factual" data? How can we guarantee that in the political problem the various opposing parties have equal access to the relevant data? How can complicated matters be made the subject of public discourse?

From these difficulties result the question of clarity and plausibility of political discourse for those who are affected by its consequences. In

a democratic system, how can we guarantee that the political decision system gives a proper account of its actions, in such a way that its electorate can critically check the arguments leading to these decisions? "Socializing insight" is not an idle problem that would become acute only in the connection with elections. This is demonstrated by the great number of examples of misled enthusiasm and loyal plebescites where a misguided population has helped to induce its own catastrophe. But how can one avoid gross oversimplifications and, in spite of this, preserve the clarity and plausibility of the situational model? Is there any way to clearly delineate the different standpoints in a political controversy and - above all - to expose the common basis of the opponents which is always present? To what extent is it meaningful and possible to identify the implicit basic beliefs of the various parties and to subject them to a political discourse? Is it possible to develop better forms of debate which cultivate the processes of carrying out conflicts and which help to find a way towards conflict resolution through a higher rationality?

Many political goals are not formulated very clearly or are too coarse for the necessary distinctions of the "ought-to states" of the world. Particularly such goals and variables which are derived from ideological constructs, frequently prove insufficient because they are unspecific and do not give any hints as to how they could be reached. Of course, everybody wants "wealth for everybody"; but this says nothing about the nature of this wealth or welfare or about the ways and means which are considered admissible in order to reach it.

Obviously, political goals and variables are not invariants. They are subjected to continuous (though possibly slow change, but also to conscious manipulation. These conscious manipulations do not have to be

left to the practices of "hidden persuaders". The dynamics of goals and variables is not necessarily the product of subliminal Pavlovian conditioning. It could and should be the outcome of articulate controversy and of insight or conviction and not of persuasion. Therefore, controversy has to be kept alive permanently, in which one tries to permanently clarify the appropriateness of goals, principles and variables by questioning them systematically. How can one generate conflict about questions like: Does the bourgeois' idyll of possessing a home, a motor car, some television and a couple of common stocks of his own provide an appropriate archetype for social policy? And, if one agrees, what kind of a culture would we produce by this? Are there any alternatives to this idyll? How do we want to live? Our society is ill equipped for the liberty of wanting what it wants.

False and insufficient situational models frequently lead to side effects which have not been thought of before. These can be explained either by the effects of forgotten factors or by the cumulative effects of many individual modes of behavior each by itself which may be acceptable, but the sum of which produces undesired effects. For example, the city of Los Angeles is a gigantic conglomeration of single dwellings, each of them generous and comfortable by itself. The totality, however, results in an amorphic suburban landscape, the circulation system of which collapses twice a day, and which is in danger of being poisoned by its own metabolism. Nobody has wanted this. There are legions of examples of this kind: Hegel's "ruse of the idea" which, from some unexpected corner, suddenly puts everything into an entirely different light, frequently proves to be nothing but the consequence of neglected effects.

Similarly, the problem of long-range effects of political decisions frequently lies beyond the horizon of those events which can be extrapolated from past events. Very often, this leads to long-range planning against one's own will: although some cautiousness would have led to considering certain consequences, action is taken only in view of immediate utility. Pre-election "gifts", reckless exploitation of natural resources, blindness towards growing social tensions are ubiquitous phenomena. A good example is the education policy of the German Federal Republic where catastrophic consequences can be easily anticipated: today's planning determines what kind of people will live "beyond the horizon", that is, in ten to fifteen years.

This list of open problems could be extended. Here it is only intended, however, to demonstrate some shortcomings of existing political decision systems, the mitigation of which would lead to improvements in the "technological" sense as defined above, according to which a decision system performs the better the less frequently it fails according to its own standards. Each of these examples is meant to indicate an area in which it seems worthwhile to develop "higher" instrumental knowledge.

It could be objected that this is an Utopian attempt. Or, it could be argued that this list does not present anything but different facets of the condition humaine of diverse phenotypes of human insufficiency and scantiness. Consequently, according to this standpoint, it would be unrealistic to formulate these problems on that general level, nor to speak about attempts for their solutions. Of course, the world would be better if its inhabitants would be better. Apart from this, how would it help to develop ideal typical designs for solving problems of the kind mentioned? It would be hopeless to implement their realization because the present

practices and institutions are solidly established, and anyone who wants to change these institutions could do this only within them and in terms of them. Any attempt of this kind, consequently, is very likely to provoke opposition which will exactly follow the patterns as described above. Therefore, the successful implementation of such ideas is extremely unlikely.

Against this defeatist's argument one can only argue from an "activistic" point of view: up to the proof of impossibility, it ought to be tried to improve the condition humaine. The history of human institutions demonstrates that this is not necessarily a futile enterprise. Innovations like the invention of parliamentary democracy, of the foundation of the United Nations, of Social Security legislation, have, through planning, improved political and social systems. Without any doubt "ideal typical solutions" to the questions above would not be solutions: each correction has to be conceived of in view of the existing conditions. Their success will show only after their implementation.

If this train of thought is accepted then the important question arises as to who might be capable of dealing with such tasks of "social technology" and who should carry them out.

The politician? It is a basic assumption of democracy that the capability for governing is one of the best distributed things in the world (just as Descartes has claimed it for common sense!). In principle every citizen can be called upon to govern, and everybody is assumed to be capable of governing and he is expected to be able to judge who is to do the governing. There is, however, nothing like a specialized education for the political trade.⁹ This problem is not all trivial. It could very well be (and there are many symptoms for this) that a political decision system

operating on a high level of knowledge requires politicians with such qualifications which even the slyest fox has not been endowed with by nature. The aristocratic assumption of an inheritable capability for government is as absurd as Plato's idea of a philosopher-king, or the naive supposition that an elected representative can supplement his common sense by expert advice without giving away a portion of his responsibility and of his power of control.

On the other hand, could the scientist assume the role of political engineer? Perhaps not, if he wants to adhere to the principles of his sub-culture. Apart from the fact that he has no mandate (of course one could elect a parliament of professors - an idea against which a benign fate may guard us!): he would give up the basis on which his qualification rests (and to which he owes his considerable prestige in our society).

Because all these problems are political problems, any solution depends on the political engagement of those who try to solve them. Nonetheless they pose tasks of systematically generating knowledge. And hitherto the most efficient institution for producing systematic knowledge has been the institution of science. Science-like approaches (as they have been accepted by the engineer) seem to be the only possibility for generating that desirable instrumental knowledge of a higher level. In talking about "science" I do not mean that social system of professors, institutes, people, publications, conferences, and rules of professional conduct. I mean that critical and rational mode of reasoning to which the present institution of science owes its existence, that purposeful and cautious tactic of generating more reliable knowledge.

Every scientist getting involved in such an enterprise must realize that he is either giving up his membership in the community of scholars,

or that this community has to change its basic character. "A science that goes that far gives up its objectivity as well as its immunity...science of tomorrow will not be objective...the dichotomy objective - subjective, prejudiced - not prejudiced will lose its present meaning...the science of the future will not be politically immune." (Churchman)¹⁰

There are many examples of "apostating" scientists, as those ten thousands who in the United States are involved in politically relevant innovation. I am not sure that these political engineers are the same people who are producing today's science.

Whoever is going to generate that knowledge has to be aware that truth - as in the institution of science - is the subject of a social contact: that the discussion about values and goals cannot be objective, once and forever be anchored to "last" principles; that any item of knowledge can become instrumental; that escaping into the fenced and shielded subcultures of esoteric sciences and arts does not relieve one from social responsibility. In any case, he has to make a choice: either he can offer himself to his respective ruler as a technician of governing sine ira ac studio; or - and it seems to me the more appropriate standpoint - he can become involved in the controversies about his own ideas of "ought to states" and the ways to reach them. This kind of scientification of politics would necessarily imply the politization of science - a state of affairs which is not provided for in today's self-image of the established scientist.

Let us return to the initially given definition for the improvement of a decision system. It is relativistic insofar as it does not normatively state what has to be considered a good decision system. This was intended because the answer ought to remain an open question, a subject of permanent

controversy which is nonetheless not to be decided by arbitrary speculation. There are established value systems and goals as well as institutions which are trying to realize them. Everybody who wants to change them has to deal with them.

I have stressed the instrumental character of politically useful knowledge, of know how, in order to emphasize that such knowledge can be utilized in the service of very many different intentions. A hammer can be used to drive in a nail or to hit somebody's head; and atomic energy can be transformed into household energy or into nuclear explosions. The only possibility of improving the condition humaine lies in the generation of instrumental knowledge of a high level. The price for this is the dangerousness of this kind of knowledge. We have to learn to live with such tools and to carry the burden of their development.

NOTES:

1. Kenneth E. Boulding, "Political Implications of General Systems Research", General Systems, VI, 1961, pp. 1-7.
2. Karl R. Popper, The Poverty of Historicism, New York, Evenston, 1961, p. 1, 60.
3. Nonetheless some reserve seems to be adequate: knowing the laws of the gyroscope is of little help to the bicycle rider; it can even be hindering.
4. Popper, op.cit., p. 58 sq.
5. A strategy of "disjointed incrementalism", i.e., a decision theory based on only marginally changing systems has been developed by D. Braybrooke and Ch. E. Lindbloom, A Strategy of Decision, The Free Press, Glencoe, Ill., 1963.
6. A classical example of a collection of instrumental knowledge for the politician is the writing of Macchiavelli. The fact that generally so little instrumental knowledge is documented explicitly is partially due to the fact that heuristic rules remain pre-conscious, and partially to the fact that formulating and publishing such rules might produce tactical disadvantages.
7. Some phenomena should be mentioned which infringe upon the usefulness of such models. Since Operations Research has become a regular field of study in the U.S.A., many graduates are encountering considerable hindrances in their jobs if the implementation of their proposed changes is at stake. On one side, they have not been taught how to "sell" a solution; on the other side, they seem to have the understandable but detrimental inclination to rather adapt reality to their models than, conversely, to custom tailor models appropriate to the situation. It is easier to reduce a management problem to a learned, well-established standard model of inventory control than to investigate and to model the relationships between order flow, salesman training, and production management.
8. cf. Benjamin Whorf, Language, Thought and Reality, M.I.T. Press, Cambridge, Massachusetts.
9. A discussion of the usefulness of Political Science for the practice of the political craft, cf. O. Morgenstern, The Question of National Defense, Random House, Inc., New York, 1959.
10. C. W. Churchman, Prediction and Optimal Decision, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1961, p. 209 sq.