Purposive Systems

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Cybernetics of Cybernetics

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Background of Cybernetics

I suppose that one of the reasons that I am contributing to this endeavor is that I myself was at the small Josiah Macy Foundation Conference on cerebral inhibition—in the middle of World War II—at which we began planning for the Macy Conferences which became the Conferences on Cybernetics.[1] That first small conference was so exciting that I did not notice that I had broken one of my teeth until the conference was over.

I was a member of that first group as an anthropologist. The competence I had—and have—comes from the intensive analysis of very small, relatively isolated, and intimately known communities which serve as living models from which one can sometimes develop larger, more formal models. Besides the anthropologists' experience with the small societies which are their laboratories, anthropologists have a second task: to interest themselves in what is happening in our own culture, to stand outside it and look at it as a whole.

As an anthropologist, I have been interested in the effects that the theories of cybernetics have within our society. I am not referring to computers or to the electronic revolution as a whole, or to the "implosion" and the end of dependence on script for knowledge, or to the way that dress has succeeded the mimeographing machine as a form of communication among the dis-

senting young. I specifically want to consider the significance of the set of cross-disciplinary ideas which we first called "feedback" and then called "teleological mechanisms,"[2] and then called "cybernetics"—a form of cross-disciplinary thought which made it possible for members of many disciplines to communicate with each other easily in a language which all could understand. This was an important motive for those of us who worked in those first conferences at the end of the 1940's. We were impressed by the potential usefulness of a language sufficiently sophisticated to be used to solve complex human problems, and sufficiently abstract to make it possible to cross disciplinary boundaries. We thought we would go on to real interdisciplinary research, using this language as a medium. Instead, the whole thing fragmented. Norbert Wiener wrote his book *Cybernetics*.[3] It fascinated intellectuals and it looked for a while as if the ideas that he expressed would become a way of thought. But they didn't.

I would now like to consider cybernetics as a way of looking at things and as a language for expressing what one sees. We might look at the history of thinking about the relations between the United States and the Soviet Union. There was a time about 20 years ago when the two countries were so preoccupied with each other that they acted as if they were the only two countries with any political significance on this planet. Specialists in each nation expended enormous energy trying to penetrate the secrets of the other system. The Soviets made a great many hypotheses about the way our system worked which were based on their own highly centralized form and which led to false conclusions, such as the assumption that both American political parties were run from "Wall Street"—a sort of capitalist counterpart of the Kremlin. This belief of theirs and our adverse views of the Kremlin have now coalesced in the present mythology of "the establishment" or "the industrial military complex." Twenty years ago, even ten years ago, it was possible to think of the United States system and the Soviet system as two relatively self-contained and independent systems, coupled together by mutual suspicion, passionate attention, and intermittently successful espionage. It was even possible to propose—as I did a few years ago—that, if we wished for a more reliable form of knowledge and understanding between the two systems than espionage could provide, we should use cybernetics as a cross-cultural vocabulary for expressing the relevant differences between the two systems. I suggested this at a time when it seemed that cybernetics was ideologically free and was developing very rapidly in the Soviet Union. Many more young people there were learning about it than there were in this country, and it seemed that here was a possibility that two rival nations, with very different ideological premises, could develop a language in which their systems could be described in a way that was ideologically neutral. As there were many unadmitted occasions when the United States and the Soviet policy-makers did want to agree, such a language would have been useful.

New Developments

Today there are new developments which make me less hopeful that such a venture could succeed. We have now developed an interest—and interest in Soviet affairs always contains a certain element of fear—in the possibility that the Soviet system may become totally cyberneticized, in the technical sense, as a way of controlling everything within its borders and possibly outside, with thousands of giant computers linked together in a system of prodigious and unheard-of efficiency. If this is so, or if we continue to discuss the computerization of the Soviet economy in terms of emulation and dread, cybernetics as a way of thought will cease to be ideologically free. There has also, however, been a marked decrease in the extent to which the United States and the Soviet Union are exclusively preoccupied with each other.

Meanwhile, a quite different area of cross-disciplinary cooperation has been developing: "ekistics,"[4] the applied science of human settlement, a larger and more encompassing discipline than that implied in the American jargon term "urbanology." Within the international group developing ekistics there is an exceedingly practical innovator who has directed one of the

most successful urban renewal processes in the modern world—Edmund Bacon, who has come on cybernetics by way of a down-to-earth political interaction system among the citizenry, the elected officials, and the planners in Philadelphia.[5] He is looking for a cross-national language for the interdisciplinary groups engaged in planning in different nations, and he has begun to plead, persistently and stubbornly, for teaching general systems theory in every university in the world, so that we may communicate where now English, French, Greek, Russian, and Japanese all fail. Planners would be furnished at the same time with a method for communication and tools for thinking about complex systems.

As the world scene broadens, there is a continuing possibility of using cybernetics as a form of communication in a world of increasing scientific specializations. The possibilities are fascinating if we can only get a large enough number of well-defined elements in large enough systems. It is argued, e.g., that Lake Erie is not only dead because there was no agency equipped to think ecologically about what was happening to its waters, but that, in fact, Lake Erie and its environs is too small a system to have been dealt with if, in fact, there had been any group or agency charged with preventing the Lake Erie disaster. It is further argued that if, instead, the whole Great Lakes region is considered together, then it might be possible to make the kind of predictions which could be tested in advance. In such a plan it should be possible to introduce correctives for too much linear and too little lateral planning, and linear planning is the besetting difficulty of most of the planning in the world today. It is argued that with large, inclusive, and well-analyzed systems we might be able to do a better job. There we find, on the one hand, tremendous hope about our capabilities to deal with complex systems if we can only identify the right system of the right size with the right variables. Although these are a great many ifs, they are not serious ifs. For we are free now from the superstition of some sociologists in the 1950's that we would never be able to deal with more than seven variables at once. And we have also gotten out from under the tyranny of the law of parsimony so that we can't be bullied quite so easily into thinking that the simplest solution to a problem is the best.

But, at the same time, I think we ought to look very seriously at the current state of American society within which we hope to be able to develop these very sophisticated ways of handling systems that are, indeed, in dire need of attention. Problems of metropolitan areas, the growth of such areas, and the choice of areas appropriate for planning certainly represent one such field. The interrelations between different levels of government, the efficient redistribution of income through procedures like the negative income tax, and the linkages necessary among parts of large industrial complexes that are widely separated in space are cases where a systems analysis is necessary. But the new kind of analysis of these complex systems on which predictions can be based must be undertaken in a world which is made up of individuals who hold a great variety of positions of power within the various bureaucracies, in government, in industry, in the armed services. And these powerful people—who must order, provide for, and utilize such system analysis—are living in a world in which there are a large number of breakdowns in thinking. These breakdowns are of an order that I think should concern those of us who hope to promote the ability to think in cybernetic terms.

There have been, for instance, airports and airbases where the auxiliary power, set up to serve when the main power failed, was coupled to the very same main power. This kind of failure to think, of which I could cite many examples, indicates that we have pretty good cause to worry. We find this pattern of failure to think through a set of obvious and systematic relationships at a great number of levels. Take an illustration of a different kind: a large manufacturer of pharmaceutical products wished to redesign the container of a deodorant. An elaborate market research was carried out, a sample of consumers chosen by the most refined methods was interviewed, the best designers were entrusted with the creation of the new bottle. The research had focused on blue, everything had pointed out that blue was the most desirable color for a deodorant. When the final result appeared on the shelves of the drugstores, it disappeared, went under immediately in the sea of its competitors: all were blue.

Or look at the logistics of an airport which has a conveyor

belt from plane to luggage and a conveyor belt in front of the customs agent. In between, the travelers drag their suitcases as best they can. The older, the more infirm the traveler, the more inappropriate a human link he is in the conveyor system. What I should like to suggest is that the attempt to introduce automated systems of one sort or another into a society which does not understand them is dangerous. The public builds up a large number of fears about automations and becomes willing to accept almost anything in terms of computer failure. They graft new kinds of alibis and new kinds of breakdowns into their expectations. They produce an atmosphere in which the effective social use of the very considerable powers we have is almost impossible. Furthermore, we are building systems where the use of human judgment and the use of automatic decision-making are put together in a very bad mix, as, for instance, when the distribution of electric power in a grid is partly based on cost, determined by human calculation, and partly on the demands of part of the system, determined automatically, in which the time relationships have not been properly allowed for. From mixes like this come types of confusion and catastrophy with which we have never been cursed before.

Yet it seems that interest in the human components of complex automated and computerized systems is decreasing rather than increasing. First we looked at men and turned them into "human components," and then we stopped looking at them at all. We are educating the future human components, upon whose precision and accuracy and sense of responsibility the operation of future systems will depend, by training them to be trigger-happy in multiple-choice tests, by out-educating from their minds the fundamental human quality of responsibility based on accurate reasoning. I recently attended a large, expensive, and important conference on a subject of interest to many millions of people. The young and enthusiastic organizers, when queried about some of the arrangements they were making, simply replied: "We have decided we just have to risk failure." This is a form of ethical heroism appropriate perhaps in individual life but highly inappropriate in the design of national conferences on airport lighting, in fact in any of the increasing number of circumstances in which—as in parachute jumping—it is necessary to get it right the first time. We have not yet built into our educational system any recognition of the points where precision is essential, and yet we are living in a society where one mistake can dislocate the lives of thousands of people, wreck distribution systems, and distort life-history data, and subsequent career lines.

I would also like to point out briefly some of the consequences of living in a world in which, owing to the diffusion of modern scientific endeavour, we now tend to think of all civilized countries capable of supporting the modern scientific enterprise as parts of one system. Within this assumption there has been a continuing, and inappropriate, preoccupation of the United States and the Soviet Union with each other's technical and scientific development, as if in fact they were parts, and the only significant parts, of one system. It is true that our information and, in all probability, Soviet information about technical and scientific developments in China is grossly incomplete and inaccurate, screened as it is through distorting ideological filters. Nevertheless, what is happening scientifically and technically in China is relevant in a world in which knowledge and reaction to knowledge are more ambiguous and more disorganized than in the days when the United States and the Soviet Union could be treated as a single pair of competitive and rivalrous systems, coupled together by the intensity of their preoccupation with each other. Some of us can look back to the work of Richardson, which Carl Lienau helped to final publication,[6] and Richardson's first hypothesis about the mathematics of armament races.[7] Richardson's was a pioneering venture, but in today's terms, 28 years later, we can see with what a simplified world picture Richardson then dealt. Two countries, rivals and potential enemies, could be analyzed in terms of the reciprocal escalation involved. In comparable fashion, the sorts of analyses which we were, as anthropologists, able to make of very old, stable, well-defined, old-fashioned nation states could be very easily computerized today for they were very simple. But a situation like Vietnam cannot be analyzed in such a fashion. There was a beautiful bit in a newspaper, with the headline: "VC Turncoat

Makes It Big as Marine Hero." This is an account of a Vietnamese who first fought for and then against the French, went back to his village and was part of his village's defense group against the Viet Cong, defected from the village to the Viet Cong, defected from the Viet Cong to us, and has now become a hero. The article comments, "The underlying motives of an ex-communist who gladly goes out with Marines and hunts former comrades is hazy at best to Western minds." But this little vignette also represents a state of disorganization that we, as social analysts attempting to analyze and predict social events, are totally unaccustomed to.

I have just lived through a conference where I found myself wishing nostalgically for the dear old days of the late 1930's, when the only people one had to worry about were communists who had clearly defined goals which were different from your own but with whom, if one was firm enough and could stay up long enough, it was possible to come to some sort of *modus operandi*. Their strategic goals were clear to them and to their opponents. I later found this was equally true in working with Russians.

But in this recent conference there were groups of young people whose only goal was to disrupt, who called meetings and then discussed in public such questions as whether they should stay in the conference and subvert it or walk out and get more publicity. When one asked what their aim was, they had no answer, only a loose rationale of the desirability of disrupting all the establishments, even the ones they had themselves created a few hours or a day ago. Previously schematizable ways of communicating were ineffective with them. There was no way of predicting what they were going to do, no possibility of orderly compromise, no way of dealing with them. If the groups they temporarily aggregated made a decision, they had no mechanism for following it out.

The result was a degree of disorganization beside which the political activities of 25 years ago looked like a game of checkers. In World War II, anthropologists developed ways of thinking about old nations like Japan. Japanese culture was very easy to schematize in ways that were adequate for effective prediction.

All that was needed was some hard work by experienced analysts. It was possible to probe and sample at any one of many available points in order to get material for a systematic description. But new nations, amalgams of different cultures at different levels, within the present world framework, cannot be dealt with this way. We have no tools for doing a comparable analysis of Nigeria torn by civil war. We are dealing with new kinds of partial organization among areas of much higher and much lower organization which none of our theories take into account. In the past, it was possible to view opposing and organized systems in some degree of isolation. Today we are dealing with a sort of social metastasis in which there are fragments of formerly highly organized behavior which are unsystematically related to each other. We have no way of thinking about this.

If we think of the steps through the early interdisciplinary development of cybernetic models, through general systems theory and our growing willingness to include more and more complex systems, I think that now we have to take another step and develop ways of thinking about systems that are still bounded but within which there are loci of very contrasting degrees of organization and disorganization. If we approach them with our former methods, if we treat some of these organized pieces in isolation, we may get something that can be treated as a system, but we learn nothing about the way in which it is embedded in intractable ways in some larger and less organized context, and we may also do a great deal of harm. I believe that finding ways of meeting this dilemma is the next step that this society should take.

In conclusion I should like to tell a story which I think may be useful to our new society. I went to the organizational meeting of the Society for General Systems Theory that was held in connection with a meeting of the American Association for the Advancement of Science in Atlanta. The audience was typical, a few old men and women, five or six people who had arranged the meeting and knew exactly what they wanted to do, and a few diverse and unidentifiable characters. They were going through a perfectly stereotyped, conventional, and uninspired rigmarole. As no one knew who I was, I had an opportunity to

see how cranky a new idea seems unless it is advanced by a well-known person. I suggested that, instead of founding just another society, they give a little thought to how they could use their theory to predict the kind and size of society they wanted, what its laws of growth and articulation with other parts of the scientific community should be. I was slapped down without mercy. Of all the silly ideas, to apply the ideas on the basis of which the society was being formed to ITSELF!

I would now like to repeat this suggestion. It seems to me that in a new organization, centered upon our knowledge and interest in circular self-corrective systems and our capacity to deal with the situations to which they may be productively applied, it might be worthwhile for this combination of old and new to really consider, technically and carefully, what in thunder we are founding. How many members do we want and from what groups should they be chosen? Maybe it would be well to consider from what groups they should not be chosen. How are we going to keep from getting steadily older, so that ten years from now young men will not want to join a society of people with whom they can't communicate? How are we going to keep our communication system alive? Or should we plan for the society to die in ten years? Recognizing that one is working in new and possibly transient fields, one can set a terminal date even at inauguration. (Like any contract, of course, such a date can be extended. But setting it produces a different style.) It is possible to say: let's aim at a short, definite period. We know what we want to do now and we think we can do it. The membership that we are going to bring in are the people to do what needs to be done. We are certain that we are not leaving out any of the people who ought to be here now. Why can't we look at this society systematically as a system with certain requirements, certain possibilities of growth, and certain constraints, in a world which is making demands, to some of which this society is to be responsive? If this society is to pay attention to the way cybernetics is developing in other countries, especially in the Soviet Union and other countries of the Eastern European block, what are the devices for adequate cross-national and cross-ideological communication? Do we have the right people?

Do we have the necessary techniques? When are we likely to need either death or transformation?

I think these are questions which the American Society for Cybernetics should ask, and, as I am not disguised as a casual crank in Atlanta, I commend them to you.

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