

# Entering Chaos

## *Designing the State in the Information Age*

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The emergence of the information society has contributed to the increasing relevance of civil society issues, both directly by altering the relationship between the state and civil society, and indirectly by affecting other geopolitical changes that are also of importance to civil society. In the information age, those who hold to romantic conceptions equating the nation-state with states that emerged in Western Europe and North America over the past few hundred years today experience increasing uncertainty and the erosion of the effectiveness of traditional modes of power as vulnerabilities.<sup>1</sup>

An alternative conception, however, can now be developed at the intersection of theories of organizational evolution, second-order cybernetics, and chaos. At this theoretical and historical juncture, it is possible to see the nation-state as an evolving organizational form or system ideally characterized by the self-amplifying causal loops of autopoiesis and morphogenesis and by the holographic distribution of information and decision making. From this perspective, today's turbulence in traditional social and political relations is to be viewed as an experimental period necessary for the transformation required for survival under rapidly changing internal and external conditions. As part of this period of change, there are new ways for civil society to relate to the state.

The approach offered here differs from earlier explorations of systems theory in political science in two ways. First, the most widespread systems theory approach to the study of political matters (Easton 1979, 1981; Martin 1977) was traditionally offered as an alternative to focusing on the state, while here we are treating nation-states as systems themselves. Karl Deutsch (1953) saw the state through the lens of its communication system relatively early. Niklas Luhmann (1985) has gone the furthest in the direction of viewing states as morphogenetic and coevolving systems (though using other terms) in his sociology of law.

Second, our understanding of the nature of systems has also radically changed. As cybernetic theory developed, attention turned away from static toward dynamic systems, away from negative self-amplifying causal mechanisms toward positive, and away from fear of deviance and experimentation to an appreciation of their critical roles. Second-order cybernetics works in tandem with chaos theory when applied to social processes. While W. Ross Ashby (1956, 1964) thus defined survival as stability, Erich Jantsch (1989) sees it as a transformation. Rather than assuming a static and homogenous system oriented to a statistical mean, a morphogenetic system is thought to be dynamic, heterogeneous, and constantly evolving through experimentation and amplification of deviation through causal loops. Rather than being organized in a traditional hierarchical pattern, successful morphogenetic systems disperse information, skills, and decision-making capacity throughout and focus more on lateral relations. Chaos as a process that alternates with order is now the subject of study itself. Last but not least, models of systems undergoing extreme, continuous, and unpredictable change under conditions of constant, extreme, and unpredictable change map particularly well onto current global conditions.

The model of a state as a morphogenetic and coevolutionary system promotes survivability, permits great diversity, and offers fruitful modes of thinking that may provide concrete suggestions to policymakers in times of severe, constant, or unique change or crisis.

In this essay, I introduce and explore basic concepts from second-order cybernetics, chaos, and organizational evolution theory as they apply to the nation-state. I offer general policy principles that emerge from this perspective and explore a range of information policy positions that might result from the application of these principles. Finally, I discuss how such applications might affect relationships between the state and civil society in the information age.

There must also be caveats. The models and metaphors introduced are no more than that and cannot be expected to offer complete explanations or predictions. Of course, there are always problems in transferring models from either the hard or the biological sciences. Concepts such as “the individual” and the relationship between the individual and society—let alone between society and the state—are extremely complex and change their meaning and/or manifestations from time to time in response both to external pressures and internal growth or change. Ideas that seem beneficial can also boomerang—a liberating and self-empowering education, for example, can be turned on its head to become undesirable and undesired training or enforced conformity of speech and behavior.

Predictive failures, weaknesses, and possible distortions of meaning or application do not, however, seem reasons not to examine the range of possible approaches to information policy offered by this way of understanding what are clearly chaotic changes in the geopolitical and information environments. There are several advantages to exploring the possibility of a morphogenetic state. It is a theoretical approach that vastly enriches our understanding of today’s key characteristic—chaos. Chaos is not only incorporated into the model rather than seen as an aberration or entropic feature; it is also analyzed in a positive way, seeking conditions that favor transformation rather than entropic decline as the outcome of a chaotic period. Thus it seems an approach that might also lead to pragmatic responses by policymakers. This seems a particularly useful task in a period when information policymakers are seeking to develop as broad a toolkit as possible to deal with rapidly changing phenomena and processes.

Not all of the concepts introduced below will seem new; rather, they further articulate or refine theories previously introduced in a variety of settings. The idea of self-amplifying causal processes, for example, can usefully enrich a study of Elizabeth Noelle-Neumann's theory of the spiral of silence. The distinction between mutually harmful and mutually beneficial self-amplifying causal processes could lead public opinion research in new directions.

The relatively unmentioned figure in this intellectual tradition is R. Buckminster Fuller, the engineer-futurologist, architect, and philosopher who was a key role model of the 1960s, and whose geodesic domes provided the architectural counterpart to the political, social, sexual, religious, and chemical experimentation of that generation. From Peter Huber's (1987) use of the term "geodesic" to a common emphasis on coevolution (the *Whole Earth Catalog* and its spin-off, the journal *Coevolution Quarterly*, were dedicated to Fuller), one senses a generation struggling to deal seriously and professionally with ideas that may once have been pipe dreams. I respect these efforts, in contrast to the many less favorable responses that have been made along the way.

## THE STATE AND ORGANIZATIONAL EVOLUTION IN THE INFORMATION AGE

### SECOND-ORDER CYBERNETICS AND CHAOS THEORY

Second-order cybernetics is an approach to the establishment, growth, and change in systems that emphasizes self-amplifying causal processes, positive as well as negative feedback, and interactions between systems and their environments (Archer 1982, 1988; DeGreene 1982; Krippendorff 1984, 1988; Varela 1979). Chaos theory, which explores the ways in which chaos comes out of order, and order out of chaos, provides insights into the processes of system change identified by this body of cybernetic theory (Andersen 1988; Gleick 1987).

Morphogenetic systems are heterogeneous, symbiotic, and nonhierarchical. Because they are nonrandom and interrelated, they do not act in ways that follow normal Gaussian distributions—a factor that has kept invisible many morphogenetic processes and phe-

nomena until recently (Maruyama 1963, 1982). While the study of these systems began in the hard sciences, the approach is increasingly applied to the social sciences, both in general (Foerster 1984; Hejl 1984; Loye and Eisler 1987; Maturana 1980; Maturana and Varela 1987) and specifically (Allen 1982; Arthur 1990; Powers 1976). In morphogenetic social systems, the decisions made by individuals or by collectivities representing certain localities affect the evolution of the system and everyone in it. Thus individual actions have a collective aspect that is synergistic rather than merely the economists' sum of the parts.

Morphogenetic systems are organized not around specific objectives (a product) but around the process of self-renewal or autopoiesis (Jantsch 1980, 1989). Several conditions are required for successful autopoietic processes. At the micro level, some autonomy for individual actors from the environment is required. From this perspective, structural processes are important but not completely determinative. Deviance, variety, and experimentation are not just tolerated—they are viewed as elements of a system that is healthy in times of equilibrium and are required for successful change in periods of turbulence.

At the macro level, there must be a degree of uncertainty. Systems without uncertainty are so static that they cannot respond to changing environmental or internal conditions. While such systems may thrive under stable conditions, in times of change they fail. As Cameron and Quinn (1988) and others suggest, these static systems are less effective under today's social, environmental, and geopolitical conditions.

There must also be sufficient redundancy in the system to permit experimentation and self-examination. Redundancy includes both the building in of extra parts or resources into a system and the design of individual elements that they can serve more than one function. In terms of the social and political structure, the need for redundancy suggests both that individuals could be offered the opportunity for education in a wide range of skills so that they can play many roles, and that there should be sufficient resources to permit experimentation

and sustain ongoing social processes. The need for sufficient energy going through the system is implicit in the requirement of redundancy. Self-examination is a special result of redundancy that permits examination of a system's goals, assumptions, or processes as held against norms and allows readjustment should it be required for internal realignment and the building of resonance.

The relations of a morphogenetic system with its external environment, including other systems, are critical for survival; an inability accurately to perceive and respond to various elements of the external environment will lead to an inability to exchange the resources (including information) necessary. Three characteristics of a successful system support healthy cross-boundary relations: adequate modes of information collection and processing; internal decision-making procedures designed to acquire and incorporate information collected from the environment; and the presence of all elements in the external environment, in as structurally complex a manner, within a system (the principle of requisite variety). It is particularly important that complexity and variety are matched within boundary regions. When all three conditions involving relationships between systems are met, evolutionary developments within one system serve as stimuli for developments within other systems in its environment. When evolutionary cycles become coordinated among systems, the process is known as coevolution.

Morphogenetic processes are encouraged in systems that also follow the principle of holographic design, which requires embedding the whole in each of the parts (as genetic information is found in each cell). In combination with the principle of requisite variety, this suggests that every member of an organization should incorporate critical dimensions of the environment with which he or she must deal, so that each can self-organize to respond to demands as they arise. Gareth Morgan (1986) notes that the holographic principle is becoming expressed in organizations through the use of micro-processors, which diffuse information, communications, and control throughout, making many layers of hierarchy (such as much of middle management) unnecessary.

In a political system, holographic design would focus on the potential for organization forming rather than on the organization structure of any given time, that is, one would hope to produce citizens capable of mutually beneficial self-governance, not individuals who in themselves reproduce a given form of the state.

### **ORGANIZATIONAL EVOLUTION**

Born in Frederick W. Taylor's efforts to efficiently organize manufacturing processes during the 1920s and 1930s, organization theory moved away from trying to formally define a perfect organization to trying to understand organizations better. Influenced by the work on morale carried out by social psychologists during World War I and by functionalism, this field shifted away from mechanical concerns toward an interest in human relationships as a key to organizational performance. Organizations thus came to be seen as living social structures.

During the 1920s and again in the 1950s, strands of organizational theory derived from Max Weber's interpretations and developments in sociology joined existing ideas to identify problems with a rational model of organizations, in which there is conflict between the principle of hierarchy and the need to maximize use of expertise, and a trade-off between rigidity and rationality. Strategic contingencies theory looked at organizations as power systems in which structural features interact with, and are affected by, factors that make some participants more powerful than others. Radical organization theory—particularly Marxist theories—tied what happens in organizations to theories of power in society. Others focused on the dependence of organizations upon the environment and on the relationship between elements of the external environment and the internal environment. Until the 1970s, organizational theory thus tended to view structure behaviorally and prescriptively (Mohr 1971).

By the middle of that decade, however, Humberto Maturana was noting that traditional ways of analyzing organizations were inappropriate for the examination of such complex phenomena as paradox. By the end of the decade, organizations began to be seen as

information systems (Brown 1978), and by the 1980s Cameron and Quinn (1988) and J. D. Ford and Robert N. Backoff (1988) were able to point to the paradoxical characteristics of organizations themselves. (They are, for example, both loose-coupling and tight-coupling and incorporate both deviation-amplifying and -reducing processes.) In 1990, however, Peter Monge could still point out that almost no longitudinal information has been gathered about organizations.

Changes in the real world over the last couple of decades have also challenged traditional theories, which were inadequate to explain the processes unfolding as organizations mutated and new problems and issues arose (Crouch 1986; Held 1989; Meyer et al. 1990; Weick 1977). The transnational corporation—made possible only through the use of new information technologies—came to challenge the nation-state in the exercise of many traditional forms of power, such as control over economic and communication flows across borders and control over the national infrastructure (Evans 1985; Dewandre 1986).<sup>2</sup> Research into the nature of transnational corporations shows that their innovative characteristics include more than their global nature, the irrelevance of national regulatory systems, and the consequent lack of concern for the local, which has led to the development of a code of ethics for such corporations. They are also distinguished by innovative decision-making structures with great variety in the relative degrees and types of centralization and decentralization of information storage and processing as well as of decision making (Antonelli 1981, 1984; UNCTC 1981a, 1981b, 1983, 1989). Organizational innovation occurred at all levels as microprocessors were introduced and telecommunications services were deregulated. The impact of new technologies on organizations came to be an area of study both in itself (Barley 1990; Hill 1988) and because of the introduction of a new class into political systems (Duvall and Freeman 1983).

The challenge, therefore, was to develop a model for organizational change or evolution. The Weberian viewpoint was pushed to a provocative edge in the work of Anthony Giddens (1984), who pro-



vided a springboard into cybernetics with its focus on structuration (Archer 1982; Ranson et al. 1980; Willmott 1981; Wittrock and Wagner 1988). Michael Tushman and Elaine Romanelli (1985) find concepts of organizational evolution implicit in works on population ecology, industrial organization economics, strategic management, and organization theory—and they find them “consistent to the point of near redundancy” (188) in their emphases on the alternation between periods of reorientation or recreation (marked by shifts in strategy, distributions of power, and the nature and pervasiveness of control systems) and periods of convergence. Morgan (1986) takes an information-processing approach to transformational models, which he feels necessary for moving beyond bounded rationality in organizations. Because organizations reflect information-processing capacities, new capacities will lead to new organizational forms. Clearly, computers have introduced new capacities, including the possibility of organizing without a physical presence.

The concept of a dissipative structure offers a model of organizations that evolve through a series of transformations in which instability and structural fluctuation generate disequilibria, ultimately resolving, after some experimentation, into new equilibria (Leifer 1989). Kenyon DeGreene (1982) distinguishes several types of disturbances to a system, each of which alone or synergistically could trigger a transformation. A fluctuation is “a seemingly sudden, spontaneous, and often unexpected variation from the average in a variable describing the state of a system” (175). A perturbation is “a change in system structure or behavior imposed by an environmental stressor and associated with a weakening of linkages between subsystems,” while noise is “the small ongoing, random variations at any system level” (175). A catastrophe occurs when “a continuously changing force yields an abruptly changing effect” (183). He notes that differentiation within a previously homogeneous organization can be a fluctuation, as can mutations and innovations. The system itself or interactions between the system and its environment prevent most small changes from being amplified. A dissipative structure itself is a

huge fluctuation stabilized by exchanges with its environment. Dissipative structures, unlike equilibria, may show coherent behavior or appear as wholes.

Gary Gemmill and Charles Smith (1985) describe four critical elements of the nature of dissipative structure systems:

1. *Disequilibrium*. During disequilibrium, change becomes possible because of turbulence, environmental and/or internal.

2. *Symmetry breaking*. In dissipative structures, symmetries are broken when self-replicating or usual autopoietic functioning becomes ineffective or is purposefully suppressed in order that new possibilities might emerge. Unsuccessful replication increases the possibility of change by increasing the degrees of freedom within which change can take place.<sup>3</sup>

3. *Experimentation*. Through experimentation, the system creates new possible configurations around which it can eventually reformulate. Only through play, or experimentation, can true self-design emerge, for there can only be patterned voluntary elaboration and complication of process where the pattern is not under the dominant control of goals and structural constraints. Effectiveness in conditions of uncertainty depends on combining aspects of behavior that would be seemingly unrelated in a framework based on utilitarian values—that is, “inefficient” action is required in order to produce the variants around which a system may realign. The systems that are best able to survive are those which are most open to experimentation as well as the retention of deviants.<sup>4</sup>

In addition to redundancy and sufficient system energy, experimentation requires causal loops that amplify what might be an insignificant or accidental initial kick but builds up sufficient deviation to diverge from the original condition and develop a variant. These self-amplifying causal loops were first described by Heinz von Foerster as the “eigen-function,” a recursive process. He linked together objectivity and subjectivity through this notion, for “what is referred to as ‘objects’ (*gegen-stände* = ‘against-standers’) in an observer-excluded (linear, open) epistemology, appears in an observer-included (circular, closed) epistemology as ‘tokens for stable behaviors’” (1976, 91).

The nature of self-amplifying causal processes is actually more important in determining final outcomes than are seemingly trivial or undetectable differences in initial conditions, an insight from chaos theory that illuminates the importance of self-amplifying causal processes in cybernetics. We know relatively little about these types of processes, and most of what we do know deals with mutually harmful, rather than mutually beneficial, processes. Thus a commitment to morphogenetic principles on the part of the nation-state is a commitment to supporting research in the detection and understanding of beneficial self-amplifying causal processes. Further work will need to be done to translate those findings into policy so that encouragement and support for such processes can be incorporated into the state structure.

Expectations play a particular role in self-amplifying causal processes. The very conceptualization of a set of expectations enters the process both as a goal and as a set of possibilities. While Ernst von Glasersfeld (1980, 1984) talks about the impact of this phenomenon on the sociology of knowledge, Luhmann (1985) uses this point to argue for a continued effort to reconceptualize the state and to communicate those concepts and other policy-making ideas and experiences to others so that they may serve as inputs into various systems that are, ideally, coevolving.

4. *Reformulation.* The final element of the transformative process is the emergence of a new configuration or organizing principle around which the system may reformulate out of the repertoire of possible new configurations developed during the experimentation phase. While the actual reformulation process is taking place, experimental activities must take precedence rather than remaining peripheral system behaviors. All resources must be devoted to supporting the new form, which requires internal resonance or consensus. Dissipative structure changes appear to be orchestrated, simultaneous leaps as the whole system reorganizes around a new preferred configuration.

The "punctuated equilibrium model" currently so in favor in a variety of social sciences (Gersick 1991) focuses on the reorientation periods between periods of convergence, or equilibrium, in a

dissipative structure. Ideally, convergent periods are relatively long, and change is incremental, involving elaboration of structures, systems, controls, and resources toward increased coalignment. Reorientations would be relatively short periods in which all of these elements are transformed into a new alignment (Tushman and Romanelli 1985).

This approach identifies clear roles for organization leadership. During times of convergence, continuity in leadership is to be desired, but innovative leadership from outside is most desirable during times of turbulence and change. What systems theorists call a "strange attractor" is needed around which a new form of self-organization will coalesce.

#### THE STATE AS A MORPHOGENETIC ORGANIZATION

Four historic trends contribute to an interest in reconceptualizing the nation-state within and without the field of political science. First, the bureaucratic welfare state was largely dismantled during the 1980s for a variety of reasons—many perceived as crises—that simultaneously stimulated attempts to use organizational theory to understand and manage this period of change.

Second, the development of new information technologies has led to a wide variety of frustrations for nation-states—widely called in the information policy literature the "vulnerabilities of the state"—as they attempt to exercise traditional modes of power. Examples include the building and management of a government's information infrastructure by a foreign corporation; the inability of national regulation to affect the operations of the global, instantaneous, and twenty-four-hour financial industry; the susceptibility of the information and communication infrastructure to technical problems that could paralyze the government and society; and vulnerability to hackers and computer crime; etc.

Third, the nation-state has been affected by the fact that new information technologies has made possible the emergence of new organizational forms. Internally, experiments are being conducted at all levels of government. Perhaps more significant, externally the com-

petitive environment has shifted dramatically as it has come to include the actions of transnational corporations whose power is often equal to or greater than that of most, if not all, nation-states. This change, too, has prompted much examination of changing institutional conditions, including, in the domain of information policy, particular attention to negotiating techniques and decision-making procedures—boundary and self-organizing activities.

Last, new conceptions of the nation-state are beginning to emerge as a wider variety of states find successful niches in today's international environment (e.g., Singapore), as the range of surviving concepts of the nation-state are adapted to new conditions, and as new theories of the state are developed that, coincidentally, may be directed at problem-solving in what is perceived to be a potentially catastrophic environment.

Weber's organizational view of the state has stimulated many state theorists of a variety of ideological positions (Carnoy 1984; Offe 1977; Owen and Braeutigam 1978; Skocpol 1985). For Weber, states are compulsory associations claiming control over territories and the people within them, or "a set of organizations invested with the authority to make binding decisions for people and organizations juridically located in a particular territory and to implement these decisions using, if necessary, force" (Rueschemeyer and Evans 1985, 47). Raymond Duvall and John Freeman describe the state as the organized aggregate of relatively permanent institutions of governance, or the "superstructural expression of the dominant principles of social organization" (1983, 106).

Weber continues to offer something to those who view the state as an organization because his richness can be understood in different ways when one views it with changed real-world conditions or conceptual models. The systems that Weber had in mind were not morphogenetic in nature, but it enriches this body of theory to return to his general insights. Also, earlier commentators usually tended to focus on Weber's comments regarding the external environment, so that today's relative focus on internal matters is to some extent unexplored territory.

Information flows are important to both bureaucratic and non-bureaucratic forms of power, for data about social and economic conditions as well as about the effects of past policies are important for planning; information gathering itself requires tremendous organizational capacity. Deutsch (1953) defined state power in system terms: Power "occurs in situations of interaction between two or more systems of partly different inner structures which are in part incompatible with each other" (46); or, "power consists in accepting the least amount of non-autonomous change in one system while producing the largest amount of non-autonomous change in another" (47). In other words, power is preserving order in one system at the cost of disorder in another. The exercise of power would thus be potentially antithetical to coevolutionary systems. Deutsch also stresses learning capacity and information gathering from the environment as characteristics of strong organizations.

Aristide Zolberg (1980) emphasizes the importance of the establishment of administrative institutions to the beginnings of the state and describes the coevolutionary processes whereby many states were born and evolved together. Competition that contributed to the process of accumulation (and thus of state formation in Europe) included both military competition and competition in the organization of tax collection. The morphogenetic processes of autopoiesis are identifiable in Zolberg's analysis of the centrality of administrative institutions—improvisation which enabled ever-increasing mobilization of resources on behalf of the political center. Robert Wuthnow (1987), viewing the state as a set of interdependent organizations, is able to identify phenomena such as the North American and European witch hunts of the seventeenth century as border disputes.

For Theda Skocpol (1985), the value of thinking of states as organizations is that it forces attention away from basic features common to all polities and toward the various ways in which state structures and actions are conditioned by historically changing transnational contexts. One result of this approach is that "states conceived as organizations claiming control over territories and people may formu-

late and pursue goals that are not simply reflective of the demands or interests of social groups, classes, or society" (1985, 9). Autonomy, Skocpol notes, is not a fixed structural feature of a state system but can come and go. She alludes to the role of deviation and, potentially, of leadership when she notes that autonomy may arise during times of turbulence or crisis. And she makes it clear that the structural potentials for autonomous action change over time.

Marxist views of the state variously see it as an organization and come closest to the views presented here when the state is seen as a set of administrative institutions that emerge at a certain point in the division of labor (Jessop 1977; Thomas and Meyer 1984). As early as the mid-1970s, Nicholas Poulantzas (1974) saw the decline of the state in the internationalization of production processes. The world-systems approach, developed by Immanuel Wallerstein (1980, 1984) and elaborated by others (e.g., Brucan 1980), focuses on the coevolved whole. Both Marxists and structural-functionalists viewed the state as assuming functions indispensable to the organization of the social system, in the former case to economic needs, and in the latter serving the process of modernization and growing rationalization.

Pierre Birnbaum (1982) describes the ideal state as a "product of profound differentiation, one that facilitates the state's capacity both to institutionalize itself and to reinforce its autonomy" (477). Three types of state autonomy have been noted: when the state acts on its own preferences as they diverge from societal preferences; when the state and societal preferences diverge, and public officials act to bring about a change in societal preferences; and when state and societal preferences are nondivergent, and it is just as plausible to argue that state preferences influenced societal preferences as vice versa (Ham and Hill 1984). Michael Mann (1984) argues that state autonomy comes principally from the state's unique ability to provide a territorially centralized form of organization.

Bonaventura de Sousa Santos (1980) suggests that there are interactions among the three types of state power—rhetoric, bureaucracy, and violence. Importantly, he points out that "the higher the

level of bureaucratic institutionalization of juridical production the smaller the rhetorical space of the legal structure and discourse and vice versa; and the more powerful the instruments of violence in the service of juridical production the smaller the rhetorical space of legal structure and discourse and vice versa" (382). He argues that the rhetorical element has been receding, while bureaucratic and violent elements are growing.

The German sociologist and political philosopher Luhmann has gone the furthest in his prolific and difficult body of systems-oriented work on the state and the law. His work is only now being translated into English, and so his impact should be expected to grow.

### MORPHOGENETIC POLICY PRINCIPLES

A range of basic policy principles can be derived from the concepts described above, dealing with all aspects of the nation-state, including infrastructure, personnel, mode of organizational development, training, relationship of state to civil society, and information systems. These principles fall into three highly interrelated categories.

1. A commitment to organizational evolution—the morphogenetic and autopoietic processes.

2. A commitment to the holographic principle, meaning that every member of society is a knowledgeable decision-maker who has the capacity to be fully politically active.

3. A commitment to high energy and resources—including the necessary infrastructure—sufficient for redundancy and experimentation. Principles that fall into each of these categories are described below, with some attention to interactions among these principles and to their applicability to information policy.

A morphogenetic state would replace goals with a commitment to the evolutionary process. It would treasure—not just tolerate—experimentation and deviance and incorporate a pluralistic attitude toward the range of possible modes of decision making. It would be sensitive to the importance of causal loops and it would start conditions in determining outcomes. And it would be particularly appreciative of, and responsive to, mutually beneficial self-amplify-



ing causal loops and would incorporate structural support for such loops into the state structure and relationships with civil society.

Since the use of memory clearly eases the transformation process, the state has a responsibility to document experimentation, to retain that documentation over time, and to make it universally accessible in accord with the principles of holographic design. There are implications here for collection and maintenance of governmental archives and for access to all types of government information. Decisions about privatizing certain information resources previously held public must derive from basic attitudes toward the relationship between civil society and the state. To sustain archival collection, distribution, and access, there are again demands for infrastructure.

There are high expectations of the educational system. Research has shown that awareness of the nature of the dissipative structure process increases the likelihood that turbulence will be resolved in transformation rather than entropy. Opportunities for education in the information-processing and -distribution skills are needed in order to promote access to the information infrastructure and resources. Education can also encourage individuals to feel capable of effectively acting on important decisions in their environment—to act politically, based on informed decision-making. Last, education can help individuals shift activities, which is required to fulfill not only abstract principles of holographic design but also the pragmatic probabilities of a labor environment in which it is now expected that most individuals will shift careers at least twice in their lifetimes.

The need for a broadband global information infrastructure that is itself universally accessible is clear. Huber (1987) describes today's telecommunications network as revolutionary in its geodesic nature:

The old network had a simple Euclidean structure, with an inside and an outside, and clear divisions between them. The new network is described by the network of fractals, with nodes leading into lines, which lead into more nodes, the pattern replicating itself indefinitely down to the smallest scales. The old network made each link in the edifice utterly dependent for support on

one link above and below. Today's smart switches and terminals can hand off and receive traffic and information from all sides. The old pyramid, with its mass in the center, is being transformed into a geodesic dome, with a profusion of nodes and links unknown in the older architecture, connected around the outside. (6)

The geodesic network is well suited as an infrastructure for a morphogenetic state because it is capable of fulfilling the principles of holographic design, requisite variety, and redundancy. It should also be possible to develop services that would encourage mutually beneficial causal loops. Because the network is global, it has the potential to facilitate coevolutionary processes among political systems. In the brief period of millennial optimism before the Gulf War, this appeared to be happening, particularly in the East European context. Clearly, innovative use of this network and new information technologies by transnational corporations, which are less burdened by constraints on decision-making processes than are nation-states, has already had a tremendous impact on the international environment as a whole and on individual states.

There must be sufficient resources to enable experimentation at a cost that is affordable socially as well as economically. Because of the needs of the principles of holographic design, these resources must be distributed throughout society equitably, and they should be available to serve the autopoietic needs of each person as well as of the whole. Indeed, it is experimentation on the part of the individual that makes possible the transformation of the whole by developing alternatives.

Linked to resources is the need for high energy flowthrough, which must be a constant in a system at all times in order for devisitations to be successfully amplified; insufficient energy flowthrough can lead to an increase in turbulence because it contributes to inadequate performance. It has been shown that innovative communication is most likely to occur in situations in which there is already a high degree of communication, including social/personal conversation. The implication for information policy is to encourage maximized

use of the vast capacity for communication now available globally, again ensuring universal access. It favors making the public network as broadband as possible, ultimately suggesting fiber optics and/or satellite access into the home.

The need for sufficient internal resonance clearly also has implications for handling public opinion as well as any policy dealing with media content, education, public broadcasting, or library systems. A state commitment to morphogenesis also requires general social norms that respect and encourage innovation, creativity, and deviation.

Successful leadership during moments of change requires a combination of several characteristics—willingness to innovate, ability to perceive changes in the environment, and internal and external resonance. Reorientations are most successful with external executive succession of multiple members of an executive team but are more effectively implemented by stable internal executive leadership. Tushman and Romanelli (1985) see middle management in control during convergent periods, while periods of punctuation require executive leadership. Cameron and Quinn (1988) similarly argue that there should be continuity of leadership along with infusion of new leaders.

## **THE MORPHOGENETIC STATE AND CIVIL SOCIETY**

Clearly, there are many elements of such an envisioned morphogenetic state that are not new. Some processes we are used to under other names, such as participatory democracy or universal education or access. There are also limits to viewing the nation-state as a system, morphogenetic or otherwise, such as still-powerful notions of sovereignty with a medieval, Islamic, or other stamp.

The view is useful, however, because it is more complex, multidimensional, and multicausal than earlier system-type approaches; it is responsive to actual changes in geopolitical, environmental, and cultural conditions wrought, to some extent, by the use of new information technologies; and it offers models that map relatively

accurately onto our real-world experience of chaos under environmental and internal conditions of rapid and continuous change. Rather than viewing the state as "vulnerable" in a romantic sense, these moments of chaos are perceived as opportunities for redesigning systems at a time when both the demands upon, and the possibilities for, that system have undergone enormous quantitative and qualitative changes.

The shift from a libertarian state to a morphogenetic state is a narrative shift in person from the third person to the second and first. While the media and information flows are considered critical to the functioning of the state as traditionally conceived in libertarian thought, the role of the press as the watchdog, or fourth estate, is outside the apparatus of the government itself. In a morphogenetic systems, however, review of processes and goals against norms and expectations—true self-examination—is considered a regular part of the process, and a state is envisioned with enough capacity and resources and decision-making agility to design its own parts as part of its healthy autopoietic process. Individuals thus continue to play as active a role as desired in critiquing and experimenting with various forms of government.

Of course, any mandate to continuous change would itself be a totalitarian move, insistence upon active involvement in state making is the potentially fascist side of holographic principles, and so on. In moments of such turbulence that the environment is perceived as "vulnerable," it is, however, useful to have available at least one way of conceptualizing the environment as if it were normal, healthy, and full of opportunities. As Luhmann and others have forcefully argued, the conceptions of the state with which we go into the policy-making process will indicate the possible types of policies considered and the way in which we approach them. And as second-order cybernetics tells us, there is an important difference between mutually beneficial and mutually harmful causal processes. It has been repeatedly pointed out that we know much more about the latter than the former. Since there has always been a link between the needs of the state and research methods and questions, conceptualizing a state

based on mutually beneficial self-amplifying causal processes and coevolution may at least stimulate some research that might lead us in that direction.

## NOTES

1. The term "vulnerabilities" was first used in discussing the new information age by the Swedes, who used the term in a national report in the late 1970s on ways in which society is changing as a consequence of new information technologies (Tengelin 1981).

2. "Transnational," meaning a corporation that operates effectively beyond the reach of the laws of any one nation-state, is here distinguished from multinational corporations, which are headquartered in one state, though they may do business in many. The ability of the transnational to transfer vast amounts of information and information processing, money, and decision-making capability globally, instantaneously, and twenty-four hours a day means that, although in a titular way each will have a corporate headquarters in one country or another, they are able to avoid undesired legal conditions by transferring pertinent operations to more favorable climes. One does not just "do business" with parties in other countries; the various parts of one's *own* business (design, planning, production, marketing, finance, etc.) are scattered about the world and are shiftable, should conditions change. Transnationals are also characterized by the ability to centralize and decentralize decision-making ability quickly and in complex combinations. Multinationals, on the other hand, are much more bound by national laws and, presumably, retain some sense of responsibility to the "public good" as defined by the home nation-state. Relationships between center and periphery tend to be more hierarchical.

3. In biology, symmetry breaking makes possible the carbon arrangements that support life forms. Jantsch points out that the first symmetry breaks concerned the four physical forces of gravity, electromagnetism, and strong and weak nuclear forces. "With the break of their original symmetry, space and time for evolution becomes unfurled" (1989, 12). These symmetry breaks, along with another early one—the slight excess of matter over antimatter—are responsible for formation of the matter world.

4. David Bastien and Todd Hostager (1988) and Eric M. Eisenberg (1990) offer the process of jamming in jazz as a model of successful experimentation.

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