

positions in regard to information and communication technologies that Negri had articulated in *The Politics of Subversion* and in various articles during the 1980s and early 1990s.

Particularly the first four chapters and the final, ninth chapter, of *Cyber-Marx* provide an excellent introduction to Negri's work and for understanding the work of other, akin, Italian theorists, such as Paolo Virno and Maurizio Lazzarato, on the topic of the social meaning and importance of information and communication technologies today. [Dyer-Witheford's book, together with many of the primary texts in Virno and Hardt's collection *Radical Thought in Italy: A Potential Politics* (University of Minnesota, 1996), form a nice core introduction to autonomous Marxist thought on this topic.] As Dyer-Witheford explains, information and communication technologies are understood by these theorists in terms of Marx's discussion of "general intellect" in the latter's *Grundrisse*. The concept of "general intellect" in Marx refers to a moment in the development of capital when the dominant means of production are to be found in the social relations and the intellectual capacities of the workers (an early premonition of the dominant social conditions for production in so-called "information economies" or what is often termed, "post-Fordism"). Dyer-Witheford neatly and skillfully argues for how class-recomposition occurs at the moment when it seems capital has most penetrated into everyday life in the form of attempts to incorporate all of social relations, affect, and language into capital production (i.e., as "social capital"). As capital becomes more dependent on the "knowledge-economy" and on technologies that link workers, however, it stretches and undermines its traditional controls over those workers. Dialectically, class recomposition follows on the heels of capital's overextension, this time resulting in a "class" that goes far beyond industrialism's "working class."

In addition, Dyer-Witheford's book argues that newer information and communication technologies provide a means for constructing global social organizations outside the capitalist/neoliberal framework of "globalization." Today, we can see the fruits of such organizing in the so-called "antiglobalization" (really, counter-capitalist globalization) protests and the role that "autonomous" Web-sites play in organizing these highly mobile and diverse political forms into other models and means for globalization.

Dyer-Witheford's book is an excellent introduction to Antonio Negri's work, and it is an excellent introduction to the political theory of the "antiglobalization" protests. It takes the reader through difficult French philosophy and Italian political theory and history beginning in the 1960s and 1970s, and shows how concepts developed out of that theory and history reach through the 1980s and into the present day. The book's bibliography is quite exhaustive of relevant, particularly, English and French sources, and it is useful for research. The book's clarity of presentation makes it quite useful for academic classes in the social and cultural studies of information and communication, in classes on the political economy of information, for classes in knowledge management, critical management studies, history of information and history of communication, and for LIS foundation courses. Generally, this book is very useful for individuals and academic classes interested in the political, social, and cultural meaning of recent information and communication technologies. The book is rich in content and reads easily.

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DOI: 10.1002/asi.10022

A Sociological Theory of Communication: The Self-Organization of the Knowledge-Based Society. Loet Leydesdorff. Parkland, FL: Universal Publishers; 2001: 351 pp. Price: \$29.95. (ISBN: 1-58112-695-6.)

In this book, Loet Leydesdorff sets out to answer the question "Can society be considered as a self-organizing (*autopoietic*) system?" (p. 1). To do so, Leydesdorff confronts the traditional problem in sociological theory, namely the integration of individual action into the social structure without losing the essence of either. In the process, he develops a general sociological theory of communication, as well as a specific theory of scientific communication designed to analyze complex systems such as the European Information Society. For his efforts, Leydesdorff is most successful in developing his general theory of communication, reasonably successful in deriving from it a theory of scientific communication, and least successful in applying the latter theory to the study of an emerging European Information Society.

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The book is organized into 10 chapters, each corresponding to a previously published article (for a list, see p. viii). Fortunately, there must have been some rewriting involved, because the book reads mostly as one work rather than as a collection of related articles masquerading as a monograph. The 10 chapters are organized into an introduction (Chapter 1) and three parts. Part One ("Sociological Reflections") contains "Towards a Sociological Theory of Communication" (Chapter 2), "The Evolution of Communication Networks" (Chapter 3), and "The Non-Linear Dynamics of Sociological Reflections" (Chapter 4). Part Two ("Is Society a Self-Organizing System?") contains "New Perspectives on Empirical Theories" (Chapter 5), "A Triple-Helix of University-Industry-Government Relations" (Chapter 6), "The European Information Society" (Chapter 7), and "Regime Changes and Sustainable Development" (Chapter 8). Part Three ("Philosophical Reflections") contains "Uncertainty and the Communication of 'Time'" (Chapter 9) and "The Expectation of Social Change" (Chapter 10).

The first five chapters are devoted to laying out the goal of the book, reviewing the extensive literature, and developing a general sociological theory of communication. The special theory of scientific communication is derived from the general theory in Chapter 6. Chapter 7 is an attempt to demonstrate how the theory of scientific communications might be applied in an empirical study, in this case to detecting an emerging European Information Society. This chapter is the least successful and satisfactory of all the chapters. It is not well integrated into the flow of the book, perhaps retaining too much of its original form as previously published. Chapter 7 is the least well developed chapter, leaving one with the sense of being dropped into the middle of a presentation that suddenly stops before any useful or enlightening conclusions are drawn. Chapter 8 is a further elaboration of the implications that Leydesdorff's theory of scientific communication will have on the methodologies of future empirical research. This chapter is rather sketchy, and leaves much to be desired in terms of useful insights into designing methodologies more in line with these two new theories. The final two chapters bring together the work of the first five chapters and further amplify and clarify both theories of communication, particularly in terms of "time" and "uncertainty." The book concludes with a 15-page bibliography, an index of authors cited in the text, and a subject index.

The body of the book is illustrated with line drawings, charts, and tables of varying utility. Most are useful in clarifying a concept

(e.g., Fig. 5.2, p. 146) or in supporting an argument (Fig. 6.2, p. 191), while a few seemed superfluous or pointless (e.g., Fig. 4.1, p. 130). Several figures contained errors or omissions. For example, the values for Sweden, France, and The Netherlands referenced to Figure 7.6 (p. 231) in the text do not appear in the figure, while the labeling for Figure 7.7 (p.232) and the text references to it do not correspond well and are confusing to sort out. The production values for the illustrations are uneven as well. Most of the illustrations are well done (e.g., Fig. 5.3, p. 148), with a few are not (Fig. 3.4, p. 102). The lack of a list of illustrations makes these problems all the more annoying. Fortunately, the quality and the accuracy of the vast majority of figures and tables are good, which makes up for the few that are not. The text of the book is very clearly and cleanly written, and the concepts fully explained using a minimum amount of discipline specific jargon and quantification. With the exceptions previously noted, the presentation is thorough and in depth.

Leydesdorff's general theory draws on existing theoretical sociological models. The models most heavily used are those developed by Niklas Luhmann (self-organizing social systems), Jurgen Habermas (communication as social action, uniting individual action, and social organization), Claude Shannon (information as uncertainty), and Anthony Giddens (structuration, social structure based on the dualism of action theory and institutional analysis). For Leydesdorff, the relationship between the individual and society is one of actors and networks, each existing as a separate system that nonetheless "operate in each other's environment, and over time" (p. 155). Actors and networks are "structurally coupled while each performs its own operation" (p. 158). Actors function as the network nodes, while the network links the nodes. Actors/nodes communicate with each other via the network. Communication is required for the network to survive. Networks that cease to communicate cease to exist. It is communicate or die. Even so, the participation of each actor/node in the network is not required, as communication "patterns can be maintained in the network over time," even when some of the actors/nodes have stopped functioning or have been replaced with new actors/nodes (p. 159). "Each change in the network requires action" at the local actors/nodes, "but the system of reference for the change is the network" not its constituent actors/nodes (p. 159). This results in a system with memory, albeit a virtual one that is "physically located in the actor" (node) (p. 159).

The communication process is generated by the network when one or more actors/nodes create a "disturbance" by acting (transmitting "information" as defined by Shannon) through the network (p. 159). Frequent communication causes the network to grow and become more complex. Because the communications process can include communications about communications, the network can become self-referential ("self-reflexive"), the result of a "recursive operation of structure upon the information previously contained within the network," within its virtual memory (p.159). Because the communication system is made up of decentralized actors/nodes, communication is "distributed by nature," and therefore, "contains uncertainty" (p. 160).

Networks contain not only information (as per Shannon), but also meaning. For meaning to exist, it requires an actor/node that can "receive the message [via the network], deconstruct it with respect to the expected information, and assess this information reflexively with references to its own structure" or perception of its own place in the network (p. 174). Thus, if a system can "position messages reflexively, it is able to give the messages meaning; if not, the system can only disturb the content by generating noise" (p. 174).

Communication acts to create and define networks of communication, which in turn define or create social organization by discourse. Social reality is based on language and its use. Hence, social reality can be deconstructed into its constituent discourses at

any specified level of analysis by defining the system of reference. Because chaos or uncertainty is inherent in the network it is also inherent in a social system. A social system does not naturally seek stasis or equilibrium, but is constantly "emerging," or is only an "expectation" (pp. 300–301). The appropriate metaphor for describing such a situation is not biological (society as a living system) but cybernetic, using a "model of parallel and distributed processing" to understand the "intersecting routines" (p. 246). The theorist or observer then understands itself "in terms of a reconstruction, as theories are constructed and reconstructed as discursive reflections of universes that are envisaged" (pp. 192–193). The communication system is a postmodern system, decentralized and discursive in nature. Society is defined by its communication network(s), and therefore, should never be reified as an entity separate from the communication process, as society can always be deconstructed into its component discourses (p. 160).

From his general theory of communications, Leydesdorff derives a sociological theory of science or, because society is a function of its component discourses, a model of scientific communication. This model is based on the relationship between the cognitive tasks of the individual scientists, defined as personal communications among a particular research group, and science as a social organization, defined as communication between research groups and their surrounding environment. That is, "what does the research group do when it researches," and "what will these [disciplinary/research field] networks process as a signal from the research group?" (p. 170). Each functions as its own "specific processors, as parallel densities in the relevant network," each operating according to its own "rules of the game," i.e., programs. Within the research group, the concern is the degree to which it can "organize its own self-referential loop as a group" (p. 171). In relation to its colleagues (competitors), a given research group "may lose or gain because of its changing position in terms of the signals which it can send to specific networks [i.e., intellectual fields of study/disciplines] in its environment," i.e., science (p. 170).

Science then is the codification of "reflexive communications on top of a . . . network of social relations among scientists" (p. 190). As an historical process, "*science is an order emerging from networks of communication* with dynamics relatively independent of the carrying authors," or the actors/nodes of the network [emphasis original] (p. 190). Kuhnian scientific revolutions then are the result of competing paradigms disturbing "one another by performing in an emerging "reality" of scientific discourses and science-based transformations" (p. 301).

This brief summary cannot do justice to the intellectual depth, philosophical richness of the theoretical models, and their implications presented by Leydesdorff in his book. Next to this, the caveats presented earlier in this review are relatively minor. For all that, this book is not an "easy" read, nor is it for the theoretically or philosophically faint of heart. The content is certainly accessible to those with the interest and the stamina to see it through to the end, and would repay those who reread it with further insight and understanding. This book is recommended especially for the reader who is looking for a well-developed, general sociological theory of communication with a strong philosophical basis upon which to build a postmodern, deconstructionist research methodology.

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DOI: 10.1002/asi.10009