André Delobelle

FEEDBACK, CYBERNETICS

AND SOCIOLOGY

Feedback appears to be a fundamental characteristic of the phenomena of life. Elsewhere it only appears in man-made machines.[1] These machines are always presented as being a meeting ground for laws immanent both in matter and in man. A new science has been created to study the applications of feedback: cybernetics. As feedback is closely related to questions concerning the transmission of information, cybernetics has rapidly given rise to a theory of information. The latter, with its applications, has taken on an absolutely essential role in our modern world wherever problems of administration occur.

The final object of cybernetics is the study of ensembles which are capable of autoregulation, which is precisely the principal property of the phenomena of life. Autoregulation implies the full capacity to adjust and adapt oneself while still preserving one's own existence or even enhancing it. Life is naught else. The concept of feedback can be used to describe these processes of reequilibration, with the help of information, of autoregulating ensembles in relation to the environment.

Translated by Allen Grieco

[1] S.T. Bok, *Cybernetica (Stuurkunde). Hoe sturen wij ons leven, ons werk en onze machines?* Utrecht, Aula-Boeken, 1961, pp. 144-150.

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The problem which confronts us is to know in what measure cybernetic models shed light on psychosociological phenomena. Many authors have already given hesitating or enthusiastic answers to this question.[2] Certainly any development in cybernetics can only be extremely beneficial to the social sciences. However, we would like to reverse the problem here and, starting with the applications of the concept of feedback in these sciences, ask a few questions of cybernetics, in particular as concerns its limits.

After recalling a few of the basic definitions of cybernetics, we will try to describe the way in which these concepts have been translated and have proved themselves useful in the social sciences. We shall do this from three points of view: firstly, the renewal brought to the study of communications; secondly, the application of the concept of feedback to psychosociological entities such as people, organizations and groups; and thirdly the difficulties which cybernetics poses in the analysis of the closure of sociological ensembles or of the change which manifests itself in them.

THE PHENOMENON OF FEEDBACK

Norbert Wiener has explained how cybernetics was progressively born from the discovery, made at the beginning of the twentieth century, of chance as a fundamental element of the universe. Hitherto the universe had been considered to be strictly determined by physical laws. Since then we have had theoretical models where the determinism of the laws of matter constantly oppose themselves to the indeterminism of chance. It is in this manner that the hypothesis of the total coherence of the universe collapses before the acknowledgement, in every place and at every minute, of an opposition between the determined and the indetermined, between the organized and the chaotic, between communication and "noise." A corollary to this being the conclusion according to which nothing is known beforehand, the

[2] See, for example, Norbert Wiener, *Cybernetique et société. L'usage humain des êtres humains*, Paris, Union Générale d'Editions, 1962, 252 p.; G.A.M. Vogelaar, *Communicatie. Kernproces van de samenleving*, Haarlem, Bohn, 1962, p. 96.

organized is always the conquest of chaos, and, inversely, the greatest probability is on the side of the expansion of the undifferentiated.

Wiener presents the problem in the following manner: "...l'univers et *tous les systèmes clos* qui existent en son sein tendent à perdre leurs caractères distinctifs, et à aller de l'état le moins favorable vers l'état le plus probable, à avancer d'un état d'organisation et de différenciation, dans lequel les distinctions et les formes existent, vers un état de chaos uniforme. ...L'ordre est le moins probable, alors que le chaos est le plus probable. Mais tandis que l'univers comme un tout tend à se délabrer, il existe *des enclaves locales* dont l'évolution semble opposée à celle de l'univers en général, et *dans lesquelles se manifeste une tendance limitée et temporaire à l'accroissement de l'organisation. La vie trouve refuge dans l'une de ces enclaves*".[3] The concept of entropy is used to indicate the degree of the probability of growth of this chaos, or, if you will, the degree of indifferentiation of a given, finite world.

Thus we see that the essential question is that of the preservation of these differentiated, organized, ordered and structured "entities." In order to be such they must adjust themselves externally and adapt themselves internally to the incoherencies and changes in the environment.[4] In this case the adjustment is in relation to momentary reactions to average or short-term attacks on the part of the environment; thus plants bend under the effect of the wind. Adaptation responds to profound long-term modifications of the environment.

In cybernetics, therefore, it is not at all a question of the conservation of a simple content or of some substance or other but, on the contrary, of the perpetuation of a form or a model.[5] Again the example of phenotypes may show us that this form or model cannot be purely and simply assimilated to the "exterior" or "superficial" aspects of the ensembles studied. This would be a grave error because these aspects are still part

[3] Norbert Wiener, *Op. cit.*, p. 12. Our italics.

[4] For the difference between "adjustment" and "adaptation" see the corresponding articles in Julius Gould, William L. Kolb (eds), *A Dictionary of the Social Sciences*, New York, The Free Press, 1964, pp. 8-10.

[5] Norbert Wiener, *Op. cit.*, pp. 117-128.

of the adaptations of these ensembles. Like Claude Bernard, we might more exactly but also anachronistically say that it is essentially a question of the defense and preservation of the "idea" itself which is found at the base of these ensembles.[6] This "idea" corresponds in this case to the genotype, that is to say to the "internal" and "deep" structure which directs this ensemble on a long-term basis, differentiates it from others, and gives it its initial identity.

This structure appears to be profoundly homeostatic.[7] This is coupled with a constant, external plasticity with regard to the influences of the environment both in terms of adjustment and in terms of adaptation.[8] At each moment the structure enters into a systematic relation of equilibrium by interactions with this environment. Any closed and differentiated system studied by cybernetics must fulfill these two basic conditions: an internal homeostasis and an external plasticity. However, these two conditions are but two analytically distinguishable aspects of the same function, as we have seen above. It is interesting to note that this double function, rediscovered by cybernetics, is perfectly homologous with the definition of a structure. In fact every structure fulfills a double condition, it has a centralized point and criteria of differentiation. This double condition only analytically distinguishes inseparable things which have a different import according to circumstances: on the one hand the meaning which centrally dominates a structure and on the other hand the symbolism by which it manifests itself.

How then does the question of feedback present itself according to these initial questions? Wiener, using an anthropomorphic language for which he has been reproached[9] but which has the advantage of visualizing the problem, helps us to localize the question. In order to do so he distinguishes three types of organs at the heart of these cybernetic or autoregulated ensembles. "D'abord, ces machines sont faites pour accomplir une ou plusieurs tâches définies, et doivent, pour y parvenir, avoir des

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[6] Claude Bernard, *Introduction à l'étude de la médicine experimentale*, Genève, Bourquin, 1945 (réédition), pp. 184-196.

[7] Colin Cherry, *On human communication*, New York, Science Edition, 1961, p. 57.

[8] Colin Cherry, *Op. cit.*, p. 57.

[9] Colin Cherry, *Op. cit.*, pp. 57-58.

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organes moteur (analogues aux bras et aux jambes des êtres humains) grâce auxquels ces tâches seront menées à bien. Ensuite, ces machines doivent avoir des *organes des sens* (par exemple des cellules photoélectriques ou des thermomètres) qui non seulement leur disent quelles sont les circonstances extérieurs, mais aussi leur permettent d'enregistrer l'accomplissement ou le non-accomplissement de leurs tâches. Cette dernière fonction ... est appelée "feedback" (rétroaction), ce qui n'est que la possibilité de définir la conduite future par les actions passées. ... Pour toutes ces formes de comportement et particulièrement pour les plus compliquées, nous devons avoir des *organes de décision* centraux qui déterminent ce que la machine va faire à partir de l'information qui lui est donnée et qu'elle a emmaganisée par des moyens analogues à la mémoire des êtres vivants".[10]

Thus feedback derives in the first place from "sense organs." "Dans sa forme la plus simple, le principe du feedback signifie que le comportement est *étudié* afin d'en connaître le résultat, et que la réussite ou l'échec modifie le comportament futur."[11] In general, "...le feedback est la commande d'un système au moyen de la réintroduction dans le système, des résultats de son action."[12]

To understand feedback one must resituate it in an explanation of the whole. Each structure has a meaning, it is finalized. This finality or this objective introduces a tension in their realization. Between the situation at the start and the finishing point there exists an optimum course which is called a norm. During this course different exterior influences oppose this realization, causing deviations from the norm. These deviations must be corrected or at least reduced: this is the function of feedback. Feedback can therefore only be given if the norm is known. In the absence of a precise norm it is at least necessary that the finality be evident. In this case the solution will be "invented" at each moment by comparing the circumstances with the objective. Obviously the cybernetic ensemble can only overcome such a difficulty if it belongs to a hierarchical level which is more

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[10] Norbert Wiener, *Op. cit.*, pp. 39-40. Our italics.
[11] Norbert Wiener, *Op. cit.*, p. 73. Our italics.
[12] Norbert Wiener, *Op. cit.*, p. 75. Our italics.

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elevated in the quality of its decision-making procedure. The "decision-making organs" take on all the more importance as the response demands greater elaboration. In this case we are close to an apprenticeship situation.[13]

Thus feedback (rétroaction, teragkoppeling, Rückmeldung) is in itself an equilibrating mechanism between a structure and its environment. This equilibrium presents itself as a play of opposing forces. The process which is engendered by the structure and which is synonymous with life, is never static. It normally tends towards full development. Any complete stop of this movement is equivalent to death, in which cast there is no more autoregulation. Nevertheless exterior influences can disturb it more or less strongly. Feedback entails movements of compensation with regard to these exterior influences. It thus ends in constantly creating counter oscillations which compensate for the oscillations created by the environment. As long as there is life, the exterior impulses cannot entirely suppress the internal movement. In the same manner feedback cannot entirely suppress the effect of these external influences. Thus the search for equilibrium takes on a cyclical character which varies between a minimum and a maximum. The bigger the coefficient of feedback is, the more the feedback can repel the effect of the environment's influence. This coefficient of feedback must be directly linked to the degree of autonomy of the structure. Present in every living organism, the degree of autonomy increases correspondingly with the hierarchization of living beings. It is at a maximum in man.

But this feedback is not instantaneous, it needs a certain amount of time to manifest itself. The more rapid it is the better it is. It must at least be able to take on the speed of the environment's influence. Strength and speed of reaction intersect in the feedback. But they are not adequate if they are not themselves ordered, that is to say if the organism is not capable of channeling them into the most adequate form.

Evidently all of this poses the *sine qua non* question of information concerning the environment and also that of the possibility of comparing it to the indicated norm, or, better still, that of the capacity of analysing it in function of the

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[13] Norbert Wiener, *Op. cit.*, p. 75.

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objectives of the machine or the finality of the process. The cybernetic ensemble in question must then be able to record information on the difficulties which it is most likely to encounter. At the same time it should be able to compare this information to a reading-grid which will consequently give it the signal for the best reaction possible. In a more perfect ensemble, where the norm is not given beforehand but must be invented, it is necessary for the principal influences or perturbations coming from the exterior to present a certain degree of coherence so that they can be measured and so that the "decision-making organ" can calculate the best response. In practice, one selects the parts of the environment whose laws are best known because they are the most regular. It is the comparison of circumstances to this memorised information which permits the deduction of the response.

Equilibrium is maintained as long as the actions and reactions respond to each other and mutually compensate each other. If the compensations can no longer exert themselves normally due to a delay in the feedback, an insufficiency in the counter-impulse or an inadequacy in the form of response, the equilibrium is upset and is lost. It can even happen that the exterior attack and the feedback coincide in their effects. Here also the dislocation or the death of the cybernetic ensemble will occur. The maintenance of a *critical equilibrated function* between a structure and the system of force-relations which it has with its environment is therefore indispensable.[14]

From this rapid presentation of the principal elements of cybernetic theories it is evident that feedback, as it is studied, always refers to closed and determined universes. Either the differentiated cybernetic ensemble is closed by the fact that the norm is perfectly defined beforehand, or else it is closed by its own unchanged finality which it cannot "transform."[15] When, in the latter case, the momentary response must be calculated or "decided," it can only be so insofar as the environment is at

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[14] We speak of "structure" to indicate the internal order of a closed ensemble, and of "system" to indicate the interactional equilibrium in which this ensemble finds itself with its environment.

[15] We have based this summary of the phenomenon of feedback on the exposition made by Bok, *Op. cit.*, and in particular on pp. 22-67.

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least conceived of as being stable and determined in itself. Up to the present day cybernetics has concerned itself only with definite ensembles.[16] Moreover a calculation of probability, which is intrinsically tied to all theories of information, is only possible within the framework of a supposedly stable and coherent universe. This is why *feedback is only conceivable in the framework of a closed circuit*. It is this closure of the feedback circuit which permits its analysis at any point. Everything is simultaneously cause and effect (if it is analysed from upstream to downstream), or means and end (if it is analysed from downstream to upstream), that is to say that there is neither beginning nor end (upstream and downstream coincide; the distinction is purely analytical).[17]

But living organisms are capable of creativity even beyond the phenomena of feedback. This essential property, which is found at the heart of their capacity for autogeneration and autoregeneration, even seems to prevail over the simple preservation properties of the living structure. After all, the living structure can only preserve itself by constantly recreating itself. The more specialized it is, the more difficult this becomes. This creativity becomes all the more important as we rise in the hierarchy of living beings. It typically characterises the human being.

In the following pages we would like to show, with the help of results coming largely from experiments in social psychology and the sociology of small groups, how much more complex is the problem of feedback in the social sciences. If, at a first glance, there appear to be analogies with cybernetic models, this impression is dispelled as we begin to examine the question more thoroughly. Firstly the closure of ensembles shifts continually. Secondly, the change and stability of the finalities intersect at every moment. We are forced to conclude that from here on we are in the presence of *open circuits*. The question which poses itself then is to know what happens to the concept of feedback and cybernetic models in the social sciences.

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[16] The cybernetic model invented by W. Ross Ashby (in *Design for a brain*, New York, Wiley and Sons, 1952), called a "Homeostat," which is capable of selecting types of responses, within certain limits by trial and error, until it returns to a stable equilibrium, does not, however, invalidate this conclusion.

[17] S.T. Bok, *Op. cit.*, pp. 233-241.

COMMUNICATION AND FEEDBACK

Replacement of the classic scheme of communication

Cybernetics has had good results in communication theory. It has questioned the first syntheses and has imposed the development of new syntheses.[18] The first consequence was the bypassing of the old scheme which presented communication as beginning with the transmission of a message between a Transmitter and a Receiver. This appeared to be too punctual, too unilateral, in short, too static. In fact, the reequilibration by interaction with which the concept of feedback is associated presumes that each entity which is present is at the same time both a transmitter and a receiver. Feedback implies the idea that each message sent produces a message in return. Even when, at first sight, feedback seems to be lacking, it must be assumed to be present or else the emitted message is equivalent to a dream. It is not the presence of feedback which must be explained, but rather its apparent absence in certain circumstances. Without feedback, communication is incomplete.[19] Thus we must absolutely replace the old scheme $T \to R$ by a more dynamic scheme of the type $T \rightleftarrows R$.

Moreover, where previous authors pursued the analysis by studying the coding and decoding of transmitted messages (also presented as being unique), it is now necessary for us to consider this question from the point of view of a plurality of complementary, convergent or divergent exchanges which, together, result in the diffusion and assimilation of a theme. It is no longer a question of a single transmission, but of a complete cycle of exchanged messages. If this is really the case, it is not the cycle which must be explained, but again its apparent absence in certain cases.

Once a theme is introduced (or a question is asked) the exchanges expand, giving rise to various developments, to evaluations, to suggestions, to eventual decisions, to signs of

[18] Gerhard Maletzke, *Psychologie der Massen-Kommunikation*, Hamburg, Hans Bredow, 1963, p. 19.

[19] Fred Dowling, "Communication only Seems Simple," in *Personnel Journal*, vol. 37, 1958, pp. 177-179.

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agreement or disagreement, to joyous or ironic interpellations, to movements of relaxation or to bitter words, and so on.[20] Inside the cycle we find transmissions of information, redundances and "noise," contained together simultaneously. The conversation tends to organize itself into a functional whole. It is owing to this fluid totality that the coding and decoding operates. Repetitions or reinterpretations can then compensate at their leisure for too rapid statements. The duration of the cycle is a function of the importance of the question, that is to say of the interest of the communicating parties. If the information is a pushing back of uncertainty, its probability is a function of the completeness of the cycle.

As wherever there is feedback, the negative remains present throughout this cycle and carries it ahead. It is present under the form of the preliminary question, it is present later in the pursuit of questions and answers, and in the end it is still present in the balance of non-resolved problems and non-liquidated tensions in such a way that it can always give rise to a new series of exchanges, and therefore to a new cycle. Inside a conversation, cycles can even overlap, alternate, interpenetrate each other, be reborn and disappear.

However, keeping only to the negative aspects, the feedback proper to each participant would only intersect and become entangled in different directions. It is the positive aspects which everyone can obtain from the other, according to his feelings, which will end up regulating the individual feedback into a system of interdependencies.[21] It is sufficient for some sort of a point of contact to exist (an incident, a problem or a question) between different significant structures (people, groups, tendencies, etc.) so that a system of interactions may emerge, equilibrating itself according to the interdependencies which exist between them. From there on it is really no longer a question of Transmitters and Receivers, but of Communicators. According to Prakke's terminology, Communicators, one by one or simul-

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[20] Robert F. Bales, "The Equilibrium Problem in Small Groups," in A. Paul Hare, Edgar F. Borgatta, Robert F. Bales, *Small Groups, Studies in Social Interaction*, New York, Knopf, 1965, pp. 444-476. By the same author, *Personality and interpersonal behavior*, New York, Holt, Rinehart and Winston, 1970, Appendix 4, pp. 471-491.

[21] Gerhard Maletzke, *Op. cit.*, pp. 18-21.

taneously, put a mark on the conversation with their imprint ("Prägung") and are submitted to its reflection ("Spiegelung").[22] Interdependence thus goes hand in hand with a continual tendency toward the equalization of information between partners, that is to say with a sharing of that which was not shared before. This is what Newcomb means when he speaks of the "Principle of balance" in all communication.[23] This is made possible because a point of contact exists at the beginning between the interlocutors, but it develops according to a process of equalization of differences. The stability of the system of communication is controlled by the possibilities of maintaining this equilibrium. The conversation stops once equalization has been obtained, that is to say once the sharing has been accomplished.

Modalities of communication

It is commonly said that interpersonal communication is the richest type of communication because it implies a direct, face to face, person to person relation. This is due to the fact that feedback is constant and polymorphous, using at the same time verbal and non-verbal modes.[24] Everyone can adapt his message concretely to the perplexities of his interlocutors and the partner can interpret information coming from the exterior according to the motivations of his partners.[25] It seems that in the non-verbal sector a very particular importance has to be accorded to sight. It is enough to remember that a witness is in the first place "one who has seen," much more than one who has simply heard. What happens, then, when sight can no longer play a role in the transmission of information? Isn't communication more handicapped because of it, and with it the whole phenomenon

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[22] Henk Prakke, *Kommunikation der Gesellschaft. Einfürhung in die funktionale Publizistik*, Münster, Regensberg, 1968, p. 95.

[23] Theodore M. Newcomb, Ralph H. Turner, Philip E. Converse, *Social Psychology. The Study of Human Interaction*, New York, Holt, Rinehart and Winston, 1965, pp. 129-136, pp. 185-220.

[24] Leonard Sayles, "Employee Communication: It's Easier When you Know How," in *Supervisory Management*, vol. 7, n. 8, 1962, pp. 12-15.

[25] Elihu Katz, Paul F. Lazarsfeld, *Personal Influence. The Part Played by People in the Flow of Mass Communications*, New York, The Free Press of Glencoe, Paperback Edition, 1964 (1955), XXII + 400 p.

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of feedback at the heart of the interactions?[26] We know certain substitutes develop in these cases by an increase of the functions of other sense organs.

There are nevertheless always analogous difficulties which arise when interpersonal communication is replaced by communication in larger and larger groups. Here feedback loses its original polymorphism and falls back on more subtle or more difficult processes with longer and longer periods. The factors of feedback are evidently reduced accordingly. In the case of collective diffusion techniques, the "talk back" can be so late or so infinitesimal that the responsible parties organize it themselves.[27]

What may one then say about the formalization of channels of communication in companies or institutions? The matter is made all the more difficult by the fact that these channels are most often reserved or exist in one direction—from the management towards the base. There messages take on a caricatural tone and particular techniques must eventually be put into action to facilitate their transmission. The feedback used by the management is thus itself led to use substitutes (like the blind mentioned above), such as rumors, etc.[28] Leavitt and Mueller have reproduced these conditions in an experiment where only the monitor was able to transmit information, the partners being forbidden any verbal or written reaction. A hostility toward the monitor developed immediately. The prohibition on reacting gave the information transmitted a lesser precision. With time, however, the precision improved thanks to the efforts of the monitor, who tended to lack confidence in himself. Things were considerably facilitated in groups where a public reaction time was authorized before going on to the interdiction.[29] Thibaut and Coules have shown that the possibility of reacting to a hostile act on the part of the monitor maintains a certain sympathy towards him on the part of the public after the experiment. It is different if these

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[26] Jean Stoetzel, *La psychologie sociale*, Paris, Flammarion, 1963, p. 185.

[27] Harold D. Lasswell, "The Structure and Function of Communication in Society," in Wilbur Schramm (ed.), *Mass Communications*, 2nd Edition, Urbana, University of Illinois Press, 1960, p. 121.

[28] S.W. Gellerman, *The Management of Human Relations*, New York, Holt, Rinehart and Winston, 1966.

[29] H.J. Leavitt, R.A.H. Mueller, "Some Effects of Feedback on Communication," in *Human Relations*, 1951, pp. 401-410.

reactions are forbidden.[30] One immediately sees how much the communications system in organizations loses by the formalization of communications. Anomies, which are equivalent to a very favorable ground for all psychosociological pathologies, are created from these deficiencies.

Participation in communication

All the participants do not occupy the same place inside a communicational cycle made up of interdependencies pushing towards the equalization of information. They can thus be globally affected by a "feedback ratio" according to Bales' formula:[31]

$$\frac{R}{I} = \frac{\text{Amount of participation received}}{\text{Amount of participation initiated}}$$

The numerous experiments made by the author have always shown that these ratios are not homogeneous. Those who take the lead in the conversation (corresponding to the "leaders of opinion") tend to address themselves more to the group as such, the other participants addressing themselves above all to particular persons in the group.[32]

But it seems that it is necessary to go further and consider the fact that individuals are characterised by a given, and therefore strongly limited, capacity for absorbing information which comes to them through feedback. When a person is submitted to an arrival of messages above his own limits, either because of an insufficient aptitude or because of an excess of information, the person tends to abandon the system of communication. The system is then broken.[33] In the same manner one must note the results of experiments which show that there is

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[30] J.W. Thibaut, J. Coules, "The Role of Communication in the Reduction of Interpersonal Hostility," in *Journal of Abnormal and Social Psychology*, vol. 47, 1952, pp. 770-777.

[31] Robert F. Bales, "Task Roles and Social Roles in Problem-Solving Groups," in Eleanor E. Maccoby, Theodore M. Newcomb, Eugene L. Hartley (eds), *Readings in Social Psychology*, New York, Holt, Rinehart and Winston, 1958, p. 445.

[32] Robert F. Bales, "The Equilibrium Problem in Small Groups," in A. Paul Hare, Edgar F. Borgatta, Robert F. Bales, *Op. cit.*, pp. 457-461.

[33] F.W. Banghart, A.J. Bachrach, E.G. Pattishall, "Studies in Problem Solving," Virginia University, Sept. 1959.

also a maximum speed to this absorbtion. This maximum speed is that speed at which the person attains the greatest reception speed while still keeping a maximum capacity for discerning information and choosing appropriate responses.

Therefore there also exists an optimum feedback speed.[34] We can reasonably guess that it varies in function of the different domains in which the person is competent. These questions concerning saturation in the reception of information or concerning the speed of critical reception of information must evidently be brought to bear upon that which we know about the limits between which feedback oscillates in cybernetic models. If the experiments mentioned indicate the existence of maximum limits in that which concerns human feedback, it would be easy to complete them with the results of experiments in behavioral psychology which concern the minimum thresholds of information perception which give the lower limits of human feedback.

Like the other conclusions reached in this section devoted to the connections between communication and feedback, we find a great deal of analogies with the working of cybernetic models. The reference to the latter has even permitted us to rectify the old scheme of communication analysis, thus making the explanation of systems of communication much easier. However, human phenomena regularly go beyond these cybernetic models because of their extreme flexibility and their great complexity.

PEOPLE, ORGANIZATIONS, GROUPS AND FEEDBACK

People and feedback

In the first place, a person is a being full of emotions. These emotions exercise essential functions in feedback because of the constant modifications they bring about. Thus the expansion of the phenomenon of feedback seems to give a person a greater feeling of reality. This feedback then becomes the source of his own action. On the contrary the disappearance of feedback

[34] P.M. Fitts, "Cognitive Aspects of Information Processing: III. Set for Speed versus Accuracy," in *Journal of Experimental Psychology*, vol. 71, 1966, pp. 849-857.

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coming from the exterior gives the person over to his sole internal tensions. His action is then only constructed from his own motivations.[35] If the feedback is satisfactory the communication becomes richer and the solution of problems is facilitated. But people who present a certain psychological rigidity tend to avoid contacts with the exterior or to communicate less with it in order to protect themselves against tensions; their work is made more difficult by this.[36] Ease in communication with others makes action easier. Furthermore, by speaking we impose on others the recognition, at least in fact, of our existence,[37] and we invite them to have us participate in their action. Affectivity is thus an essential variable in the behavior of the communicators. In each case it favors or hinders the cycle of communication and orients it differently. It directly conditions the play of feedback.

Organizations and feedback

What has been said above about the formalization of communications in organizations helps us to understand what obstacles the institutional framework created by man can add to feedback. In organizations the communication channels are either vertical or horizontal. As we have seen, the vertical channels can only function from the top towards the bottom. In this case communication from the base toward the management must discover new channels. The horizontal channels can be blocked by rivalries and jealousies. Every time blocks occur, "oblique" channels must be created, especially when the case is pressing.[38] Communication is made all the more difficult according to the number of hierarchical echelons it has to go through. Each echelon filters the communications in order to adapt them for the following echelon, thus falsifying their feedback.[39]

[35] A. Paul Hare, *Handbook of Small Group Research*, New York, The Free Press of Glencoe, 1962, pp. 268-269.

[36] D.M. Wolfe, J.D. Snoek, "A Study of Tensions and Adjustment under Role Conflct," in *Journal of Social Issues*, vol. 18, n. 3, July 1962, pp. 102-121.

[37] Jean Stoetzel, *Op. cit.*, p. 195.

[38] Didier Anzieu, "Les communications intra-groupes," in F.A. Geldard (ed), *Communication Processes*, New York, Macmillan, 1965, pp. 169-188.

[39] Bernard M. Bass, "Experimenting with Simulated Manufacturing Organizations," Louisiana State University, March 1961.

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But the different echelons do not always react in the same way or in a direct manner. Schramm cites the case of diplomats and their government. By analogy with the nervous system, he distinguishes between afferent and efferent information. The diplomat sends reports (afferent information) and his minister answers him in a public speech (efferent information).[40]

Participation is richest when the participants in an action all have an identical status and are motivated. Participation is poorest in very hierarchical organizations and when people have little motivation.[41] In very centralised institutions, peripheral members have few channels at their disposition to inform themselves, they adapt themselves less well and are more frustrated.[42] But the central people who often take the floor or who keep it to themselves impede the reactions of the peripheral members. They then adapt themselves less well to these members and their feedback is poorer, whereas their audience goes away frustrated.[43] Stoetzel's remark on speaking as a demand for recognition here takes on its full meaning.[44]

One should obviously continue by quoting experiments on styles of leadership, with their consequences on the efficaciousness of feedback. The classic experiment of Lippitt and White on this subject is fairly well known.[45] Lyle showed that the obstacles put in front of feedback lowered the morale of "democratic" groups more than that of "authoritarian" groups.[46]

On the whole, experiments and investigations have shown that it is in vertical communication inside organizations that the

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[40] Wilbur Schramm, (ed), *Op. cit.*, pp. 120-121.

[41] Bernard Bass, "Amount of Participation, Coalescence and Profitability of Decision Making Discussions" in *Journal of Abnormal and Social Psychology*, vol. 67, 1963, pp. 92-94.

[42] H.J. Leavitt, "Some Effects of Certain Communication Patterns on Group Performance," in *Journal of Abnormal and Social Psychology*, vol. 46, 1951, pp. 38-50.

[43] Robert F. Bales, "Task Roles and Social Roles in Problem-Solving Groups," *Op. cit.*, pp. 444-445.

[44] See above, note 37.

[45] R. Lippitt, R.K. White, "An Experimental Study of Leadership and Group Life," in G.E. Swanson, T.M. Newcomb, E.L. Hartley (eds), *Readings in Social Psychology*, New York, Holt, 1962, pp. 340-355.

[46] Jack Lyle, "Communication, Group Atmosphere, Productivity and Morale in Small Task Groups," in *Human Relations*, vol. 14, 1961, pp. 369-379.

greatest problems are presented to efficient feedback.[47] This is quite an irony for entities which consider themselves to be efficient. Leavitt proposed to assess these losses in order better to compare the faults and advantages of each type of organigram.[48] For both Knight and himself, the idea that efficiency is directly tied to a hierarchical organisation is a "historical" accident, a simple cultural phenomenon.[49] It is on this point that the experiments in social psychology started by Kurt Lewin and followed up by his students have perhaps provided the most conclusive results.[50] In a society which considers itself to be scientific, the resistance offered to the acceptance of these conclusions testifies to the cultural character of this idea.

Groups and feedback

In groups we find all the complexities of feedback which we encountered in the section on people. But here they are multiplied, aggravated, and even more fluid.

If the study of organizations concentrates essentially on the communication of information, the scope becomes much larger in the case of groups and rejoins that of people. One then perceives all that the study of organizations can leave implicit because their objectives are apparently clearer. Anzieu distinguished three kinds of communication in groups (including organizations): communications concerning the transmission of information, communications which have a cathartic character of unburdening and of self-expression, and lastly communications which concern group participation as such.[51] Now, these types of communication include all phenomena of feedback. All these forms of feedback intersect inside the communication cycle. The

[47] William Scholz, *Communication in the Business Organization*, Englewood Cliffs, Prentice Hall, 1962, 233 p.

[48] H.J. Leavitt, "Recent Conceptions in Administration," in *Personnel Psychology*, vol. 13, 1960, pp. 287-294.

[49] H.J. Leavitt, K.E. Knight, "Most 'Efficient' Solutions to Communication Networks: Empirical versus Analytical Search," in *Sociometry*, vol. 26, 1963, pp. 260-267.

[50] Dorwin Cartwright, Alvin Zander (eds), *Group Dynamics. Research and Theory*; London, Tavistock, 1953. Since then there have been two updated reeditions.

[51] Didier Anzieu, *Op. cit.*, pp. 169-188.

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results of Bales' interaction experiments could be redistributed on the basis of this typology.[52] They would point out the phenomena of compensation in the equilibrium of groups when they stabilize or question themselves, that is to say when they satisfy their participants or not (according to Bales' criteria).

It is therefore false to reduce feedback to the simple communication. If it is essential for attaining objectives, other feedback corresponds to other functions which are equally important. The environment is never reduced to mere objectives, and everyone communicates much more than he says. Faults in the feedback of information can have serious consequences for the survival of groups and can eventually bring about their disintegration, in particular when task groups are dealt with.[53] But experiments on groups show that blocks on other forms of feedback can have equally serious consequences.

As a matter of fact Anzieu's distinctions should be compared with those established by Back in his own experiments on the cohesion of groups. Back organized three series of groups: one series based on these criteria of efficiency, another series based on the psychological affinities between partners, and a final series grouping work-cells on the basis of the prestige attributed to the partners (a fourth series was made up of control groups).[54] He showed that the communication systems developed differently for each of these series. One notices that feedback of information takes on its full impact in the efficiency groups, even if it is equally present elsewhere (as a matter of course). One thus localises the problem better insofar as this typology is exhaustive.

But this typology, along with Back's results, enables us to situate the reasons for (and the functions of) blocks in vertical communications inside organizations. In Back's experiment the efficiency groups contained only members having an equal status. In organizations the "task groups" doubled as "prestige groups." This is possible because each group contains the three types of feedback. The introduction of different hierarchical echelons in

[52] See above,

[53] Peter Nokes, "Feedback as an Exploratory Device in the Study of Certain Interpersonal and Institutional Processes," in *Human Relations*, vol. 14, 1961, pp. 381-387.

[54] Kurt W. Back, "Influence through Social Communication," in *Journal of Abnormal and Social Psychology*, vol. 46, pp. 9-23.

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task groups made them lose many advantages. The possibility of expansion given to communications coming from the base put the management and the base on an equal footing because each one could call upon the other. The refusal of this "transversality" of social relations is justified by the loss of time into which such steps would incur.[55] In reality the argument is valid above all for questions that must be resolved quickly or which are of little importance. For all other questions the organization loses the advantage of the creativity which would result from open and multilateral exchanges.[56] The research done by Bavelas and his successors on this subject is significant. We know that Flament took the study of the distortions caused by different constraints on the communications network for the subject of his research. With the help of graph theory he compared real networks to that which they would be if they were not submitted to any constraint.[57] Zajonc shows by experimentation that the efficiency of people grows when they are given a task as a group. This efficiency grows to a maximum when it is possible for them to communicate with each other on the results of the team as well as on their individual results. The difference becomes particularly evident when the problem that must be resolved becomes more difficult. When the members can only communicate on the results of the team, without discussing their individual results, their efficiency does not increase as much.

These experiments on groups suffice to emphasize the particular characteristics of the feedback that can be observed in them. From this point of view, the study of groups permits an increase of the phenomena that the study of people does not always permit. In groups everything is more involved and more confused.

But if people represent very distinct entities which impose themselves on every observer with a very special obviousness, it is no longer the same for groups. People could be more or less rapidly compared with machines. This becomes more difficult for

[55] Félix Guattari, *Psychanalyse et transversalité. Essais d'analyse institutionnelle*, Paris, Maspero, 1972, XII + 292 p.

[56] E. Schlesinger, "Meeting the Risks Involved in Two-way Communications," in *Personnel Administration*, vol. 25, 1962, n. 6, pp. 24-30.

[57] A summary is in D. Anzieu, J.Y. Martin, *La dynamique des groupes restreints*, Paris, P.U.F., 1968, pp. 135-144.

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groups. And yet the problem isn't any different. The eighteenth century wanted to construct automatons in the image of man. Several authors have pointed out that today it seems rather that man is thought of as a machine. It is time to reverse the situation and go back to the first idea.

Now the definition of a group obliges us to ask again all the questions which were brushed away by a sort of morbid fascination with determinism. At the same time the problem of people is again posed because people and groups are intimately mingled and their definitions are closely linked. We will ask these questions according to two criteria: that of the limits or the differences between closed ensembles and that of profound change at a level analogous to that of genotypes, well beyond simple adjustments or complex adaptations, in short, at the level of mutations. With these two absolutely essential criteria we reach the limits for the application of cybernetic models.

DETERMINISM AND CREATIVITY

Similarities and differences

We have seen that the communicational cycle begins at a given point of interaction: a question asked, a topic launched, a chance encounter, etc. The exchange of information then continues by alternate negations and affirmations to the effect of an equalization of knowledge between those who dispose of more information and those who are in possession of less. The system is upheld by the feeling or the hope of an advantage or profit in one's own centers of interest. The refusal to impart information goes against the principle of equalization and favors the rupture of the communicational system.

However the differences between partners are not interpreted by chance. That which the other says is analysed by the receiver on the basis of what he knows about the communicator's role and the circumstances in which he speaks. The receiver does the same when he speaks to the communicator. Moreover, the com-

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[58] Claude Flament, *Réseaux de communication et structures de groupe*, Paris, Dunod.

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municational system itself distributes roles to the participants. By engaging in a conversation a person spontaneously selects a role which establishes an equilibrium between that which the communicational system in use implies and his own motivations or tendencies. Every person's part in the feedback is thus determined by the play of these roles. Thus we see the importance of role theory for the study of communications.[59]

Let us again note that because of the existence of this communicational system it is not necessary for the same people to be present throughout the exchanges. These people can be replaced as long as their tendency (or the significant structure which they represent) continues to be actuated by others. At best one person alone can hold his own against an opposing faction which may even be rather large. The exclusion of this opposition or, similarly, the interruption of the interventions which are addressed to it, will be in function of the cohesion of the majority group, in function of the importance of the problem for the participants or in function of the degree of deviation of the opposition itself.[60]

During these role interactions, retroactions can be exerted as a reinforcement of the tendencies of those who intervene within the framework of a general consensus. On the contrary they can also give rise to friction between the interlocutors by reinforcing latent oppositions. The cleavage lines around which or in function of which the communicational system equilibrates itself can thus pass as easily through the "exterior" margin of the participants as between them. These lines not only slide constantly but can also "transform" themselves qualitatively throughout the whole duration of the conversation "along with" the discussion.

The analyses of social control can be resumed within this framework. According to a remark of Newcomb, "les normes surgissent à travers la communication qui, à son tour, est rendue possible parce que les normes existaient déjà."[61] Thus there exists a circular link between norms and communications throughout which they mutually condition each other. Therefore every com-

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[59] Anne-Marie Rocheblave-Spenle, *La notion de rôle en psychologie sociale*, Paris, P.U.F., 1962, passim. See in particular pp. 118-119.

[60] S. Schachter, "Deviation, Rejection and Communication," in *Journal of Abnormal and Social Psychology*, vol. 46, 1951, pp. 190-207.

[61] Quoted in Anne-Marie Rocheblave-Spenle, *Op. cit.*, p. 67.

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municational system bases itself on latent norms of a general kind, and at the same time it constantly creates norms which are best adapted to it.

Norms and cleavage lines are thus closely linked. It is in function of them that the communicational roles are distributed or are taken on, that they become partners or oppose each other in "counter roles." "Toute activité sociale postule des échanges d'informations, soit entre les membres d'un même groupe, soit entre les membres de groupes différents... La façon dont s'effectuent ces échanges conditionne les relations entre les hommes."[62] But the inverse is equally true, for the relations between men condition the manner in which they exchange their information. Finally, each one of these concepts refers to each one of the others, in a circular fashion. Where then is the first condition which produces either positive relations with the eventual constitution of a group or negative relations of a conflictual character? "En fait, entrent en contact, non pas une 'boîte noire' émettrice et une 'boîte noire' réceptrice, mais un 'locuteur' et un 'allocuté,' plus généralement *deux ou plusieurs personnalités engagées dans une situation commune et qui, se débattent avec des signification.*"[63] From here on we find ourselves at the heart of the dispute; *the problem of meaning.* "Les éléments de la communication sont essentiellement des *symboles*, plus ou moins connus des interlocuteurs, plus ou moins clairs, rarement univoques. La charge symbolique des significations des mots utilisés au fur et à mesure induit des associations de sens qui ouvrent les champs de compréhension respectifs des interlocuteurs et permet à ces champs de coïncider de mieux en mieux."[64] And let us add: or to diverge more and more. The whole mechanism is there but it implies several conditions.

A first condition is of a psychological nature and is given to us by Newcomb's commentaries.[65] In fact, he noticed that the communicators are less interested in the globality of the message exchanged than in certain "properties" of this message. That

[62] D. Anzieu, J.Y. Martin, *Op. cit.*, p. 123.

[63] D. Anzieu, J.Y. Martin, *Op. cit.*, p. 126. Author's italics.

[64] D. Anzieu, J.Y. Martin, *Op. cit.*, pp. 127-129. Author's italics.

[65] Theodore M. Newcomb, Ralph H. Turner, Philip E. Converse, *Op. cit.*, pp. 157-184.

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which attaches a person to a communicational system and transforms him into a participant is the perception of certain aspects of the communicator's message on a verbal level (that which he says) as well as on a non-verbal level (his gestures and his postures) with which he feels an affinity. The "properties" of the message which interest him are those elements which provide an answer to his own questions, which open new perspectives for him or which consolidate his own opinions. Inversely the same phenomenon but negative this time, distances a person from the exchanges in which he perceives too many differences compared to his own attitudes or his own conceptions. A communicational system can only function validly if it encounters at least some conditions of similarity between partners. The differences can then be expressed starting with these similarities. In similar circumstances this narcissistic condition probably operates selections among the public exposed to the message and transforms part of it into an audience.

The selection which each one of the receivers operates leaves a balance of pertinent information—the "accurate informations" of Newcomb—peculiar to each one of them, whose first effect is to diminish their degree of uncertainty or insecurity. It is here that the conformism of collective opinions finds its base.[66] We know that a strictly individual opinion can, in the long run, make a person insecure and make him operate a return movement towards public opinion.[67] The assimilation of the message, its selective memorization or forgetting must be connected with these communication "properties" as well as with the phenomena of security which they convey. The "being in a group," with the security that it offers, favors communication in a shared sense—it roots itself in common properties.

But they can also have other consequences. The post-decisional consonance in the person who decides favors the selection of only the information conforming to the decision taken. On the contrary, lack of confidence favors ambivalent information in the

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[66] See also the experiments and investigations mentioned in A. Paul Hare, *Op. cit.*, pp. 30-42.

[67] S.E. Asch, "Effects of Group Pressure upon the Modification and Distortion of Judgments," in H. Guetzkow (ed), *Groups, Leadership and Men*, Pittsburgh, Carnegie Press, 1951, pp. 177-190.

case of dissonance.[68] These properties can even become quite pathological, as, for example, the "placebo" effect shows us.[69] Discoveries made by Feldman and Rich tend to show that individuals subjected to particularly distressing conditions select, above all, in view of the decision to be made, the most ambiguous aspects of the information which has been given to them.[70] This opens before us the immense domain of public rumor. Finally, the phenomenon of "captive consciousness" can completely deform the perception of a message. The information is completely restructured by the time it arrives.[71] In each of these experiments we see the "properties" themselves become consequences much more than conditions. This is because they are conditioned by the affectivity of the interlocutors.

Affectivity is therefore one of the first conditions of communication. It is insured or not insured and ordered according to cleavage lines between partners. Here we find the cathartic function of communication. Finally, the function of information does not develop validly unless the cathartic function is satisfactory. The same experiment by Feldman and Rich showed that feedback was all the more objective the more the conditions were supple and secure.[72] Thus the affective factors which play a role in all communication are not made to favor an exact transmission of the messages. The whole problem of empathy poses itself here. One can understand the conclusion Human and Sheatsley arrived at, according to which "il n'existe pas de corrélation entre le contenu objectif d'une information et ce qui a été retenu par les individus récepteurs."[73]

Another condition of communication is of a clearly cultural type because it is directly based on the sharing of the same categories of thought and on the attribution of identical meanings.

[68] Leon Festinger, *A Theory of Cognitive Dissonance*, London, Tavistock, 1962, XII + 292 p.

[69] Roger Muchielli (ed), *Opinions et changements d'opinions*, Paris, Editions Sociales Françaises, 1969, p. 60.

[70] S.E. Feldman, J.K. Rich, "Tolerance for Unambiguous Feedback," in *Journal of Personality and Social Psychology*, vol. 2, 1965, pp. 341-347.

[71] Roger Muchielli (ed), *Op. cit.*, p. 67.

[72] H. Hyman, P. Sheatsley, "Some Reasons why Information Campaigns Fail," in *Public Opinion Quarterly*, vol. II, 1947, pp. 413-423. Quoted in Roger Muchielli (ed), *Op. cit.*, p. 26.

[73] D. Anzieu, J.Y. Martin, *Op. cit.*, p. 129.

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"L'aptitude à communiquer avec que qu'un d'autre est d'autant plus grande que les deux personnes auront pensé dans le même univers symbolique et possèderont les mêmes cadres de référence."[74]

Linguistic ethnology and sociolinguistics have for a long time encountered this fundamental fact of the differentiation between families of languages. These differences appear to lie in the different ways of constructing phonemes, of establishing semantic distinction or of organizing syntax. Inside the linguistic families there is much less difference. Here it is more a question of nuances which were brought to light two centuries ago by comparative linguistics and which made possible the belief in the distant existence of one original language. For a long time this was the central hypothesis of Indo-european.

More recently linguistics have shown that even inside a single language any act of communication implies a certain complicity between partners. Much information is not even reproduced during the communication because it seems too obvious or is understood. These different "presuppositions" constitute the fundamental framework, even if it remains latent, inside of which the conversation unfolds and develops its cycle of feedback. The conversation can be entirely implied without questioning these presuppositions. It can also, on the contrary, refuse or examine them. In this case the presuppositions are explicit.[75]

This also shows that these presuppositions do not only constitute a framework of implication but that they are also the object of a positive or negative attitude. In function of these attitudes the cleavage lines are drawn between the participants in a communicational system. These cleavage lines are only the exterior of the identification relations which appear in the communication: they correspond to the relations of counter-identification. This permits a link to be established with group or conflict theories in sociology. The direct link is furnished by the theorems of Heider which are an essential but generally not sufficiently appreciated contribution describing the play of

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[74] See, for example: Benjamin Lee Whorf, *Linguistique et anthropologie*, Translation, Paris, Denoël, 1969 (1956), 224 p.

[75] Oswald Ducrot, *Dire et ne pas dire. Principes de sémantique linguistique*, Paris, Hermann, 1972, Régine Robin, *Histoire et Linguistique*, Paris, Colin, 1973, pp. 20-29.

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regroupings or exclusions and departures in function of the positive or negative values which are attributed.[76] The attractions or rejections according to the "valences" of people or topics[77] are only another aspect of the same phenomenon.

Communication is thus both the place and the instrument, thanks to the mediation of implications and identifications, of a micro-culture which englobes and synthesizes previous entities at the same time. By the play of "imprints" and "reflections" each partner is affected by the meanings, the behavior and the norms which emerge between them. In his experiment on the the autokinetic effect Shérif has shown how the exchanges between individuals give rise to identical ways of perceiving the environment.[78] Once this community of opinion is established it normally tends to reinforce itself.[79] G.H. Mead has based the possibility of communication on the interiorization of a "generalised Other" which is identical for all the members of a same culture and which facilitates agreement between them.[80]

These conditions of affectivity (by the intermediary of implied values) give rise to zones of "isomorphism" between interlocutors.[81] Inside these zones understanding is facilitated.

Where as before we had several independent entities (people or tendencies) we now find ourslves faced with a single encompassing entity which has integrated the former into so many sub-entities. Something new has appeared. The interactional system, made up of exteriorities and force-relations, which predominated at the beginning has given way to a dominant cultural structure which integrates everything through relations of affinities and identifications. The phenomenon is reversed! At

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[76] Fritz Heider, *The Psychology of Interpersonal Relations*, New York, Wiley and Sons, 1958, X + 326 p.

[77] Theodore M. Newcomb, "Varieties of Interpersonal Attraction," in Dorwin Cartwright, Alvin Zander (eds), *Op. cit.*, pp. 104-119.

[78] Muzafer Sherif, Carolyn W. Sherif, *An Outline of Social Psychology*, revised edition, New York, Harper and Row, 1956, pp. 249-262.

[79] William S. Verplanck, "The Control of the Content of Conversation: Reinforcement of Statements of Opinion," in E.E. Maccoby, T.M. Newcomb, E.L. Hartley (eds), *Op. cit.*, pp. 32-39.

[80] George H. Mead, *L'esprit, le soi et la société*, translation, Paris, P.U.F., 1963.

[81] Melvin L. De Fleur, *Theories of Mass Communication*, New York, David McKay, 1966, pp. 90-96.

the same time we have passed from several cultural unities to a single one. The similarity has covered up the differences which now only appear as nuances. These nuances then tend towards zero without ever attaining it.

On the other hand, in cybernetic models, the entities remain strictly independent in order to preserve their homeostasis. "...Dans le phénomène de feed-back, ... le locuteur reçoit l'information en retour en provenance de l'allocuté, intègre cette information à sa propre conduite, et modifie son émission en conséquence. Mais en psychologie social, le feed-back est bien davantage... Il est une identification progressive avec l'interlocuteur et un échange personnel enrichissant avec celui-ci. ... Un auditeur compréhensif provoque, chez celui qui se sent écouté et compris, une diminution de la volonté de durcir sa position."[82] If the conditions of isomorphism are not fulfilled the positions continue to diverge, the structures do not meet and understanding remains difficult if not impossible.

If fundamental convergences exist between partners, as much from the point of view of mental categories as from that of presuppositions, even if the symbolism used is not perfectly univocal, the play of interactions permits the nuancing of the understanding of a term up to the point of making it usable as an element in a particular exchange. If the meaning of the symbols derives in a general manner from the cultural ensembles, speech adapts them and recreates them in this manner in practically every conversation. Neologisms or extensions of the meaning appear which eventually rejoin the cultural treasure of the language.

Interdependencies thus continue inside common structures as much as in the systemic interaction relations. But, depending on the case, one or the other situation can prevail, that of integration or that of conflict, that of the division of the implied values or that of the questioning of all that might be held in common.

Normally the significant structures present influence each other by isomorphism. They tend to vary together and to evolve in the same direction, that is to say to transform themselves into a common structure. In order to do that the distance which separates them must not be too great. It is for this reason, without doubt,

[82] D. Anzieu, J.Y. Martin, *Op. cit.*, pp. 134-135.

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that we have certain topics of conversation (the weather, health, business, etc.) which, acting as smaller common denominators, permit the conversation to begin, starting with minimum isomorphisms. Again it is necessary for these distinct structures to evolve at the same rhythm and in a converging manner, that is to say for their spacing to remain reduced, constantly tending towards zero in an asymptotic manner.

Through these similarities and these differences of opinion, entities are continually creating and undoing themselves. According to each individual case they are either encompassing and tend to stabilize themselves according to their own variables, or else they diverge and equilibrate themselves with each other around a theme of interaction according to their force relations. Their greatest security then lies in the possibility they have of avoiding each other. The significant structures are never definitively closed universes. Their differentiation is the function of the conjuncture.

Stability and change

The fundamental relativity of the significant structures is ultimately directed by the manner in which decisions are taken and applied. The structures stabilize themselves or split, integrate or ritualize themselves. Here we reach the heart of all the problems posed by the application of cybernetic models to psychosociological phenomena.

Decision is intrinsically tied to the phenomenon of feedback because it constitutes the crux of the action. It is thus eminently "problem-solving." It is, at the same time, conditioned and conditioning. First of all it depends on the "sense organs," that is to say on the quality of the communicational networks which ensure the continual arrival of information from the environment ("information supply.") Then its quality is directly influenced by the pertinence of the information which is transmitted to it ("appropriacy.") It itself conditions the action in two ways: on the one hand by the choice of the most profitable activity for a mimimum of energy expended ("efficiency,") and on the other hand by its aptitude to adjust or adapt the response to the different situations it encounters ("flexibility").[83]

[83] F.W. Banghart, A.J. Bachrach, E.G. Pattishall, *Ibid.*

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In human phenomena each one of these aspects takes on a new form which, although analogous to that of servo-mechanisms, still presents some radical differences. First of all the flux of information does not depend solely on the good technical functioning of the networks. However, even from this point of view we know how the substitutes can organize themselves,[84] and how there exists a tendency to select constantly the most suitable network both for the people present and for the problem at hand.[85] Much more essential is the fact that the transmission of information is closely tied to the conditions of isomorphism be they of an affective or of a cultural type.[86]

But the pertinence of the information leads to far more complex questions. Whether the communication be intentional or not, verbal or not,[87] the "accurate information" must be able to be extracted from it, whatever the content at the start or whatever the materials: cathartic expressions, technical information or manifestations of participation or prestige. This information can come from the reactions of the partners as well as from the circumstances in which they find themselves. In each case one should take into consideration the difference between that which is articulated at a manifest level and that which remains latent. This latter aspect can eventually prove to be much more important than the first. To top it all the latent can change entirely according to the situation. One should none the less try to apprehend that difference which, by comparison, will furnish the accurate information. Therefore nothing is coded ahead of time, and it would be a serious mistake to trust only the manifest verbal codes.

Moreover, in sociological phenomena, the Other is not just any type of more or less stable material environment. On the contrary, it is always a person who introduces in his response at least as many of his own motivations as echoes of the interventions of the communicator. Thus the communicator can never accurately measure the consequences of his actions on

[84] See above.

[85] C. Flament, *Op. cit.*, pp. 53-145.

[86] See above.

[87] Jurgen Ruesch, Weldon Kees, *Nonverbal Communication. Notes on the Visual Perception of Human Relations*, Berkeley, University of California Press, 1972, (1956).

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Others as can a servo-mechanism (by necessity). Both adjust and adapt themselves to each other simultaneously.[88] To use a classic sociological distinction, the communicator can never entirely distinguish between the functional and the unfunctional in his acts: the analysis must be made again at each intervention.

The Other at the same time conditions the communicator and is conditioned by him. Furthermore, the receiver makes himself into a communicator. He invents his own part while responding to his interlocutor. Every participant in the communication is thus both *condition* and *cause*,[89] "upholder" and innovator (as little as that may be), determined and determining. His intervention is not only the reaction to a stimulus, it is the "response." Thus at each moment of the cycle of interactions the communication is susceptible to modification and diversion with regard to the theme. But even in the unexpected brought about by his evolution, the communicator must be able to distinguish between things in order to extract the pertinent information from them.

In reality, while the exchanges are often multilateral, the interdependencies of which the communicator should keep track are almost always many. The situations are very rarely simple. This multiplicity of interdependencies[90] complicates the analysis that the person must make. This is all the more so when it is not just a question of the links between the scientific laws but of varied and confused responses. These are beings who, at least in principle, are endowed with free will and who are the origin of psychosociological phenomena. Consequently the situations themselves never occur in exactly the same way. They are never more than partially similar, they diverge as much as they repeat themselves. In short, the person is involved in a historical evolution. The environmental stability of a servo-mechanism has given way to the dialectic of history. The situations are no longer reversible, they evolve constantly.[91]

Since the situations are irreversible the analysis of the

[88] T.M. Newcomb, R.H. Turner, E. Converse, *Op. cit.*, pp. 266-270.

[89] Positivism made these two terms synonymous and then wrongly abandoned the second in favor of the first.

[90] Dr. G.A.M. Vogelaar, *Op. cit.*, pp. 67-81.

[91] Alfred Kuhn, *The Study of Society. A Multidisciplinary Approach*, London, Tavistock Publications, 1966, pp. 258-259.

temporary environment will never be sufficient. The feedback will be based as much on that which is given at the moment as on that which can be forseen for a short, medium or long term. But this prediction counts on a certain stability at least of the evolutionary axis of the social system. As change is constant here, this prediction will only be valid if it includes a certain degree of probability. The probability increases in so far as the stability or the finite closed character of the social system increases. It decreases proportionately with the increase in randomness, that is to say that the more "open" the social system is, the more frequent are the confusing events. We are thus far from the predictability and the stability of cybernetic models.

Because of all this the individual is no longer faced with the question of comparing an environment which obeys scientific laws to a code which detects the appropriate and adapted solution. On the contrary the person must observe the environment.[92] The quality of this observation will be in function of the criteria already at his disposal as well as of those criteria which he will invent. His security does not come from the stability of the material universe but from the subtlety of his grid of analysis. He must learn to discover and to recognize the most efficient indicators. The selection of information he makes will be in function of this grid, and can always be challenged. He will proceed to a critical evaluation of the information thus selected, of its advantages and its defects for the future. After this evaluation it will be possible for him to decide, that is to say to operate a choice for the following action. Thus, throughout this decision-making process the person will act in function of the confidence which he has in certain criteria and in certain indicators. When the action necessitates a rapid decision, without delays, the person will choose according to his intuition, and this will be in function of the confidence which the person has in himself. The automaton escapes these moments of consciousness. In an automaton the operations of "decision" are automatic![93]

The responsibility and the irreversible character of the psycho-sociological situations give a new meaning to the notion of time. It becomes more than the mathematical and regular flow of

[92] Colin Cherry, *Op. cit.*, p. 216.
[93] On the phases of decision see Alfred Kuhn, *Op. cit.*, pp. 251-313.

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seconds, minutes, hours, days, months and years. It resumes its qualitative meaning; that of the succession of equilibriums which are always different in their principle. It explains a direction. "Time, we say, has a direction."[94] The significance of the "evenement" must be rediscovered in so far as it is the irruption of the diachronic into the synchronic.[95]

Thus there exists a direct, intrinsic connection between the "responsible" character of the decision such as one encounters in psychosociological phenomena, and the *change*, the mutation which resides in them. For too long now, under the influence of the physical sciences, we have had the tendency to study the stability of social systems, only posing the problem of change afterwards. In fact, with every act carried out within the limits of the possibilities laid down by the existing conditions, the decision can make the society go from a stable situation into change. More exactly, with each act, the society finds itself at the edge of stability or change, at the edge of the synchronic or the diachronic. The question is not to know how stability moves into change but what favors or retards the change, what frees and gives a right to exist to innovation and what increases the weight and the sedimentation of the socio-cultural group.

In this way every human phenomenon and every psychosociological ensemble derives simultaneously from "survival models" and "growth models."[96] "Groups oriented toward survival attempt to maintain their boundaries while obtaining gratification, while growing groups penetrate and extend their boundaries."[97] "..., when conditions are favorable and the operations are effective, the group not only survives but becomes capable of monitoring itself, altering its direction, *determining its own history* and learning how to learn to determine its history —with the consequence that it accumulates and expands its capabilities, or grows."[98]

[94] Colin Cherry, *Op. cit.*, p. 212.

[95] See also the special number of *Communications* dedicated to the "évènement," n. 18, 1972, 200 p.

[96] Karl W. Deutsch, *The Nerves of Government*, New York, The Free Press, 1963. Theodore M. Mills, *The Sociology of Small Groups*, Englewood Cliffs, Prentice-Hall, 1967, pp. 19-23.

[97] Theodore M. Mills, *Op. cit.*, p. 21.

[98] Theodore M. Mills, *Op. cit.*, p. 19, our italics.

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Realizing the situation thus plays an essential part in change. It consists in a certain distance taken with regard to the conditions of the situation, a rupture with regard to these conditions in order to understand them better in their entirety and, consequently, the possibility of changing them. In this way there is no change, in the sense of mutation, except when the individual or the group can escape the material or cultural determinism of the situation. Outside of this capacity for "reflective" abstraction,[99] evolution does not exist, the only things that exist then are involutions and more and more well defined processes beginning from the initial values.

At this level of the hierarchy of beings it is less a question of understanding a content than of "learning to learn."[100] Whereas animals are still dominated by a specialized ability, man is capable of methodology, of epistemology and of criticism of knowledge. Through this apprenticeship complex situations become progressively simpler to explain. When the situation becomes "simple" man can dominate it and, in principle, change it.[101]

But nothing is ever certain beforehand and these possibilities cannot give rise to a blessed optimism. Positive and negative feedback develops its cycle with a certain regularity in cybernetic models because the objectives or the term finalities are clearly given. Man must invent his own finalities. They are progressively constructed in daily praxis with the happy or curtailed outcomes that implies. The finalities are certain ahead of time only in stable socio-cultural ensembles. There they take on a more especially absolute character according to the strength of the drive towards stability. The forced sacralization of integration can here give way to a ritualization of all the relations.[102]

Thus if a man is capable of innovation, of creating, of changing himself profondly, the difficult road of critical objectivity, applied to all that which its pursuit can invent, appears to be but a

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[99] Jean Piaget, "Remarques finales," in XXU, *L'explication dans les sciences,* Paris, Flammarion, 1973, pp. 215-232.

[100] M.W. Pryer, B.M. Bass, "Some Effects of Feedback on Behavior in Groups," in *Sociometry,* vol. 22, 1959, pp. 56-63.

[101] Alfred Kuhn, *Op. cit.,* pp. 254-255.

[102] Howard Becker, "Current Sacred-secular Theory and its Development," in Howard Becker, Alvin Boskoff (eds), *Modern Sociological Theory in Continuity and Change,* S.l., Holt, Rinehart and Winston, 1957, pp. 133-185.

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narrow door which is hardly interesting. *Everything is possible but nothing is given.* A big contrast with the machine whose possibilities are limited but whose finalities are clear and evident. In short, man is an "autonomous" being in the full sense of the word.

There is one last difficulty, that of dimensions. The cybernetic ensemble adjusts or adapts itself to a moving environment with respect to its fundamental variables. It is essentially plastic and homeostatic. Man, before adjusting or adapting himself, tends to change the environment rather than transform himself. He has the tendency to want to inscribe all his dreams and blockages on reality.[103] The cybernetic ensemble controls the environment in order to pursue its own existence as a closed world. Man, from controller becomes a manipulator of the environment.[104] The difference cannot be whisked away in an analogy of scientific models. Man is thus capable of progressively changing exterior chaos into order, of transforming "nature" into "culture" by the mediation of his action, of coordinating more and more numerous and more and more complex ensembles in the always more elaborate organization of his social system.

One immediately sees that this capacity for manipulation of the exterior must be coupled with an aptitude for interior self-renewal. By the distance taken with regard to the structures in which he lives, that is to say by putting himself on the outside, he is capable of transforming these structures, of operating profound mutations on them (which are analogous to biological mutations at the level of genotypes), and of overturning the central values on which the cultural structures are built. Each different culture has its own logic which orders a development process of a different type. Each mutation in these cultures operates a veritable conversion in the development. But this transformation passes through an opening of the ensemble in question. This opening is nothing else but the capacity to look at one's self with exterior eyes. *Involution is tied to the closing of cybernetic ensembles, as evolution is tied to the*

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[103] Robert K. Merton, *Social Theory and Social Structure*, Revised and enlarged edition, Glencoe, The Free Press, 1957, pp. 421-436, chapter XI.

[104] Wilbur Schramm, *Op. cit.*, p. 122.

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opening of auto-determined ensembles. Only the latter are susceptible to "revolutions."

At this level, finally, cybernetic models give out onto a fundamental dialectic. The ensembles concerned here draw on an increase of life. The new syntheses which are the result redefine the universe each time. In a certain way the closure of the universe is also transformed by these. On these higher levels of the hierarchy of living beings—and their superiority depends on nothing more than a large "opening" of the circuits—it is no longer just a question of preserving order in the local enclaves at the heart of the general chaos of the universe, but rather, at each "Aufhebung," it is a question of a rewelling of life, of a new start on new bases. Thus we have arrived at the anticipodes of our point of departure in cybernetic reflection. Certain authors even come to ask themselves if, at these levels, the concept of entropy still has a meaning.[105]

GENERAL CONCLUSIONS

In conclusion this long analysis leads us to ask the question of the closure of cybernetic models. If it is so essential to their definition they are only partially adequate for human phenomena. Doesn't their application falsify the study of psychological facts at least as much as it helps it?

Taking this as a departure point two attitudes are possible where cybernetics are concerned. One can either think that feedback is not necessarily the only cybernetic concept, that it can be prolonged by other concepts such as that of dialectics;[106] or one can conclude that the communicational systems, especially on a human level, cannot be treated by cybernetics and demand an autonomous scientific approach.

Without doubt the hierarchization of levels incorporates a regular decrease of the degree of closure of the ensembles and, similarly, a regular increase of their degree of aperture. But, by insisting too much on similarities or analogies one ends up by masking the differences and the ruptures. Dialectics are more than

[105] Colin Cherry, *Op. cit.*, pp. 212-216.
[106] Prof. Dr. S.T. Bok, *Op. cit.*, pp. 240-241.

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a prolongation of feedback. They are probably its inverse.

Scientific research will settle the question by comparing, in each case, analogies and opposites and by describing the degrees of closure or aperture as well as the limits of the dialectic or feedback phenomena. Theories of evolution could be re-read in this perspective by taking the adaptations and mutations into consideration.

But on the level of the social sciences it seems to us that a more discerning study of closed ensembles or of ensembles in mutation would be particularly useful for the future. This was already the dispute between the natural and the cultural sciences at the end of the nineteenth and at the beginning of the twentieth centuries. Perhaps the argument was too quickly shelved. The analogous theories must be taken for what they are worth or for what they can do and their facile transformation into a theoretical hold-all must be discontinued. Their character is, above all, exploratory. Explanations cannot come entirely from them. The most pertinent theorems of the theory are also constructed by opposition.