Ecology and Ideology in the General Systems Community

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SUMMARY

This paper gives an account of the participatory, democratic and pluralistic perspectives of Boulding and other important figures in the General Systems Community (GSC). It contrasts their perspectives with the technocratic approach of H.T. Odum, as analysed in particular by Peter Taylor. It argues that GSC's concern with systems in relation to their environment is more complex than simply mediated energy, information or currency flows crossing the boundaries of Odum's systems. This ensures there is no privileged place for an outside observer/manipulator of the GSC system; in fact, the analyst is often part of the GSC system. Moreover, the interactions within GSC systems are not reduced to a simple metric, such as Odum's energy currency.

INTRODUCTION

I begin my discussion of this topic with the opening lines from 'A Ballad of Ecological Awareness,' written by Kenneth Boulding in 1972:

> Ecological awareness leads to questioning of *goals:*
> This threatens the performance of some old established *roles.*
> So to raise the human species from the level of subsistence
> We have to overcome Covert Political Resistance.
> So we should be propagating, without shadow of apology,
> A Scientific Discipline of *Poleconecology.*[1]

I highlight his mention of goals and roles, as these concepts are central in critiques of systems thinking as ideology that focus on the implicit project of scientific management of society. At issue in these critiques is the process by which social and ecological goals are determined. Though written in jest, Boulding's proposal of 'poleconecology', or a political economy of ecology, still reflects the breadth of his systemic conception of ecology, which I contrast with the much narrower focus of the scientific field of systems ecology.

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Kenneth Boulding was one of the founders, along with Ludwig von Bertalanffy, Ralph Gerard and Anatol Rapoport, of the Society for General Systems Research. The Society was founded in 1954 to foster interdisciplinary research into the dynamics of organised complexity in physical, biological, and social systems. In my work on the history of this group, I have been particularly interested in the tension between hierarchical and participatory models of social organisation. While there is clearly a tendency toward manipulation and control in some applications of systems ideas, it is important to acknowledge a significant trend within this movement that supports a more decentralised and democratic approach.

For the founders of the society, the systems view was inherently ecological, in that it was concerned with studying systems in relation to their environment. Systems ecology, as a branch of the emerging science of ecology, has generally been characterised as highly reductionist and mechanistic, representing complex ecological relationships in terms of energy flows and economic exchange and reinforcing a utilitarian and managerial view of the relationship between humans and nature. In contrast, the ecological perspective of the general systems group reinforced a more expansive conception of this relationship. Boulding's work in economics, for example, included a consideration of the sociopolitical and ethical dimensions of both economic and ecological relationships.

In this paper, I will examine critiques of systems thinking in general and of systems ecology in particular, focusing primarily on the work of Howard Odum, and drawing on Peter Taylor's critique of Odum. My primary aim is to suggest that the predominant conception of systems thinking is too limited and does not adequately take into account the range of views represented within the whole movement. Peter Taylor describes his critique of systems models in ecology as a contribution to the development of participatory, rather than technocratic, approaches to socio-ecological studies.[2] I suggest that there are important contributions in this direction within the general systems community that explicitly reject the technocratic vision.

ECOLOGY AND SOCIAL THEORY: FROM ORGANICISM TO THE SYSTEMS VIEW

The systems view emerged out of earlier organismic models that were prevalent in both biological and social sciences during the early twentieth century. Since ecology is generally defined as the study of the relationships between organisms and their environment, it occupies a somewhat ambiguous position in the borderland between the biological and social sciences. Historically, there has been a strong connection between ecological and social concepts, although the social dimension of ecology has been steadily eclipsed during the latter half of the twentieth century, at least in ecology as a science. In his history of the

Chicago School of Ecology, Gregg Mitman discusses the emphasis on cooperation and group selection in organismic conceptions of ecology.[3] For most of the members of this school, cooperation was based upon patterns of dominance and hierarchy. In the context of the Postwar era, organismic holism came to be associated with fascism and the subordination of the individual to the state.

When Arthur Tansley introduced the ecosystem concept in 1935, it was largely in reaction to the organismic holism of community ecology, although, for many, his concept still reflects a holistic orientation. More importantly, it included the study of the inorganic components of the environment along with the living organisms in the community.[4] In this sense, his work reflects the concerns of the general systems group. Like ecology, the general systems view is concerned with whole systems, interactions between the elements that make up the whole, and interactions between any system and its environment. The problem, of course, is that any attempt to represent the whole is bound to be only partial.

The field of systems ecology was established by Eugene and Howard Odum, building on the work of Evelyn Hutchinson and Raymond Lindeman which incorporated ideas about feedback from cybernetics and information theory into the older organismic model. For this reason, the ecosystem concept has ambiguous connotations, as both organic and mechanical metaphor, with both holistic and reductionist implications. However, as systems ecology evolved, with its emphasis on energy flows, it became increasingly seen as a mechanistic model, oriented primarily toward the rational management of the relationship between human and natural systems, and it has often been associated with the intensification of managerial capitalism during the postwar era.[5]

TAYLOR'S CRITIQUE OF ODUM'S ECOSYSTEM VIEW

Most critiques of systems theory as ideology argue that, in the name of objective science, it conceals the interests of its proponents in securing for themselves a privileged role in the management of society. While it may ground its discourse in the interests of the whole, it is really supporting the particular interests of a certain group or class. This is the basis of Robert Lilienfeld's classical critique of systems theory and also of Taylor's critique of Odum's work in systems ecology.[6] While Taylor's critique is valid as it applies specifically to Odum's work, the extension of this critique to the whole body of systems thought fails to recognise the wide diversity of views within the systems community.

Taylor describes Odum's work in systems ecology as a form of 'technocratic optimism,' based on the belief that complex social and ecological problems can be solved through the application of technological knowledge. Taylor argues that the cybernetic theory of feedback mechanisms led to the conception of nature as a machine and that 'a systems approach to understanding nature moved

easily into a systems approach for engineering society'.[7] For the technocrats, such an approach was essentially value free, representing the universal interests of society. It assumed, however, that the complex problems of a technological society could not be solved by a democratic social order, and would require scientifically informed managerial roles. Taylor writes: 'A social feedback system implied the existence of systems scientists under whose controlling hands the system would run for the benefit of the rest of society.'[8]

He uses the following illustration from Odum's book, *Environment, Power, and Society*, to reinforce his critique of the fundamental reductionism of Odum's approach.[9]

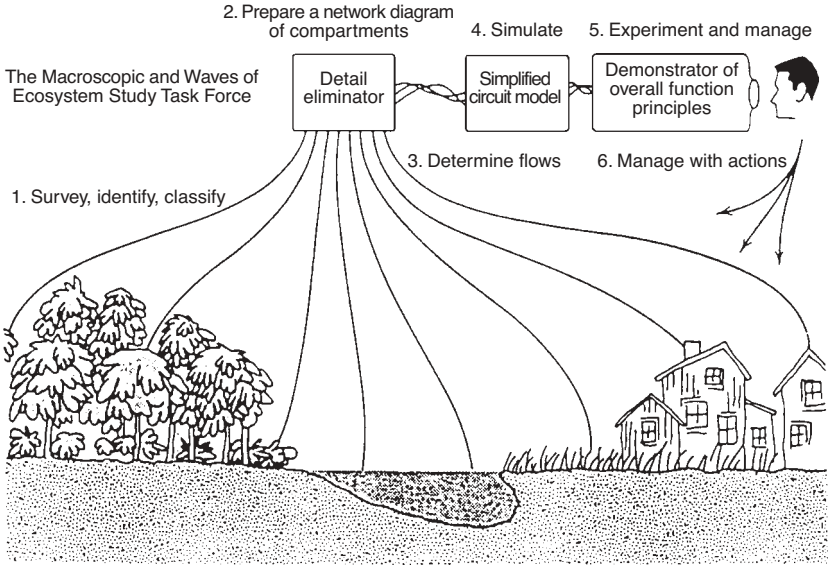

FIGURE 1. Cartoon of the macroscopic view. The detail eliminator simplifies by grouping parts into compartments of similar function

According to Taylor the idea that nature is decomposable into systems implies that the systems analyst has a privileged vantage point external to the system, from which he is able to manage and control it.[10] Further, since Odum's models emphasise system stability, the goal becomes the determination of control mechanisms that maximise the efficiency and productivity of the system in primarily economic terms.[11] This emphasis on stability reinforces a rigid status quo and suppresses conflict or resistance, encouraging individual adjustment and adaptation for the sake of the whole.

ALTERNATIVE PERSPECTIVES FROM THE GENERAL SYSTEMS COMMUNITY

In contrast to Odum's work, the general systems community saw the ecosystem concept as highlighting the importance of understanding the interrelationships between all parts of a system, as well as between the system and its environment, and as fostering a more inclusive view that cannot be encompassed from any single vantage point. General systems theory should be seen as a mode of inquiry rather than a rigid model of nature. For Ludwig von Bertalanffy, who coined the term, it was explicitly anti-reductionist and anti-mechanistic. For him, a systems approach to understanding a problem was an approach which attempted to incorporate an analysis of all the interacting factors in a specific situation. Of course this is difficult to achieve in practice and attempts, such as Odum's, to model these interacting factors tended to be highly reductionist. For others, however, systems theory provided an impetus continually to extend the scope of inquiry, and fostered a more expansive conception of knowledge.

Margaret Mead was an active member of the general systems society. She had also been a participant in the Macy conferences on cybernetics, and like many of the original cybernetics theorists, she considered their approach to be unique in incorporating the observer into the system being observed, in contrast to Odum's representation of the analyst as external to the system.[12] In the following diagram, she and Gregory Bateson explain what they see as the difference between traditional engineering and cybernetic approaches.

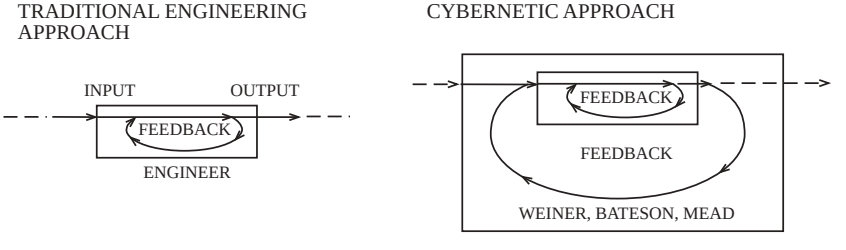

FIGURE 2.

In the first figure, the engineer is clearly external to the system. In explaining the second figure, Bateson uses the term ecosystem, which he defines as 'organism-plus-environment', to describe the cybernetic perspective that includes the observer in the system as part of the environment. This illustrates what the general systems community saw as the epistemological expansiveness of the systems view in contrast to the reductionism of the mechanistic view.

In his 1957 article entitled 'The Political Implications of General Systems Research,' Boulding asks, 'How do "the people" control the specialist?' Explic-

itly rejecting the technocratic vision, he argues that 'democratic theory is based on the assumption that the kind of knowledge required for government is not scarce', and suggests that the 'growing self-consciousness of science itself as a social system' is necessary to avoid the abuse of scientific knowledge and power.[13] Such reflexivity is at the root of Boulding's emphasis on the importance of values in the determination of social and ecological goals, as can be seen in his review of Odum's book, *Energy Basis for Man and Nature*, which echoes many of the themes in Taylor's critique. Boulding writes:

> It is a painful duty to have to report that I think the book is profoundly wrong in its overall view of the world… The basic error is the failure to recognise that all values are human values created by human valuations. Social systems cannot be reduced to physical description whether in terms of energy, entropy, or any kind of physical or engineering efficiency concepts … The Odums are ecologists and ecologists, like many economists, have been obsessed by equilibrium. The real world, however, is an evolutionary, that is disequilibrium, system, and crude equilibrium models of energy flows are only a first step toward understanding it.[14]

Bertalanffy constantly criticised what he called the machine view of nature and humanity, and he was particularly concerned with the potential for dehumanisation that he saw in the technological and managerial applications of systems models. Echoing Boulding, he argued that 'scientific control of society is no highway to utopia'.[15] In addition, he constantly emphasised the limitations of any single point of view. Instead, he hoped to foster a pluralistic perception of the world. As he says, 'all scientific constructs are models representing certain aspects or perspectives of reality.' Such models become dangerous only when they commit the 'nothing-but' fallacy which, in Odum's case, is the representation of ecological relations as 'nothing but' energy relationships.[16]

Although cybernetics and systems theory are generally equated, Bertalanffy made a sharp distinction between the cybernetic view and his conception of living systems as open systems. He was critical of the emphasis on homeostasis and stability that he saw in the cybernetic concept of feedback. For him, it reflected a machine theory of the organism as essentially reactive and contributed to a view of humanity that justified manipulation and social control. In contrast he emphasised the active and self-organising character of human behavior.[17] His concept of open systems was explicitly evolutionary, emphasising the dynamic rather than static nature of interactions. Unlike mechanical systems, whose structure and function were externally determined, open systems were internally determined and self-referential.

Leonard Duhl, who was closely associated with the founders of the general systems society, builds on Bertalanffy's conception of open systems in his discussion of the political implications of ecology. He was critical of models that portrayed ecological systems as closed and rigid systems, which could be used as an excuse for massive control. He writes:

> An ecological model can be twisted into a highly institutionalised and status-quo-oriented approach that negates the essence of ecology – change, and the participation of all segments of a system in the processes through which that change occurs… Treated as an open system, an ecological model for social planning can actually help ensure the survival of democratic procedures.[18]

This open system model of ecology underlies Boulding's work in economics. For him, an ecological view was inherently opposed to concentrations of power. He distinguished between organismic patterns of organisation, which were centrally integrated, and systemic patterns of organisation, which were self-organising, coordinating dispersed agency:

> General Systems should lead to a kind of environmentalism of the mind, a delight in the great variety of the world. It should enable us to see the world of human ideas as indeed an ecosystem, fostering immense variety, and not as an organism demanding subordination to a central authority.[19]

Boulding was critical of overly structured models. In his words, he was 'suspicious of the man with the blueprint'.[20] Furthermore: 'The world is a very complex system. It is easy to have too simple a view of it, and it is easy to do harm and to make things worse under the impulse to do good and make things better.'[21] Again, like Bertalanffy, his conception of general systems theory was based on the acknowledgement of multiple perspectives, and he thought that knowledge that did not take into account a multiplicity of views would be inadequate. 'It is hardly too much to say that if the world is destroyed it will be because decision makers lacked a sense of the general system of the world and only saw things from their own perspective.'[22]

Boulding often pointed out the problems of applying methods appropriate to phenomena at lower levels, to more complex levels of organisation. His book, *The Image*, published in 1956, explored the role of information and knowledge in organisms and organisations. He saw the image as an active internal organising principle that is increasingly important at higher levels of organisation, becoming an essential organising force in society. As he said, at the level of the social system, 'knowledge of the system becomes an important part of the system itself'.[23]

Based on this assumption, the decision-making process becomes the critical focus in the development of social organisations, and Boulding became increasingly concerned with the nature of responsible decision making, which for him required improving channels of communication between all levels of society. He believed that democracy required participation in the decision-making process, and he saw discussion and convergence as the essence of the democratic process, which depended upon adaptable value systems. Further, since all decisions are made in light of some view of the universe, he was particularly interested in understanding the processes by which these views were formed. His work along

these lines anticipates contemporary perspectives on the social construction of knowledge. As early as 1955, he suggested that the belief in scientific objectivity was really dependent upon the value system of the observer.[24]

His concerns are echoed in the work of a number of members of the general systems society. Russell Ackoff, who was president of the society in 1987, emphasised the need to involve in the decision-making process everyone who would be affected by the decision. He suggested that participatory problem solving required changing the role of the professional problem solver from one of providing others with solutions to their problems to one of enabling them to solve their own problems more effectively. He promoted a methodological pluralism, incorporating multiple ways of thinking and multiple views of the world.[25]

Ackoff also acknowledged the increasing interaction between the knower and the known in dealing with social systems. Since individuals cannot be treated as objects, he emphasised the importance of conversational method and cooperative exploration of alternatives, echoing Boulding's emphasis on discussion and convergence.[26] Peter Checkland, president of the Society in 1986, suggested that most problems arise in environments where people have different values, based on particular images of the world. He was one of the first to popularise the distinction between 'hard' and 'soft' systems approaches. In contrast to the 'hard' systems approach, with its emphasis on modelling and quantitative analysis, his 'soft systems methodology' focused on the clarification of values and perceptions, based on the idea that 'social reality is not a given but is a process in which an ever-changing social world is continuously re-created by its members'.[27]

While even 'soft' systems analysts still tend to function as professional problem solvers, often in the role of management consultants, there is a continual effort to clarify and evaluate their own values and assumptions within the context of their work with individual clients. Many systems consultants within this tradition are aware of the dangers of assuming a privileged role, and tend to portray themselves primarily as educators and facilitators. While they possess expertise in the methodologies of systems analysis, they do not see themselves as possessing superior authority, and generally seek to foster participatory analysis, using the various analytical and heuristic tools developed within the 'soft' and more recent 'critical' systems approaches.[28]

CONCLUSION

The tension between expert knowledge and the democratic ideal continues to escalate as the world becomes increasingly interdependent, raising difficult issues of incompatibility between different cultural values. Perhaps there are irreconcilable conflicts between different ways of viewing the world, although such a position can itself be seen as an ideological stance. In *The Postmodern*

Condition, Jean-Francois Lyotard points out that, during the last century, there have been two basic representational models of society, one which sees society as a functional whole and another which sees it as fundamentally divided. The first he associates with positivism and instrumental rationality. The second, which he says is 'wary of syntheses and reconciliations', he associates with reflexivity and a consideration of values.[29]

Clearly the concept of a 'functional' whole lends itself to utilitarian and mechanistic interpretation. There are, however, many different ways of conceiving of 'wholes'. An inclusive 'holistic' conception would incorporate a multiplicity of perspectives, and would support a conception of dispersed agency within that whole. Critics of holism tend to see the assumption of coherence inherent in the concept of 'wholeness' as coercive or controlling, repressing the conflict they see as inherent in the multiplicity.

From the critical perspective, the system concept itself becomes a tool of oppression. And it is important to acknowledge that there have been abuses in the name of the 'system'. On the other hand, it is also important to acknowledge the possible contributions of a more integrated and holistic way of looking at complex systems. Boulding wrote, 'It is … important to look at the earth as a total system in which only a tolerant ecological view can save us.'[30] While there are many who would object to the language, the concept of the earth as a total system implied for him the necessity of considering social and ecological problems from a global perspective, which included different ways of looking at things, with no one, privileged perspective.

Critique that pushes back the boundaries of inclusion serves the purpose of expanding the conception of the whole. If I might be pardoned a parody of the Tao Te Ching, the system that can be modelled is not the whole system. However, systems models can provide a useful tool if they are supplemented with a continual re-examination of the values and assumptions upon which they are based. Some models clearly emphasise control. Others, however, which take seriously the interactive nature of social and ecological systems, foster a more participatory and inclusive conception of social organisation.

NOTES

[1] From Beilock 1980, p. 164. (Originally published in M.T. Farvar and J.P. Milton [eds] 1972. *The Careless Technology: Ecology and International Development.* Garden City, NY: Natural History Press.) The emphases are mine.

[2] Taylor 1992, p. 142.

[3] Mitman 1992.

[4] See Hagen 1992, p. 136.

[5] There are a number of writers who portray systems ecology as a movement which pointed the way toward a new rationalistic approach to the management of nature. See Hagen 1992; Golley1993; Worster 1977; and Kwa 1993. There are also numerous references in Peter Taylor's work which will be discussed subsequently.

[6] See Lilienfeld 1978; also Taylor 1988.
[7] Taylor 1988, p. 223.
[8] Taylor 1988, pp. 234, 237. See also Taylor 1991.
[9] Taylor (1991), p. 291; from H.T. Odum 1971. *Environment, Power, and Society*, New York: Wiley-Interscience, p. 10.
[10] Taylor (1991), pp. 274, 285; also Taylor (1988), p. 220.
[11] Taylor (1988), pp. 222, 225, 227, 230.
[12] Brand 1976. See also Heims 1991, on the development of the second cybernetics.
[13] Boulding 1961.
[14] Boulding, Kenneth 1977, in *Friend's Journal*, **23**(9): 276-277.
[15] Bertalanffy 1956.
[16] Bertalanffy 1962.
[17] Bertalanffy 1968, pp. xix-xii, 23.
[18] Duhl et al. 1970.
[19] Boulding 1985.
[20] Boulding 1956, p. 129.
[21] Proceedings of the 7th Friends Association for Higher Education Conference, Malone College, 1986, p. 4.
[22] Boulding, Kenneth, 'The Boulding's Eye View of General Systems', (in Boulding Collection, University Archives, University of Colorado, 'Unpublished Papers,' no date), p. 16.
[23] Boulding 1962.
[24] Boulding 1971. Concrete applications of Boulding's systems perspectives were most clearly evident in his work in peace research and conflict resolution, which grew directly out of his lifelong involvement in the Quaker community, with its commitment to participatory democracy.
[25] In Cavallo 1979, pp. 38-9.
[26] Cavallo 1979, pp. 47-50.
[27] Checkland 1981, pp. 17-20. See also Checkland 1990.
[28] The most interesting work in this regard comes out of the 'critical' systems approach based on the work of Michael Jackson at the University of Hull in Great Britain. There is a n evolutionary progression from Ackoff to Checkland to Jackson, each building on the former's work in attempting to more fully actualise the ideal of participatory decision making in practical contexts. The greatest difficulty is often the disparity between this ideal and the desires of clients, generally corporate and government managers, who often favor more authoritarian approaches to decision making. For an excellent overview of current work in this tradition, see Ellis et al. 1995; also Flood and Jackson 1991.
[29] Lyotard 1991.
[30] Boulding 1985, p. 11.

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