

VIII Information, Language, and Society

The concept of an organization, the elements of which are themselves small organizations, is neither unfamiliar nor new. The loose federations of ancient Greece, the Holy Roman Empire and its similarly constituted feudal contemporaries, the Swiss Companions of the Oath, the United Netherlands, the United States of America, and the many united states to the south of it, the Union of Socialist Soviet Republics, are all examples of hierarchies of organizations on the political sphere. The Leviathan of Hobbes, the Man-State made up of lesser men, is an illustration of the same idea one stage lower in scale, while Leibniz's treatment of the living organism as being really a plenum, wherein other living organisms, such as the blood corpuscles, have their life, is but another step in the same direction. It is, in fact, scarcely more than a philosophical anticipation of the cell theory, according to which most of the animals and plants of moderate size and all of those of large dimensions are made up of units, cells, which have many if not all the attributes of independent living organisms. The multicellular organisms may themselves be the building bricks of organisms of a higher stage, such as the Portuguese man-of-war, which is a complex structure of differentiated coelenterate polyps, where the several

individuals are modified in different ways to serve the nutrition, the support, the locomotion, the excretion, the reproduction, and the support of the colony as a whole.

Strictly speaking, such a physically conjoint colony as that poses no question of organization which is philosophically deeper than those which arise at a lower level of individuality. It is very different with man and the other social animals—with the herds of baboons or cattle, the beaver colonies, the hives of bees, the nests of wasps or ants. The degree of integration of the life of the community may very well approach the level shown in the conduct of a single individual, yet the individual will probably have a fixed nervous system, with permanent topographic relations between the elements and permanent connections, while the community consists of individuals with shifting relations in space and time and no permanent, unbreakable physical connections. All the nervous tissue of the beehive is the nervous tissue of some single bee. How then does the beehive act in unison, and at that in a very variable, adapted, organized unison? Obviously, the secret is in the intercommunication of its members.

This intercommunication can vary greatly in complexity and content. With man, it embraces the whole intricacy of language and literature, and very much besides. With the ants, it probably does not cover much more than a few smells. It is very improbable that an ant can distinguish one ant from another. It certainly can distinguish an ant from its own nest from an ant from a foreign nest, and may cooperate with the one, destroy the other. Within a few outside reactions of this kind, the ant seems to have a mind almost as patterned, chitin-bound, as its body. It is what we might expect *a priori* from an animal whose growing phase and, to a large extent, whose learning phase are rigidly

separated from the phase of mature activity. The only means of communication we can trace in them are as general and diffuse as the hormonal system of communication within the body. Indeed, smell, one of the chemical senses, general and undirectional as it is, is not unlike the hormonal influences within the body.

Let it be remarked parenthetically that musk, civet, castoreum, and the like sexually attractive substances in the mammals may be regarded as communal, exterior hormones, indispensable, especially in solitary animals, for the bringing the sexes together at the proper time, and serve for the continuation of the race. By this I do not mean to assert that the inner action of these substances, once they reach the organ of smell, is hormonal rather than nervous. It is hard to see how it can be purely hormonal in quantities as small as those which are readily perceivable; on the other hand, we know too little of the action of the hormones to deny the possibility of the hormonal action of vanishingly small quantities of such substances. Moreover, the long, twisted rings of carbon atoms found in muskone and civetone do not need too much rearrangement to form the linked ring structure characteristic of the sex hormones, some of the vitamins, and some of the carcinogens. I do not care to pronounce an opinion on this matter; I leave it as an interesting speculation.

The odors perceived by the ant seem to lead to a highly standardized course of conduct; but the value of a simple stimulus, such as an odor, for conveying information depends not only on the information conveyed by the stimulus itself but on the whole nervous constitution of the sender and the receiver of the stimulus as well. Suppose I find myself in the woods with an intelligent savage who cannot speak my language and whose language I cannot speak. Even without any code of sign language

common to the two of us, I can learn a great deal from him. All I need to do is to be alert to those moments when he shows the signs of emotion or interest. I then cast my eyes around, perhaps paying special attention to the direction of his glance, and fix in my memory what I see or hear. It will not be long before I discover the things which seem important to him, not because he has communicated them to me by language, but because I myself have observed them. In other words, a signal without an intrinsic content may acquire meaning in his mind by what he observes at the time, and may acquire meaning in my mind by what I observe at the time. The ability that he has to pick out the moments of my special, active attention is in itself a language as varied in possibilities as the range of impressions that the two of us are able to encompass. Thus social animals may have an active, intelligent, flexible means of communication long before the development of language.

Whatever means of communication the race may have, it is possible to define and to measure the amount of information available to the race and to distinguish it from the amount of information available to the individual. Certainly no information available to the individual is also available to the race unless it modifies the behavior of one individual to another, nor is even that behavior of racial significance unless it is distinguishable by other individuals from other forms of behavior. Thus the question as to whether a certain piece of information is racial or of purely private availability depends on whether it results in the individual assuming a form of activity which can be recognized as a distinct form of activity by other members of the race, in the sense that it will in turn affect their activity, and so on.

I have spoken of the race. This is really too broad a term for the scope of most communal information. Properly speaking,

the community extends only so far as there extends an effectual transmission of information. It is possible to give a sort of measure to this by comparing the number of decisions entering a group from outside with the number of decisions made in the group. We can thus measure the autonomy of the group. A measure of the effective size of a group is given by the size which it must have to have achieved a certain stated degree of autonomy.

A group may have more group information or less group information than its members. A group of non-social animals, temporarily assembled, contains very little group information, even though its members may possess much information as individuals. This is because very little that one member does is noticed by the others and is acted on by them in a way that goes further in the group. On the other hand, the human organism contains vastly more information, in all probability, than does any one of its cells. There is thus no necessary relation in either direction between the amount of racial or tribal or community information and the amount of information available to the individual.

As in the case of the individual, not all the information which is available to the race at one time is accessible without special effort. There is a well-known tendency of libraries to become clogged by their own volume; of the sciences to develop such a degree of specialization that the expert is often illiterate outside his own minute specialty. Dr. Vannevar Bush has suggested the use of mechanical aids for the searching through vast bodies of material. These probably have their uses, but they are limited by the impossibility of classifying a book under an unfamiliar heading unless some particular person has already recognized the relevance of that heading for that particular book. In the

case where two subjects have the same techniques and intellectual content but belong to widely separated fields, this still requires some individual with an almost Leibnizian catholicity of interest.

In connection with the effective amount of communal information, one of the most surprising facts about the body politic is its extreme lack of efficient homeostatic processes. There is a belief, current in many countries, which has been elevated to the rank of an official article of faith in the United States, that free competition is itself a homeostatic process: that in a free market the individual selfishness of the bargainers, each seeking to sell as high and buy as low as possible, will result in the end in a stable dynamics of prices, and with redound to the greatest common good. This is associated with the very comforting view that the individual entrepreneur, in seeking to forward his own interest, is in some manner a public benefactor and has thus earned the great rewards with which society has showered him. Unfortunately, the evidence, such as it is, is against this simple-minded theory. The market is a game, which has indeed received a simulacrum in the family game of Monopoly. It is thus strictly subject to the general theory of games, developed by von Neumann and Morgenstern. This theory is based on the assumption that each player, at every stage, in view of the information then available to him, plays in accordance with a completely intelligent policy, which will in the end assure him of the greatest possible expectation of reward. It is thus the market game as played between perfectly intelligent, perfectly ruthless operators. Even in the case of two players, the theory is complicated, although it often leads to the choice of a definite line of play. In many cases, however, where there are three players, and in the overwhelming majority of cases, when the number of players is

large, the result is one of extreme indeterminacy and instability. The individual players are compelled by their own cupidity to form coalitions; but these coalitions do not generally establish themselves in any single, determinate way, and usually terminate in a welter of betrayal, turncoatism, and deception, which is only too true a picture of the higher business life, or the closely related lives of politics, diplomacy, and war. In the long run, even the most brilliant and unprincipled huckster must expect ruin; but let the hucksters become tired of this and agree to live in peace with one another, and the great rewards are reserved for the one who watches for an opportune time to break his agreement and betray his companions. There is no homeostasis whatever. We are involved in the business cycles of boom and failure, in the successions of dictatorship and revolution, in the wars which everyone loses, which are so real a feature of modern times.

Naturally, von Neumann's picture of the player as a completely intelligent, completely ruthless person is an abstraction and a perversion of the facts. It is rare to find a large number of thoroughly clever and unprincipled persons playing a game together. Where the knaves assemble, there will always be fools; and where the fools are present in sufficient numbers, they offer a more profitable object of exploitation for the knaves. The psychology of the fool has become a subject well worth the serious attention of the knaves. Instead of looking out for his own ultimate interest, after the fashion of von Neumann's gamesters, the fool operates in a manner which, by and large, is as predictable as the struggles of a rat in a maze. *This* policy of lies—or rather, of statements irrelevant to the truth—will make him buy a particular brand of cigarettes; *that* policy will, or so the party hopes, induce him to vote for a particular candidate—any

candidate—or to join in a political witch hunt. A certain precise mixture of religion, pornography, and pseudoscience will sell an illustrated newspaper. A certain blend of wheedling, bribery, and intimidation will induce a young scientist to work on guided missiles or the atomic bomb. To determine these, we have our machinery of radio fan ratings, straw votes, opinion samplings, and other psychological investigations, with the common man as their object; and there are always the statisticians, sociologists, and economists available to sell their services to these undertakings.

Luckily for us, these merchants of lies, these exploiters of gullibility, have not yet arrived at such a pitch of perfection as to have things all their own way. This is because no man is either all fool or all knave. The average man is quite reasonably intelligent concerning subjects which come to his direct attention and quite reasonably altruistic in matters of public benefit or private suffering which are brought before his own eyes. In a small country community which has been running long enough to have developed somewhat uniform levels of intelligence and behavior, there is a very respectable standard of care for the unfortunate, of administration of roads and other public facilities, of tolerance for those who have offended once or twice against society. After all, these people are there, and the rest of the community must continue to live with them. On the other hand, in such a community, it does not do for a man to have the habit of overreaching his neighbors. There are ways of making him feel the weight of public opinion. After a while, he will find it so ubiquitous, so unavoidable, so restricting and oppressing that he will have to leave the community in self-defense.

Thus small, closely knit communities have a very considerable measure of homeostasis; and this, whether they are highly

literate communities in a civilized country or villages of primitive savages. Strange and even repugnant as the customs of many barbarians may seem to us, they generally have a very definite homeostatic value, which it is part of the function of anthropologists to interpret. It is only in the large community, where the Lords of Things as They Are protect themselves from hunger by wealth, from public opinion by privacy and anonymity, from private criticism by the laws of libel and the possession of the means of communication, that ruthlessness can reach its most sublime levels. Of all of these anti-homeostatic factors in society, the control of the means of communication is the most effective and most important.

One of the lessons of the present book is that any organism is held together in this action by the possession of means for the acquisition, use, retention, and transmission of information. In a society too large for the direct contact of its members, these means are the press, both as it concerns books and as it concerns newspapers, the radio, the telephone system, the telegraph, the posts, the theater, the movies, the schools, and the church. Besides their intrinsic importance as means of communication, each of these serves other, secondary functions. The newspaper is a vehicle for advertisement and an instrument for the monetary gain of its proprietor, as are also the movies and the radio. The school and the church are not merely refuges for the scholar and the saint: they are also the home of the Great Educator and the Bishop. The book that does not earn money for its publisher probably does not get printed and certainly does not get reprinted.

In a society like ours, avowedly based on buying and selling, in which all natural and human resources are regarded as the absolute property of the first business man enterprising

enough to exploit them, these secondary aspects of the means of communication tend to encroach further and further on the primary ones. This is aided by the very elaboration and the consequent expense of the means themselves. The country paper may continue to use its own reporters to canvass the villages around for gossip, but it buys its national news, its syndicated features, its political opinions, as stereotyped "boiler plate." The radio depends on its advertisers for income, and, as everywhere, the man who pays the piper calls the tune. The great news services cost too much to be available to the publisher of moderate means. The book publishers concentrate on books that are likely to be acceptable to some book club which buys out the whole of an enormous edition. The college president and the Bishop, even if they have no personal ambitions for power, have expensive institutions to run and can only seek their money where the money is.

Thus on all sides we have a triple constriction of the means of communication: the elimination of the less profitable means in favor of the more profitable; the fact that these means are in the hands of the very limited class of wealthy men, and thus naturally express the opinions of that class; and the further fact that, as one of the chief avenues to political and personal power, they attract above all those ambitious for such power. That system which more than all others should contribute to social homeostasis is thrown directly into the hands of those most concerned in the game of power and money, which we have already seen to be one of the chief anti-homeostatic elements in the community. It is no wonder then that the larger communities, subject to this disruptive influence, contain far less communally available information than the smaller communities, to say nothing of the human elements of which all communities are built up. Like

the wolf pack, although let us hope to a lesser extent, the State is stupider than most of its components.

This runs counter to a tendency much voiced among business executives, heads of great laboratories, and the like, to assume that because the community is larger than the individual it is also more intelligent. Some of this opinion is due to no more than a childish delight in the large and the lavish. Some of it is due to a sense of the possibilities of a large organization for good. Not a little of it, however, is nothing more than an eye for the main chance and a lusting after the fleshpots of Egypt.

There is another group of those who see nothing good in the anarchy of modern society, and in whom an optimistic feeling that there must be some way out has led to an overvaluation of the possible homeostatic elements in the community. Much as we may sympathize with these individuals and appreciate the emotional dilemma in which they find themselves, we cannot attribute too much value to this type of wishful thinking. It is the mode of thought of the mice when faced with the problem of belling the cat. Undoubtedly it would be very pleasant for us mice if the predatory cats of this world were to be belled, but—who is going to do it? Who is to assure us that ruthless power will not find its way back into the hands of those most avid for it?

I mention this matter because of the considerable, and I think false, hopes which some of my friends have built for the social efficacy of whatever new ways of thinking this book may contain. They are certain that our control over our material environment has far outgrown our control over our social environment and our understanding thereof. Therefore, they consider that the main task of the immediate future is to extend to the fields of anthropology, of sociology, of economics, the methods of the

natural sciences, in the hope of achieving a like measure of success in the social fields. From believing this necessary, they come to believe it possible. In this, I maintain, they show an excessive optimism, and a misunderstanding of the nature of all scientific achievement.

All the great successes in precise science have been made in fields where there is a certain high degree of isolation of the phenomenon from the observer. We have seen in the case of astronomy that this may result from the enormous scale of certain phenomena with respect to man, so that man's mightiest efforts, not to speak of his mere glance, cannot make the slightest visible impression on the celestial world. In modern atomic physics, on the other hand, the science of the unspeakably minute, it is true that anything we do will have an influence on many individual particles which is great *from the point of view of that particle*. However, we do not live on the scale of the particles concerned, either in space or in time; and the events that might be of the greatest significance from the point of view of an observer conforming to their scale of existence appear to us—with some exceptions, it is true, as in the Wilson cloud-chamber experiments—only as average mass effects in which enormous populations of particles cooperate. As far as these effects are concerned, the intervals of time concerned are large from the point of view of the individual particle and its motion, and our statistical theories have an admirably adequate basis. In short, we are too small to influence the stars in their courses, and too large to care about anything but the mass effects of molecules, atoms, and electrons. In both cases, we achieve a sufficiently loose coupling with the phenomena we are studying to give a massive total account of this coupling, although the coupling may not be loose enough for us to be able to ignore it altogether.

It is in the social sciences that the coupling between the observed phenomenon and the observer is hardest to minimize. On the one hand, the observer is able to exert a considerable influence on the phenomena that come to his attention. With all respect to the intelligence, skill, and honesty of purpose of my anthropologist friends, I cannot think that any community which they have investigated will ever be quite the same afterward. Many a missionary has fixed his own misunderstandings of a primitive language as law eternal in the process of reducing it to writing. There is much in the social habits of a people which is dispersed and distorted by the mere act of making inquiries about it. In another sense from that in which it is usually stated, *traduttore traditore*.

On the other hand, the social scientist has not the advantage of looking down on his subjects from the cold heights of eternity and ubiquity. It may be that there is a mass sociology of the human animalcule, observed like the populations of *Drosophila* in a bottle, but this is not a sociology in which we, who are human animalcules ourselves, are particularly interested. We are not much concerned about human rises and falls, pleasures and agonies, *sub specie aeternitatis*. Your anthropologist reports the customs associated with the life, education, career, and death of people whose life scale is much the same as his own. Your economist is most interested in predicting such business cycles as run their course in less than a generation or, at least, have repercussions which affect a man differentially at different stages of his career. Few philosophers of politics nowadays care to confine their investigations to the world of Ideas of Plato.

In other words, in the social sciences we have to deal with short statistical runs, nor can we be sure that a considerable part of what we observe is not an artifact of our own creation. An

investigation of the stock market is likely to upset the stock market. We are too much in tune with the objects of our investigation to be good probes. In short, whether our investigations in the social sciences be statistical or dynamic—and they should participate in the nature of both—they can never be good to more than a very few decimal places, and, in short, can never furnish us with a quantity of verifiable, significant information which begins to compare with that which we have learned to expect in the natural sciences. We cannot afford to neglect them; neither should we build exaggerated expectations of their possibilities. There is much which we must leave, whether we like it or not, to the un-“scientific,” narrative method of the professional historian.

Note

There is one question which properly belongs to this chapter, though it in no sense represents a culmination of its argument. It is the question whether it is possible to construct a chess-playing machine, and whether this sort of ability represents an essential difference between the potentialities of the machine and the mind. Note that we need not raise the question as to whether it is possible to construct a machine which will play an optimum game in the sense of von Neumann. Not even the best human brain approximates to this. At the other end, it is unquestionably possible to construct a machine that will play chess in the sense of following the rules of the game, irrespective of the merit of the play. This is essentially no more difficult than the construction of a system of interlocking signals for a railway signal tower. The real problem is intermediate: to construct a machine which shall offer interesting opposition to a player at

some one of the many levels at which human chess players find themselves.

I think it is possible to construct a relatively crude but not altogether trivial apparatus for this purpose. The machine must actually play—at a high speed if possible—all its own admissible moves and all the opponent's admissible ripostes for two or three moves ahead. To each sequence of moves it should assign a certain conventional valuation. Here, to checkmate the opponent receives the highest valuation at each stage, to be checkmated, the lowest; while losing pieces, taking opponent's pieces, checking, and other recognizable situations should receive valuations not too remote from those which good players would assign them. The first of an entire sequence of moves should receive a valuation much as von Neumann's theory would assign it. At the stage at which the machine is to play once and the opponent once, the valuation of a play by the machine is the minimum valuation of the situation after the opponent has made all possible plays. At the stage where the machine is to play twice and the opponent twice, the valuation of a play by the machine is the minimum with respect to the opponent's first play of the maximum valuation of the plays by the machine at the stage when there is only one play of the opponent and one by the machine to follow. This process can be extended to the case when each player makes three plays, and so on. Then the machine chooses any one of the plays giving the maximum valuation for the stage n plays ahead, where n has some value on which the designer of the machine has decided. This it makes as its definitive play.

Such a machine would not only play legal chess, but a chess not so manifestly bad as to be ridiculous. At any stage, if there were a mate possible in two or three moves, the machine would

make it; and if it were possible to avoid a mate by the enemy in two or three moves, the machine would avoid it. It would probably win over a stupid or careless chess player, and would almost certainly lose to a careful player of any considerable degree of proficiency. In other words, it might very well be as good a player as the vast majority of the human race. This does not mean that it would reach the degree of proficiency of Maelzel's fraudulent machine, but, for all that, it may attain a pretty fair level of accomplishment.

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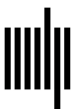
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