Andras Angyal was a Hungarian psychiatrist who settled in the United States in the late 1920s. After a sojourn at the Phipps Clinic, he became Research Director of the State Mental Hospital at Worcester, Massachusetts, but later went into private practice as a psychotherapist and became associated with Brandeis University. At the Phipps Clinic he came under the influence of Adolf Meyer who, more strongly than any other psychiatrist of that time, put forward the view that the individual had to be considered as a social, psychological, and biological whole. This tradition of dynamic holism was strengthened in Angyal’s case by the influence of the early Gestalt psychologists and of Wilhelm Stern (1930) who had introduced a theory of personalism. Kurt Goldstein (1940), who approached neuropsychiatry from a Gestalt viewpoint, was an even stronger influence.

Angyal, however, took a further step than these writers by formulating dynamic holism not only in systems terms but explicitly in terms of a theory of open systems. While the general idea of a system being open to its environment may be traced back to von Bertalanffy (1932) or Kohler (1938)—and some may look for even earlier roots—no one before Angyal (1941) in his book *Foundations for a Science of Personality* (hereafter, FSP), which appeared in the early years of World War II, had stated the open systems concept in a way that showed its central relevance to the biological and social sciences as a whole.

Though within psychology both this book and his later posthumous volume on *Neurosis and Treatment* (Angyal 1966) exercised a considerable influence on the human potential movement, his contribution was passed by when the systems idea came to the forefront in the wake of cybernetics and information theory in the 1950s and 1960s. To remedy this neglect, Trist (1970) presented a brief overview of
Angyal's ideas in a special number of the Revue française de sociologie intended to introduce the systems viewpoint to French social scientists. Sachs (1976) developed these ideas further in a critical evaluation in which he extended Angyal's concept of "relation" on the basis of the work of Ackoff and Emery (1972) On Purposeful System. Very few writers have taken up any of Angyal's ideas at the social level of analysis. Emery (1967) would appear to be an exception in using Angyal's vertical, progression, and transverse dimensions and his notions of pressure, intrusion, and mutual invasion in order to develop a theory of maladaptive social defenses.

In this paper I will present certain of Angyal's ideas that seem to me to have retained their significance, describe my own use of them, and attempt to show how later developments, especially those made by Ackoff and Emery (1972), have corrected some aspects in which they are inadequate.

**Organization, System, and System Connectedness**

The need for a systems approach arises in Angyal's view when the world is regarded as consisting of a set of concrete objects. Each member of a set of concrete objects has being only as a substantive whole; otherwise, it would have no identity, no existence. Sooner or later, any empirical science has to cope with the members of this set in its own domain, whether as atoms, molecules, crystals, cells, brains, organisms, groups, or societies. Angyal is not, however, concerned with isomorphisms that may be found in this series, as general systems theory is, but rather with the fact that, while all concrete objects display organization, each class of such objects is differentiated from other classes by having its own organizing or systems principle. Like Vickers (1984), he thought that "human systems are different."

Wholeness is not simple but represents, in Angyal's phrase, a *unitas multiplex*—a system of interdependencies. It consists in complexity—which expresses organization. Organization is the primary datum when nature—physical, biological, or social—is considered as a set of concrete whole objects. It is organization—and organizations—one has to study if this is the perspective adopted. How far organizational forms may prove to be isomorphic has to be established empirically.

Organization refers to both structure and process, concepts that have created much confusion and, in terms of one of which, to the exclusion of the other, many theories have been developed. Angyal's writings suggest that a structure is a process and that a process has structure. This double character of organization as structure and
process seems to me to be demonstrable on the psychological level by the responses to the artificial creation of random fields:

1. A random perceptual field may be created in the experimental laboratory, as in the classic Gestalt experiments with the “white fog” situation. A spontaneous differentiation then occurs between figure and ground.

2. A random association field may be created in the clinical “laboratory” of the psychoanalytic session. A structuring by unconscious processes then occurs with the patient’s associations.

3. A random group field may be created in the social “laboratory” of the small-group situation. Leaderless groups proceed to establish social structures, however temporary.

The double character of organization as structure and process means that organizations are inherently self-regulating. Organization, the opposite of chaos (randomness), is temporally as well as spatially extended. In his view the organized object resists disorganization.

We must now ask how we may handle conceptually the type of problem arising from irreducible complexity, since this is what organization possesses. The “distinctive competence” of system theory is to offer a conceptual strategy for analyzing the irreducibly complex—namely, the phenomenon of organization. This means leaving the part in the whole and handling relations of interdependence. This requires its own logic and new forms of mathematics.

Traditional scientific method has been developed for the complementary purpose—the reduction of the complex to the simple—by abstracting the part from the whole and analyzing relations of dependence and independence. The logical and mathematical forms that have become classical have been concerned with functional relations.

If the concrete whole object is organized, then a system is a logical representation (or model) of its organization. What then is distinctive about system connectedness? Von Bertalanffy (1956) was content to say: “Systems are complexes of elements standing in interaction.” Hall and Fagen (1956) became more precise but continued along the same line: “A system is a set of objects together with relationships between the objects and between their attributes.” This, which is the usual definition, does not refer the parts back to the whole. It suggests all over again that the system equals the sum of its objects, relationships, and attributes. Summation, however, is not organization, but it is of little help simply to say that a system is more than the sum of its parts.

Angyal’s definition allows the distinctive nature of the system problem to be grasped: “A system is a distribution of constituents with
positional values in a dimensional domain.” The logical model of a system cannot be directly constructed from the concept of functional relationship. Functional relationship is the key concept of the reductive approach. For a systems approach a different concept, such as that of positional value, is required which expresses arrangement and compels reference of the parts back to the whole. The value of parts is what they do for the whole. Their function is its maintenance. Only a whole maintained in this way can relate to an environment. To make possible relations with an environment is the function of the whole. Angyal is, of course, concerned with living systems.

Only, however, through certain properties (relevant attributes) can parts fill the required system positions. This allows relational thinking to be redeployed in the context of positional thinking. The old strategy can be used to reinforce rather than to extinguish the new strategy. Similarly, the new strategy can be brought in when a limit has been reached through the old. At least this is my interpretation. Otherwise, the two approaches would be in contradiction under all conditions. Complementary use would be impossible. The position taken here is that they can be used in the order determined by the problem. A psychologist familiar with the Rorschach inkblot test will recognize this complementarity: the “location” responses represent positional values, and the “determinants,” relevant attributes such as form, color, shading, or ascribed movement.

Codetermination by relevant attributes varies between systems. It is greater in more complex systems that achieve greater “economy” by using more of the properties of the parts. This increases their range of responsiveness. They are able to deal with greater variation from their environments. Codetermination is greater in more open systems, as is the holistic reference of positions.

Angyal was the first writer to make a distinction between system connectedness and functional relations and between positional values and relevant attributes. This was a major advance. As the preceding account has shown, however, he limited the concept of systems to entities that could be regarded as bounded wholes. Such entities are inherently hierarchical as the parts are subordinate to the whole. Whether such a restriction is justified will be discussed in a later section of this chapter. For the present, we shall follow Angyal's usage.

**System and Environment**

Differences between systems can, in fact, only be settled by considering the relation of a system to its environment. Little progress was made in understanding system-environment relations until the
distinction was drawn between open and closed systems. If this is now commonplace and if systems in various degrees and in various ways open to their environments are now taken as the general case, while systems closed to their environments are taken as the special case, it must not be forgotten how radical a development this represented.

Conceptually, the distinction between open and closed systems had been adumbrated by von Bertalanffy as early as 1932, but it took a number of years before equations were found and experiments carried out in sufficient number to make this concept operational in various branches of the biological sciences. Its reference back to physics itself was made operational by the earlier work of Prigogine (1947) on the thermodynamics of irreversible processes. There was, however, little reference to psychology and the social sciences. The advent of information theory concentrated attention, for rather too long, on communications systems based on electronic machines, though this served to show how many “organic” and goal-seeking properties a machine could possess.

A system is usually regarded as closed if no components enter or leave it, open if there is import and export. It became generally recognized that physics and chemistry were traditionally concerned with processes in closed reaction systems leading to equilibrium states with maximum entropy—in accordance with the second law of thermodynamics—and that living systems could not be modeled in these terms. They required the concept of the open system with changing components that could attain a time-independent steady state in which work could be done and with which maximum rather than minimum energy was associated. The organism earned a living by making a net profit in the value of its imports over its exports, a process called negative entropy by von Bertalanffy (1950).

Once the property of “negentropy” became established other properties could follow, such as capacity for growth and “equifinality.” Greater closure of part systems could permit greater openness of the whole so that more complex systems could establish ranges of adaptability far greater than simpler systems. They could extend into wider and richer environments and at the same time absorb the increased uncertainty and variance. The capacity to encode and decode information became critical. On this depended regulation through negative feedback, so that directions could be taken or held, or avoided or discontinued. Otherwise, no “terms of reference” could be set, no missions undertaken. The organism being incomplete—a necessary consequence of being open—had actively to establish and maintain environmental conditions—a domain—which permitted its continued existence. Open system theory began to characterize environmental
context and to conceptualize the interdependence between system and environment.

The above brief account summarizes ideas in good currency in systems thinking in the mid-1950s. Angyal had, however, anticipated most of them in an earlier language. On page 21 of his 1941 book is a diagram that opens the "closed circle of life." On one side, the circle is open for "intake" from the environment and its "assimilation" and "transformation" by the organism; on the other, it is open for "production." The exchanges in both directions are described on the physical, psychological, and sociocultural levels. His argument is against what he called the "immanence hypothesis."

In conceptualizing the interdependence between system and environment, Angyal made a novel contribution by making this interdependence his starting point. Instead of taking two terms "system" and "environment," which he must then relate in interactionist terms, he starts with one, the "universe," which includes them both. This he calls the "biosphere." For Angyal (1941), life takes place in the biosphere rather than inside the organism (or organization):

I propose to call the realm in which the biological total process takes place the "biosphere", that is, the realm or sphere of life. The biosphere includes both the individual and the environment, not as interacting parts, not as constituents which have independent existence, but as aspects of a single reality which can be separated only by abstraction. (p. 106)

His treatment of the abstraction process is basic and merits quotation at length:

The biosphere, although an undivided unit, still is not structureless. It is differentiated along various dimensions. In the biosphere two definite directions can be distinguished: autonomous determination or environmental government. These two directions do not exist independently but only within the biospheric happenings, in other words, as components of the biological total process. Both directions extend to the very limit of the biosphere. At one pole of the biological total process, the autonomous determination is the most potent one, and it extends to the opposite pole in the way of a gradient of decrease. At the other pole the heteronomous factor is the prevailing one which extends as a gradient of decrease toward the opposite pole. The two trends are like two currents of opposing direction, inseparably united in the total dynamics of the biosphere.

According to the dominance of one or the other determinant the biosphere is roughly differentiated into two fields. Those factors which are prevalently under autonomous government constitute the organism or self or subject, while the factors which are prevalently under heteronomous government form the objects or the environment. The words "subject" and "object" express very aptly the difference which I have in mind. "Subject" is that factor which governs, "subjects", the raw environment. "Object"
means that which is "thrown before" the subject, but also that which opposes, offers resistance, i.e., "objects" to the subject's influences. It is the non-system-determined, heteronomous factor. The differentiation of the biosphere into subject and object is the basic organization of the biosphere and forms the foundation for further structuralizations.

The single factors have no fixed position in the biosphere. Processes which, at a given moment, stand prevalently under environmental government may at the next moment come under prevalently organismic government.

Strictly speaking, one cannot generalize and state to what extent a given type of biological occurrence is organically or environmentally governed. The exact value of this ratio can be determined only in specific instances. There is, in other words, a continuous flux between the two poles of the biosphere. (FSP, pp. 101-102)

When a new unit of analysis such as this is introduced, one may expect a major conceptual shift to follow, as with the transition from closed to open systems with which it is congruent. The shift this time is in "root metaphor"—in Pepper's (1950) use of this term—from "mechanism" to "contextualism." This alters the approach to causality from that of "linear causal trains" to "field determination." This parallels the change from functional relations to system connectedness. This does not mean that the concept of causality in the traditional sense is no longer useful; simply that it may now be seen as a special case in a more general theory of contextual determination—as with the concepts of closed systems and functional relation.

Angyal's approach to behavior as consisting of biospheric events is compatible with Lewin's assertion (1935) that

\[ B = f(P, E) \]

or that behavior (B) is a function of personality (P) and environment (E). But to treat behavior in his manner as jointly determined by autonomous (a) and heteronomous (h) factors has the form

\[ B = f\left(\frac{a_1}{h_1}, \frac{a_2}{h_2}, \ldots\right) \]

which more clearly states the problem of the coupling of correlative but independent systems. The values of the ratio \(a/h\) can vary through time and context for any given system. Moreover, as Angyal is at pains to point out, the value of a relative to h increases in complex living systems that expand into their environment and to some extent fill it with their products. People, for example, have come to live largely in an environment of their own making.
Angyal's views on the joint determination of the life process by the organism and the environment foreshadow those of Singer (1947) on coproduction and of Sommerhoff (1950) on directive correlation. As discussed later, these writers took a step regarding the teleological question which Angyal was unable to take. Meanwhile, it may be noted that Angyal's view of the total "biological process" as life-expanding depended on his assigning a positive function to catabolism rather than merely the negative function (the disposal of matter and energy as wastes), which conventional biology assigned to it. More than the simple opposite of anabolism, the primary function of catabolism was for him the mobilization of the assimilated resources of the organism for "production," i.e., adaptive behavior in the environment at the physical, psychological, and sociocultural levels. He contrasts his view with that of Freud who based his idea of a death instinct on the analogy of catabolism as simple breakdown—a definition consistent with the immanence hypothesis.

In the terms of Ackoff and Emery (1972), Angyal treats the organism as a functional rather than a morphological class. As his whole account of organism-environment relations shows, this has major implications for where boundaries are placed. This problem increases in importance as the psychological and social levels are reached as distinct from the physiological level, but the treatment in terms of functional class holds for all levels.

**Models Abstracting in the Direction of the Subject and Object Poles**

A new orientation may be gained if some of the main theoretical schemes that have been used in psychology and the social sciences are considered as abstractions in the direction of what Angyal called the subject or object poles of the biospheric process. Models abstracted in the direction of the subject pole regard all events as being exclusively determined by processes internal to the target system. This is equally the case whether the target system is, at one extreme, an individual or, at the other, a society. In models abstracted in the direction of the object pole, the individual (or group) is reduced to a limit (a boundary condition) to permit examination of the environmental characteristics. However, the individual has to be retained at least as a "point region" (Lewin 1935), since it is, after all, his or her environment that is being examined, a field affected by his or her attributes and composed of objects affecting, and relevant to, the individual. The environment, when abstracted, can be treated as seen by the subject whose...
environment it is or by an external observer. This makes no difference to the direction of the abstraction being that of the object pole in Angyal’s sense.

The models made from the subject pole are of two main types called by Dahrendorf (1967) “harmony models” and “conflict models.” Harmony models are constructed to explain stability; conflict models, to explain change.

Examples of theories concerned with harmony dynamics abound in classical Gestalt psychology—the law of Pragnanz, closure, good continuation, etc. Later Gestalt-derived theories such as dissonance reduction, balance theory, and cognitive consistency are also harmony models. In all of them stabilization is presented as a self-organizing process. The structural-functional approach in sociology is no less a harmony model, particularly as developed in social anthropology by Radcliffe-Brown and his followers. Counterpoint is added to simple harmony in that Durkheim from the beginning considered social cohesion as resulting from the division of labor. Nevertheless, the intent is to show that a society as a whole maintains itself as a going concern through the compatibility of its parts.

Turning now to models concerned with conflict dynamics, we may illustrate from the work of writers as different as Marx and Freud. Marx postulated that internal contradictions in class relations would lead to the replacement of one form of society by another. But this was an immanent process inherent in the dialectic. Freud postulated a primary ambivalence in unconscious object-relations derivable from a dualistic instinct system, which he regarded as the psychological representative of the processes of anabolism and catabolism. Though this led to a positive concept of an id as well as an ego, the underlying premise is again that of immanent conflict.

However dynamic, these theories are based on closed system equilibrium models. Consequently, they cannot relate concepts of harmony and conflict. Stability and change remain incompatible states. A steady state as distinct from an equilibrium is characterized by the simultaneous presence of stability and change. Open system theory, as foreshadowed by Agnyal, can include harmony and conflict in the same model. It would expect them to coexist. If environment and organism each have their own causal texture while interpenetrating and belonging to each other, incompatibilities as well as compatibilities will arise in each system, and heteronomous and autonomous processes will both be present.

Among models based on the object pole, two perspectives may be distinguished—the projective and the introjective. In the projective
perspective the environment is treated as external to the individual (or group), and in the introjective perspective it is treated as internal. Claude Bernard introduced the idea of an internal environment into physiology; Freud introduced it to psychology. As Angyal has pointed out, what is to be regarded as organismic and what environmental cannot be decided morphologically but according to which system is in control.

An example of the projective perspective is Lewin’s field theory (1935)—the person in his or her life space (or the group in its life space). Of interest now become the valences of objects, regions of locomotion, barriers, and the permeability of boundaries. Such contentless dynamics has its own advantages but needs supplementing by a scheme such as the “action frame of reference” of Parsons (1949). The actor is now placed in a situation the content of which is defined in terms of a given social structure and culture.

An example of the introjective perspective is object-relations theory in psychoanalysis. Since Freud introduced the idea of the superego as a system of internalized figures existing in the person but largely outside the ego, psychoanalysts, such as Melanie Klein (1948) and Fairbairn (1952), have greatly extended the idea of an “internal society” invested with unconscious phantasy. An extension of this perspective is the personality-culture approach in which the culture of a society is viewed as internalized by the individual, though not passively carried but actively shaped by him or her (Kluckholn and Murray 1948).

If the difficulty of reconciling harmony and conflict models is that of relating stability and change, the difficulty of reconciling the projective and introjective perspectives is that of relating to each other the external and internal worlds. For Angyal, the traditional difficulties arise only because of the dualism inherent in any conceptual scheme that begins by separating the organism and the environment—thus closing off one from the other. By assuming that life is a function of a total biospheric process, Angyal can regard perception in any of its sensory modalities as a medium regulating the transactions between autonomous and heteronomous aspects. Like any medium, the perceptual apparatus has a degree of error, but in people its outstanding feature is symbolic representation, which creates the “psychological level.” In so doing it allows a new economy because only a part of the total object or state of affairs needs to be represented. It also increases the scope for communication between system and environment, since this no longer needs to be actual.

Angyal considers the function of the psychological level in system terms as follows:
The individual and the environment can now meet on the symbolic, representational ground of psychological functions. In the psychological realm life takes place, not through the interaction of the concrete individual with a concrete environment—which is only tangential—but by the interaction of symbols representing the individual and the environment. (FSP, p. 77)

Symbolism raises system openness to an altogether new level.

The problem of relating theories of stability to theories of change and of the subjective to the objective perspectives has continued to haunt psychology and the social sciences. Burrell and Morgan (1981) maintain that the four historical viewpoints in sociology constitute separate paradigms which only make sense in terms of their own premises. While each has its own truth-value, transparadigmatic traffic is not possible. An open systems framework such as Angyal began to develop shows them to be complementary rather than contradictory and boundary crossing to be required rather than infeasible.

We can now see more fully the implications of Freud’s concept of the ego as an intervening organization between organismic and environmental processes. This concept, unlike his instinct theory, belongs to open systems thinking. The ego coheres and integrates the individual while containing and regulating his or her conflicts. Its growth is the stuff of environmental exchanges (internal and external), its repertoire the degree of flexibility, and its direction the delineation of identity.

The ego does work (consciously and unconsciously), and it is the work process that relates the organism to the environment. This process consists of activities undertaken in the interests of adaptive survival, sometimes successfully, sometimes unsuccessfully, pursued. Once the mediating function of work in this wider sense is realized, the same conceptual scheme can be transferred from the individual to the group—to the “work group” in Bion’s (1961) sense. This permits the examination of a very wide set of human activities in one frame of reference. It allows the inclusion of the technical component whether as person-carried skills or their extension in artifacts. Sociotechnical systems are work systems. Work is the key transaction (behavior) which, by relating an operating individual or group to its environment, allows it to maintain the steady state. Individuals and groups develop “cultures” as mediating instruments that make possible the satisfaction of their needs in their environments.

The necessity of satisfying needs in an environment raises the question of individuals and groups being purposeful systems in the sense of Ackoff and Emery (1972) rather than in the traditional
Aristotelian sense. This will be discussed in the next section. Meanwhile, we may note that Glazer (1984) makes his case for looking at systems in terms of “outcomes” with special reference to Angyal’s views on system connectedness.

**Autonomy and Homonomy**

Angyal asserts that the human life process is characterized by what he calls a trend toward *autonomy*. The organism has to establish itself in terms of its own intrinsic pattern and in so doing attempts to extend its control over its heteronomous environment. It has to lay claim to, enlarge, and protect its own space. Drives and traits of competitiveness, aggressiveness, individualism, mastery, and acquisitiveness all derive from the trend toward autonomy that establishes the independence value of the individual.

The trend toward autonomy is balanced by an opposite and complementary trend he calls “homonomy.” This concerns the ways in which individuals relate to the larger world of which they are a part rather than relating this world to their own needs. The others to whom they relate and to varying degrees surrender may include a loved one, family, a social group, an organization, society, or, at the farthest limit, the cosmos. In developing relations with others, individuals establish their interdependence value which is as deeply necessary as their independence value. In his second book, Angyal (1966) greatly extends his treatment of homonomy, going so far as to say that the individual can achieve personal identity only through and by recognition of the other. He felt his earlier account had been misunderstood, largely because the values deriving from homonomy have been underemphasized in Western industrial societies whereas those deriving from autonomy have been overemphasized. He is at pains to show that aesthetic as well as religious experiences are expressive of the homonomous trend, a point since elaborated by Emery (1977).

In *Neurosis and Treatment* Angyal summarizes as follows:

> Far from being irreconcilable opposites the autonomous and the homonomous trends can be viewed as part aspects of one trend or perhaps as one trend functioning in two directions—downward and upward. To put it abstractly, the human being behaves as if he were a whole of an intermediate order, comparable to the cardiovascular system or the central nervous system, each of which is a whole, an organization of many parts, but at the same time a part of the total physical organism. The human being is both a unifier, an organizer of his immediate personal world, and a participant in what he conceives to be the superordinate whole to which he belongs. His striving for mastery is embedded in his longing for participation. (p. 29)
These two trends, or opposite aspects of the same underlying trend, which can be contradictory under some conditions and complementary under others, are of fundamental importance to his general position. They constitute a novel characterization of the human condition at the level of abstraction he has chosen as his idiom. Yet in FSP (p. 52), he says that these trends are not explanatory principles but generalized descriptions of “the way according to which the life process takes place.”

His reason for insisting on this distinction becomes clear later when he goes on to say that they are directional but not teleological. The concept of purpose obviously created insurmountable difficulties for him.

Nevertheless, in discussing the means-end dimension of personality, he introduces the concept of goals. This puts him in the position of maintaining that a purposeful subsystem can exist in a nonpurposeful total system. He attempts to correct this anomaly by saying that the direction selects the goal—goals for him being specific and subordinate to direction, which is general at the level of the basic trends, which are psychophysically neutral. He felt it necessary even at the cost of inconsistency and self-contradiction to avoid the accusation that his main position was teleological.

Teleology was anathema in the scientific world of the 1940s and the stranglehold of the ateleological position has only gradually loosened since that time. That a man otherwise so in advance of his times should have avoided the teleological issue in the way he did exemplifies the force of the prevailing paradigm.

Except for some very early work of Singer (1924), the search for a conceptual framework that would allow the inclusion of teleology in a language acceptable to science had scarcely begun when Angyal was writing FSP. This was well before the arrival of what Ackoff (1974) has called the “Systems Age.” Apart from the contributions of cybernetics and information theory, those of Churchman and Ackoff (1950), Singer (1953) and Churchman (1961) opened up a path that might have been attractive to Angyal had he known of their work. A rigorous treatment of the teleological issue became available only after his death when the publication of On Purposeful Systems (Ackoff and Emery 1972) repunctuated the field.

In my 1970 paper I had rested content with his notion of direction as a halfway house between an ateleological and a teleological position. Nor did I see any contradiction between talking about goals in their usual place in a psychology of motivation and denying purposefulness to the organism as a whole which represented the total biological process with which Angyal was so concerned.
Even with this realization it took me some time before I could pinpoint a difficulty I still had with Angyal's account of the symbolic function of consciousness (in all its modalities from perceiving to thinking) as contributing the distinctive attribute of humankind. If elementary acts of perception are regarded as having a symbolic component it would be difficult to regard them as species-specific for humans. It would be necessary to identify certain kinds of symbolization that are distinctively human. This led me back to the distinctions made by Ackoff and Emery not only between goal-seeking and purposeful systems but among purposeful systems the special class that they termed “ideal-seeking” and which they regarded as constituting the specifically human attribute.

My position now is that the capacity for ideal-seeking behavior is related to the capacity for conceptual thinking. This latter is a function of the frontal lobes that are uniquely developed in Homo sapiens. If these connections hold good, one would expect conceptual thinking to be severely restricted in patients with diffuse frontal lobe damage. A theory that this would be so was put forward by Goldstein (1934 and 1940) and referred to as “reduction to the concrete.” The results obtained by Trist and Trist (1943) and Semeonoff and Trist (1958), among other experimental work, supported this theory. When given simple sorting tests, such patients could not pick out common shapes if the objects were differently colored or common colors if the objects had different shapes. Even if they managed to sort by similarity in one way they could not shift to sorting by it in another. They could not conceive of alternatives. This requires the ability to abstract from the concrete, and it was this capability that had been impaired. The capability to abstract gives humans the capability of conceiving of possible worlds.

To think of possible worlds is also necessary for thinking about the future which was a capacity also impaired in these patients, as was will. They became distracted when changes were made in their situation, could not sustain courses of action, and experienced what Goldstein called “catastrophic anxiety.”

Some four decades before the futures movement and the reconceptualization of planning as a process began to attract serious attention in the social sciences, J.B.S. Haldane (1924) published a short book called Possible Worlds. This contained the germ of much that was to come, but neither the conceptual nor the empirical work on which this has been founded had yet been done. It may now with considerable confidence be asserted that the capacity to envisage possible worlds and to choose among them is a necessary condition for ideal-seeking behavior and that this in turn depends on symbolization at
the level of conceptual thinking. This, as Angyal points out, has intuitive, affective, and conative as well as strictly cognitive aspects.

Now that these clarifications have been made on the conceptual level, it has become possible to devise methodologies that will consciously utilize and develop a person's capacity for ideal-seeking behavior. Among those that have been tried with considerable success under a variety of empirical conditions are idealized design (Ackoff 1981, Ackoff et al. 1984) and search conferences (Emery and Emery 1978, Williams 1982).

**Couplings and Networks**

Angyal thought of systems as holistic, and his primary concern was to elucidate the distinctive nature of part-whole relations. Nevertheless, it may be asked whether all interrelated entities are holistic in the strict sense that he defined them. This question raises issues that Angyal did not address, such as the tightness or looseness of coupling among system constituents and whether entities may be interconnected without being parts of a whole.

The systems with which Angyal is concerned are what would now be referred to as tightly coupled systems. The body is his constant analogue in which the parts have no independent existence of their own, and by extension, he treats the psychological level of the psychobiological individual in the same way. At the social level, however, as Ackoff and Emery (1972) point out, an organization or group is composed of parts (individuals) which are themselves purposeful systems and have their own independence value. Social systems have a higher degree of openness than the psychobiological systems on which Angyal focused.

Ackoff (1974) introduces a classification of organizations that makes distinctions between what he calls “nodality” and “geneity.” At one extreme is the uninodal homogeneous organization, then the uninodal but heterogeneous organization, next the multinodal homogeneous organizations, and finally multinodal heterogeneous organizations. This series proceeds in the direction of tight to loose couplings. Ackoff refers to multinodal heterogeneous organizations as communities in which the whole serves the interests of the member parts. The members are interrelated in many respects and therefore generate a large system to regulate these relations on their behalf, but this larger whole has no legitimate purpose independent of them, whereas in a uninodal homogeneous organization, such as in a conventional bureaucracy, the parts serve the purpose of the whole (though these parts [roles] include only parts of the individuals concerned). The
same holds true in a more loosely coupled sense in a divisionalized corporation which is a uninodal heterogeneous organization. Multi-nodality introduces the notion of heterarchy as distinct from hierarchy (Schwartz and Ogilvy 1979). With heterarchy we begin to enter the type of organizational space in which part-whole relations in the sense discussed by Angyal no longer hold. It would therefore seem necessary to regard his holistic systems as a special class within a more generic category of systems.

Moreover, since the discovery of the hologram an entirely new concept of organization has arisen in which the whole is contained in the parts. Pribram (1971) has taken this up in neurophysiology as affording a new principle in terms of which the brain, the most complex organization at the biological level, needs to be considered. A number of social scientists have been exploring its relevance to forms of self-regulating organization which appear to be necessary once certain thresholds of complexity are passed. The holographic principle would appear to indicate a new system class which constitutes a figure-ground reversal of that with which Angyal was concerned.

In recent years, the concept of network has come to the fore. It must be asked whether networks fall within the general category of systems or whether they constitute another genus. They are not discussed at all by Angyal.

The concept of network, like the concept of system, has a long history in psychology and the social sciences. In social psychology it was introduced by Moreno (1934) and referred to sociometric choices among individuals requiring the aid of others in critical situations such as escaping from a reform school. In the Regimental Nomination Experiment in World War II, I introduced a network approach myself to increase the flow of candidates to the War Office Selection Boards when a dearth raised fear that the army in Britain could not officer itself (Trist 1985). In social anthropology Barnes (1954) showed the pivotal role of networks in connecting the work and social life of a Norwegian fishing community. Bott (1957) in her book *Family and Social Network* generated a whole literature with regard to the wider social conditions that fashioned kinship relations. Since then interdisciplinary studies in communication have taken over the term with many meanings. The verb "to network" and the term "networking" have become fashionable in innovative groups on the social periphery and those concerned with the implications of high technology. Elaborate mathematical formulation has now developed around these terms in the academic literature.

In its core meaning a network refers to a set of relations between individuals that is unbounded and nonhierarchical. The usage can be
extended to groups and organizations wherever suitable referents can be found. By contrast, the term "system," especially as defined by Angyal, refers to a bounded whole which is hierarchical in that there are at least two levels—that of the whole and that of the parts which are subordinate to it.

The members of a network do not necessarily all know each other. They need not all be actually interrelated, though potentially they may be. The membership is not stable or complete; it may grow or decline. Some of the members may form nodes, and in turn, nodes may form groups or even organizations. Networks may be postulated as having a complementary function to bounded groups and organizations and to have a special role in processes of innovation and change.

Their members are, however, related by some form of common tie whatever this may be—a value, an affinity, a goal, an idea, or a kindred. For this reason the set of relationships they compose or evolve seems to have something "systemic" about it. Having initially thought of networks as nonsystems, I have come to think of them as a class of systems, the opposite of the tightly coupled holistic systems discussed by Angyal. The loosely coupled systems described by Ackoff would occupy intervening positions.

Mathematically, the concepts of system and network may be derived from the same theorem in topology (Rescher 1979). Such a connection is also mentioned by Wilson (1975).3

### Fields

If networks may be included within a generic class of systems, may fields also be so included? My own inclination is not to include them but to reserve the term "field" for one way among others of characterizing a system's environment. Every system has an environment in which, as Angyal says, heteronomous rather than autonomous factors predominate. My suggestion is to use the term "system" when attention is directed to the subject pole and the term "field" when attention is directed to the object pole. Though his thinking suggests the distinction, note that Angyal continues to use the two terms interchangeably. Once he had made his critical a/h distinction, he was not much interested in the analysis of the environment as such.

While system centers on the subject organization, field centers on the environment in which the subject organization is embedded and which it partially creates. Systems may be regarded as generating, or being affected by, fields rather than as being fields in themselves. In conjunction with other systems they produce directive correlations
in the system-environment relationship (the universe or biospheric process in Angyal's sense) which coproduce event-clusters that have field qualities. These directive correlations may be short-, middle-, or long-range and refer to the past and future as well as the present (Sommerhoff 1950). They are temporal Gestalten (Emery 1967).

In Angyal's view, systems are primarily structural: their qualitative attributes are secondary. Fields reverse this order: qualitative attributes that suffuse them as wholes are primary; their structural properties are secondary. The two perspectives are complementary.

While systems may be characterized as holistic, tightly or loosely coupled, or network-like, fields may be characterized by the undifferentiated qualities that suffuse them as wholes. They may be strong or weak in power, greater than or less than as regard to magnitude, quasi-permanent or short-lived, densely or sparsely populated, and of varying texture, stability, degree of obstructedness, conflict, motion, etc. Lewin (1951) has described how as he approached the "region" of the battlefront in World War I, the whole landscape changed in his perception from its ordinary everyday character into "a war landscape." Social climate and group atmosphere are undifferentiated field properties to which he later refers. The alternating unconscious patterns that Bion (1961) found in the emotional life of groups have field properties.

In introducing the idea of causal texture, Emery and Trist (1965) postulated four kinds of qualitatively distinct fields in the contextual environment: the placid-random, the placid-clustered, the disturbed-reactive, and the turbulent. Requirements for adaptation differ in these four fields and become precarious under conditions of turbulence.

The system-states that produce fields, or have field effects, are those that are action-directed, whether the action be actual or potential. This action emphasis characterized the language of field theory as originally developed by Lewin—force fields, power fields, paths of locomotion, barriers, regions of free movement, etc. Later, he approached the problem of change as the unfreezing of an existing steady state and its refreezing at a new level. The language of field theory is transtopological because of the action component. Lewin tried out a concept of hodological space to remedy this but met mathematical objections. Graph theory has since been tried, but its relevance has proved limited. Ordinal treatment of multidimensional qualitative descriptors is usually the most that can be done with the present state of knowledge in approaching measurement of field properties—at any rate, at the human level.

Churchman and Emery (1966) have postulated a duality in organizations:
Any organization, in tying together individuals whose properties are partly determined by their relations to a multiplicity of different organizations, creates for itself a statistical aggregate that has properties of its own—an internal environment with field properties.

Their statement on the dual characteristic of human organizations as structured role-sets and as statistical aggregates of persons exemplifies my distinction between systems and fields, the need to retain two terms and their complementarity. Emery has since shown that, as “ground” phenomena, social aggregates accompany wider social systems even at the level of a society into which they may intrude unexpectedly, either destructively or constructively, as maladaptive defenses or as emergent transformative processes (Emery and Trist 1973, Emery 1977).

Emery and Emery (1976) have further introduced the idea of “the extended social field” to explain the influence of individuals, groups, organizations, events, values, and ideas existing beyond the immediate life space of a given individual:

The network or mesh of interlocking directive correlations implicates the individual’s behaviour, as well as his fate, in events taking place outside his immediate psychological life space. A husband, even while at work or travelling in distant places, is in some ways still implicated in the daily home setting of his wife and the school setting of the children. He is also implicated in conditions existing well back in the past (the past of others as well as himself) as these have created or failed to create present opportunities. Similarly the future becomes immediately relevant as one acts to set in motion chains of joint action that may or may not converge or diverge in the future. . . . The extended social field . . . [reaches] to the horizon of possible human action. . . . The goals served by the extended field seem to be nothing less than the survival of the population of that kind of individual system of which it is composed within the range of conditions that confront them.

To cope adaptively with social fields, social systems have to develop an appropriate response-capability (Trist 1980). Beer (1979) has posed the question: what is a viable system? One answer would be a system that can survive the field effects that it and other systems create in its environment.

The increasing turbulence present in the current world environment has drawn attention to the incapacity of existing social institutions to produce the response-capability necessary for human survival. A new response capability leading to both personal and social transformation seems to be required. This will need to be based on the primacy of symbiotic and collaborative, as compared with individualistic and competitive, relations (Perlmutter and Trist 1986).
Angyal (1966) foreshadowed this shift in values by his emphasis on homonomy which he strengthened in his posthumous book—published when a substantial increase in social turbulence was already beginning to be apparent and, as a result of the stresses induced, the new form of negativistic hysteria he identified was becoming epidemic.

Notes
1. At this early period the role of positive feedback (Maruyama 1963) and of order through fluctuations (Prigogine 1976) in morphogenesis had not been recognized.
2. An alternative treatment is offered by Carvajal (1983, 1985), who relates networks to systems through a concept of “systemic networks” which is linked to an overall concept of “systemic net-fields.”
3. I am indebted to Dr. Stuart Albert of the School of Management, University of Minnesota, for drawing my attention to these references.

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