Darrell Arnold (ed.)
Traditions of Systems Theory: Major Figures and Contemporary Developments.
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If philosophers have generally been ignorant or scornful of the influence of cybernetics and systems theory, *Traditions of Systems Theory* will do little to change this. The field has lost the importance it once held, and newcomers often feel confused by unfamiliar traditions, authors, and methodologies. This book has all of these qualities, and succumbs to all the typical critiques of cybernetics: its focus on holism, misapplication or inappropriate extension of theories and methodologies from outside fields, a computational and mechanistic view of humans and society, and so on. Despite these misgivings of the field more generally, this volume is a valuable resource for philosophers and historians interested in an important twentieth century socio-technical movement. Often too specialist in scope and approach, and with some chapters of uneven quality, this volume nonetheless offers a comprehensive view of cybernetics' past, present, and future. We would do well to remember, after all, that cybernetics gave us the analytical tools for our Information Age, massive developments in military technology, and practically launched the entire field of cognitive science.

Cybernetics is the study or praxis of the isomorphism between 'systems' (hence the name 'systems theory', although there is no consensus on the appropriate terminology). In practice, cybernetics has come to focus on a set of mechanisms or methodologies: feedback loops, epistemic blind spots, and autopoietic mechanisms. The scope of cybernetics is extremely broad, covering anything included in 'a set of elements standing in interrelations' (10). In popular culture, the term 'cybernetics' is associated with Herbert Wiener's 1948 publication of his influential book of the same name, and the multidisciplinary Macy Conferences from 1946 to 1953.

Cybernetics might function as the secret history of the twentieth century, suggests editor Darrell P. Arnold in his opening chapter. *Traditions of Systems Theory* describes the development of cybernetics from its early version in Ludwig von Bertalanffy's work through to its apex in post-War research (the most enduring of which is Claude Shannon's work)—and ultimately, its waning influence today. We are reminded that 'systems theory' goes back to Bertalanffy, and 'cybernetics' is traced to the Greek word for governing, or steering. In Europe, an updated version of cybernetic thinking still exists, read through popular authors such as Ilya Prigogine, Niklas Luhmann, Humberto Maturana, and Francisco Varela. Nonetheless, many of the authors in this volume realize that cybernetics has failed as a viable research programme (11).

The volume progresses more or less chronologically, opening with the early history of cybernetics and concluding with some directions for the future—with an excursion on sociological thinking sandwiched in the middle (and in the case of the chapter on Wallerstein, showing how systems theory can be quite unrelated to cybernetics). Arnold provides useful summaries for each of the volume's three parts, as well as an introductory overview.

Part One is the most uneven of the sections, and most likely to be of value to specialists in the field. Philipp Schweighauser provides an excellent overview of Claude Shannon's influential 'A Mathematical Theory of Communication'. Schweighauser offers a dose of caution to would-be multidisciplinary cyberneticists: Shannon's theory of information was designed in a technical

context, to solve issues facing his fellow engineers at Bell Telephone Laboratories. Despite this origin, and Shannon's subsequent words of caution, the theory of information was readily adopted by cybernetics for use outside of engineering—in studying physics, biology, humanities, and the arts. Yet, the adoption of Shannon's work was crucial to the cybernetics program, according to Wiener, because it opened up the larger field of 'probabilistic theory' (30). For the followers of cybernetics, this enabled the study of control and learning systems such as feedback or homeostasis. Schweighauser points out that more recent work in cultural and media studies adopts, and yet problematizes, Shannon's earlier work. Influential European authors such as Friedrich Kittler, Jacques Attali, and Michel Serres have made productive use of Shannon's work in far-flung fields, especially as it relates to order and noise.

John Bruni's chapter on the influence of the Macy Conferences continues to trace the legacy of Shannon's information theory. In his short chapter he follows N. Katherine Hayle's influential view that the Macy Conferences launched a new way of studying human beings as 'essentially similar to intelligent machines' (78). Bruni's contribution, unfortunately, is situated between the volume's two weakest chapters. Though Ranulph Glanville's chapter nicely problematizes the relationship between cybernetics and systems theory, it's a sales pitch for a return to a full-blooded cybernetics. Glanville argues that we should apply 'mechanisms of circularity' (66) to our research, in the form of recursion, reflexion, self-similarity, and eigenforms (or self-reproducing processes). This plea for radical holism is exactly why cybernetics has so little influence today, contributing to the impression that cybernetics is not a rigorous approach. Additionally, David Pouvreau's chapter is a highly specialized discussion of Bertalanffy, a topic of interest only to historians of cybernetics. And, at fifty-three pages, this attempt is double the length of the next longest chapter, seemingly translated from the French in Pouvreau's dissertation (with grammatical and rhetorical issues).

The remainder of Part One focuses on specific authors of the history of cybernetics. Bernhard Pörksen and Joel B. Hagen describe the work of Heinz von Foerster and Eugene Odum, respectively. These two authors developed key concepts for cybernetics, but neither is well known outside of the field. Von Foerster developed an epistemology of second-order cybernetics. Like Glanville's pitch for mechanisms of circularity, von Foerster focused on the obligation to be conscious of one's own idiosyncrasies and (literal and metaphorical) blind spots. Hagen describes how Odum applied cybernetic thinking to biological systems and developed a theory of self-regulating, homeostatic ecosystems. The final chapter in Part One describes the challenging thought of Humberto Maturana and Francisco Varela. Maturana and Varela are most famous for their concept of autopoiesis, which Bob Mugerauer frames within the context of first, second, and third-order systems. As Mugerauer describes it, autopoiesis is an epistemological and ontological view of living systems that are strongly self-constituting. These self-constituting systems are internally dynamic and homeostatic, but in a later work Maturana argued for interplay between liberal subjects that opens a 'space of common reflection … [and] cooperation' (166).

In Part Two, the focus shifts from a historical discussion of cybernetics to recent work in sociology and political science. Bettina Mahlert and Walter Reese-Schäfer offer careful summaries of two classic, if not contentious, sociologists, Talcott Parsons and Niklas Luhmann, respectively. W.L. Goldfrank introduces Immanuel Wallerstein's thought, now considered basic reading for political scientists (and also deeply criticized).

Parsons is famous for laying the groundwork for structural functionalism, but he also developed a less well-known theory of action. Parsons' theory of action is derived from a cross-

tabulation of a fourfold scheme called AGIL: Adaptation, Goal attainment, Integration, and Latent pattern maintenance. Parsons' rigid adherence to this idealized, combinatory method brought criticism during his lifetime, but as Malhert points out, proved influential to both Luhmann and Wallerstein.

Part Three of the volume extends the preparatory groundwork of the prior chapters to new and future areas of research. These chapters have to work the hardest, as scrappy underdogs extolling the virtues of the long-forgotten (or dismissed) cybernetic movement. Cybernetic thinking is extended into challenging territory: Andrew McMurry on literary theory, Raphael Sassower and Nimrod Bar-Am on digital culture, Peter Finke on ecology, Dorothea Olkowski on chaos and complexity, and Debora Hammon on management theory.

One possible theme of these final chapters is Hayles' influence on contemporary extensions of cybernetics. McMurry mentions Hayles' work on literary theory, and while the chapters by Sassower and Bar-Am and Olkowski do not explicitly reference Hayles, they could have. McMurry criticizes literary theorists who remain disdainful 'of concepts drawn from fields that a) use mathematics or b) build robots or c) theorize business management' (264). Not so with Hayles: her *My Mother Was A Computer* (2005) is keenly aware of these approaches. Or consider, perhaps, her focus on 'how we read' in light of human and technic coevolution—technogenesis—in *How We Think* (2012). Sassower and Bar-Am use cybernetics as a stopgap against reductionist and mechanistic approaches to digital systems, perhaps echoing Hayles' analysis of Karl Sims' 'Evolved Virtual Creatures', as evolving, feedback looping, translating, and adapting. Furthermore, the omission of a reference to Hayles in Olkowski's chapter on chaos and complexity feels almost purposeful, since Hayles made her name with two early books on chaos and order.

The volume concludes with a verbatim transcription of a Skype discussion between Nora Bateson and Phillip Guddemi, predominantly lamenting the limited influence of Gregory Bateson and the Macy Conferences. The capstone, or tombstone, of cybernetics and systems thinking is given by Bateson: 'I think that's one of the reasons that there was a lot of sadness at the end of Gregory's life. He felt that cybernetics was the most valuable contribution to the twentieth century … [but] when you mention it to people, they have [only] some vague notion' (355). I doubt *Traditions of Systems Theory* will change this perception—cybernetics really is dead—but this volume is worthwhile (with some reservation) for those wishing to gain deeper insight into an important twentieth century multidisciplinary research programme.

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