

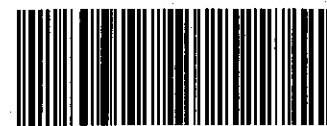
SCIENCE IN CONTEXT

VOLUME 7 NUMBER 2 SUMMER 1994

CONTENTS

- Ursula Klein **Origin of the Concept of Chemical Compound** 163
- Christian Licoppe **The Crystallization of a New Narrative Form in Experimental Reports (1660–1690): The Experimental Evidence as a Transaction between Philosophical Knowledge and Aristocratic Power** 205
- E. Roy Weintraub and Philip Mirowski **The Pure and the Applied: Bourbakism Comes to Mathematical Economics** 245
- Modern Societies and Their Environments
- Yehouda Shenhav **Manufacturing Uncertainty and Uncertainty in Manufacturing: Managerial Discourse and the Rhetoric of Organizational Theory** 276
- Juval Portugali **The ~~Taming of the~~ Shrew Environment** 307
- Martin van Creveld **The Rise and Fall of Military Technology** 327

CAMBRIDGE
UNIVERSITY PRESS



0269-8897(1994)7:2;1-K

SCIENCE IN CONTEXT

VOLUME 7 NUMBER 2 SUMMER 1994



Cambridge University Press

YEHOUDA SHENHAV

Manufacturing Uncertainty and Uncertainty in Manufacturing: Managerial Discourse and the Rhetoric of Organizational Theory

The Argument

In this paper I challenge the "uncertainty reduction" argument — the dominant explanation (and justification) for the rise of bureaucratic firms in the late nineteenth century. In contradiction to the argument that "uncertainty" was a barrier to rational economic order and therefore needed to be reduced, I argue that "uncertainty" was manufactured, objectified, and reified in the course of developing industrial bureaucracies. Using an alternative historical narrative I demonstrate that "uncertainty" was used to increase the "rationality" — i.e., control — of hierarchies and to enhance the legitimacy of "rational planning." In other words, strategies to "reduce uncertainty" increased the "certainty" — i.e., control and centrality — of rational planners but increased the "uncertainty" of their subordinates. I point to the fact that the "uncertainty reduction" argument became a central element in the professional ideology of management and a focal point in management education programs. Furthermore, the canonical organization theory in the social sciences adopted the rhetoric, logic, and epistemology produced by the agents under its study and disseminated their ideology. Through their interrelationship in organization theory, "uncertainty" and "rationality" were enacted as two binary opposites that reproduce each other and construct one "coherent" scheme.

Theoretical conceptualizations regarding the advantages of purposely designed industrial bureaucracies — as opposed to uncontrolled markets — focus on the striving of entrepreneurs and of efficiency maximizers to increase rationality within a context of economic and social uncertainty. In such a framework, "uncertainty" is perceived to be a major barrier to achieving a stable, rational economic order. Such an explanation is not unusual. In fact, arguments about social complexity and the need for an effort to reduce "environmental uncertainties" are perceived as plausible in academic and nonacademic texts and have become increasingly popular.

This paper suggests that what appears to be the prime explanation for the

transformation of markets into hierarchies — that is, “uncertainty reduction” (or “rational determinism”); the two terms are used interchangeably throughout the paper) — may be partially replaced or at least supplemented by a somewhat different interpretation. In particular, I maintain that “uncertainty” should not necessarily be framed as a defective element in the process of rationality, but rather as a resource in the mobilization of control.¹ The paper exemplifies how, at times, the definition of uncertainty is created, used, and manipulated in the course of facilitating this transition, and how the concept of “uncertainty” enabled and perpetuated the dominance of the managerial ideology of rationality. Throughout the analysis I attempt to challenge the epistemological ground on which the “uncertainty reduction” perspective has emerged, and to challenge the modernist perspective that equates knowledge and information with certainty.²

The paper is organized as follows: Section 1 describes the “uncertainty reduction” perspective that dominates organization theory. Section 2 outlines the epistemological assumptions and deficiencies of the “uncertainty reduction” argument. Section 3 presents a historical narrative illustrating an alternative view. Section 4 reconceptualizes the notion of uncertainty in light of the alternative narrative. Section 5 provides concluding remarks on the relationship between managerial discourse and the rhetoric of mainstream organizational theory.

1. From Markets to Hierarchies

From the time of the English industrial revolution, the organization of production in the Western world has experienced a qualitative transformation. If the process is to be represented on a continuum, it can be characterized as a transition from “markets” to “hierarchies.” This is parallel to a classical eighteenth-century distinction between the “invisible hand” and the “visible hand” — two competitive organizational principles that are thought to govern the production of goods and services. Adam Smith ([1776] 1922), the spokesperson for the “invisible hand” of the marketplace, envisioned that choices made by individual maximizers result in an efficient self-regulating economy. Jeremy Bentham ([1798] 1970), on the other hand, offered government regulation. In his view, the “visible hand” of the administration can be conducive to the greatest good for the highest number of people.³

¹ A similar argument, albeit in a different context, is presented by Hacking (1990). He argued that the erosion of determinism (indeterminism) during the nineteenth century was associated paradoxically with increased control.

² Another epistemological endeavor — concerned with the distinction between the ontological status of uncertainty and its discursive representations — is not undertaken in this paper. While I see such a discussion, and some of its postmodern implications, as crucial for the question at hand, it is well beyond the scope of the current paper.

³ In Adam Smith's view the “visible hand” as well as any attempt to coordinate market forces were to be condemned: “People of the same trade seldom meet together, even for merriment or diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.”

A version of the “visible hand” view became the main ideology and practice of industrial production.⁴ The historical process of integration of markets into bureaucratic hierarchies (Williamson 1975, 1985) has resulted in the emergence of multi-unit large-scale organizations supervised by professional managers and administrators (Chandler 1962, 1977).⁵ The reason for the transition, however, is not sufficiently understood within the canon of organizational theory. The mainstream argument advanced by students of organizational theory attributes the transition to the inevitable process of rationalization, epitomized by its major economic manifestation: bureaucracy.

1.1 Bureaucratization and Rationalization

The traditional story regarding the development of industrial bureaucracy suggests that since the rise of capitalism and the age of Enlightenment, modern economy has gone in pursuit of efficiency and reason (i.e., rationalization). The process of rationalization and its causes was aptly summarized by Meyer and Rowan (1977, 342):

Economic markets place a premium on rationality and coordination. As markets expand, the relational networks in a given domain become more complex and differentiated, and organizations in that domain must manage more internal and boundary-spanning interdependencies. . . . Because the need for coordination increases under these conditions, and because formally coordinated work has competitive advantages, organizations with rationalized formal structure tend to develop.

It has been argued that bureaucratic organizations are inherently characterized by efficiency-based objectives and instrumental reasoning, and thereby rank technically superior to markets. According to Max Weber (1946, 196), “precision, speed, unambiguity, knowledge of the files, continuity, discretion, unity, strict subordination, reduction of friction and of materials and personal costs” raise efficiency to its optimal level. Pure bureaucratic organizations are expected to function according to objective considerations based on the “very ‘calculability’ of results” (ibid.). Instrumental reason, the deliberate and conscious interlocking of

⁴ Paradoxically, the “visible hand” solution, which allows for market manipulation, was implemented in the name of the “free market” ideal characterizing the capitalist economy, an offspring of Smith's revelation.

⁵ It must be clearly stated that two complementary processes are at the heart of the phenomenon. The first is the rise of an industrial bureaucracy through a series of sequential stages beginning with “domestic industry” and going on through the “putting-out” system, “inside contracting,” and lastly the hierarchical bureaucracy. The second process is that of the horizontal mergers that proliferated in the United States in the late 1860s and continued to be rather extensive until the beginning of World War I. Whereas the first represents a shift from market to hierarchy within a single factory, the second represents a shift from a market with many competitors to a monopolistic or oligopolistic market.

ends and means that resides in the constitution of bureaucracy, channels energy and effort toward achieving organizational goals.⁶

This traditional view of rationalization and its subsequent development in the literature on organizations (see Scott 1987b for a review) has been subjected to criticism. Meyer and Rowan (1977) have sparked disillusionment with the Weberian interpretation of rationality by pointing out that efficiency alone has ceased to be the impetus of organizational rationality. Once institutionalized, rationality becomes a myth (see also Scott 1987a). DiMaggio and Powell (1983) have furthered this critique in their argument that bureaucratization results from processes that make organizations more similar without necessarily making them more efficient, thus emphasizing normative institutional processes rather than efficiency considerations. For example, the institutionalization of accountancy (Meyer 1986), of statistical systems such as national censuses (Cohen 1982) and of information technology illustrate how rationalization can become a cultural practice with a life of its own.

Nevertheless, the traditional view and its critique share a common affinity. *Uncertainty* is perceived and well accepted as a fundamental aspect within all attempts to describe the development of rationality. Rationality is perceived to be related to the capacity for controlling future events and creating a life relatively secure from the disruptions of chance. Economic rationality indicates an ability to make reasonable predictions about returns on investments, whereas legal rationality supposes to provide protection from unpredictable political influences and from sudden changes in the social order (Chirot 1985). The proliferation of the insurance industry since the early eighteenth century in England constitutes a case in point of the quest to replace metaphysical beliefs with rational ones. Hence chance and risk as sources of uncertainty are domesticated through the incorporation of probability theory (Daston 1987; Gigerenzer et al. 1989; see also Douglas 1985).

1.2 The Role of Uncertainty

Uncertainty, then, constitutes a central point in explaining the transition from markets to hierarchies within the rational, determinist perspective ("uncertainty reduction") proposed in organizational literature.⁷ In this literature rationality is

⁶ Weber's view was adopted and elaborated on by Parsons [1960] 1981. In his view, organizations are unified social systems primarily oriented to the attainment of a specific goal. He stated that the development of organizations constitutes "the principal mechanism by which, in a highly differentiated society, it is possible to 'get things done', to achieve goals beyond the reach of the individual and under conditions which provide a relative maximization of effectiveness" (ibid., 104). This search for efficiency earlier generated a stream of literature dealing with planning procedures according to technical logic — such as specialization of tasks and departmentalization as reflected by "principles of administration" (Fayol [1919] 1949), or such as "administrative management" (Gulick and Urwick 1937).

⁷ In addition to being characterized as the advantage of "hierarchies" (Williamson 1975) and as a

reduced to its instrumental-technical dimension. It implies a complete knowledge of the consequences of choices (Simon 1948) that are predetermined by structural constraints. In other words, rationality can be secured by structures that reduce uncertainty and ambiguity (Crozier 1964; Galbraith 1973; March and Simon 1958; Pfeffer and Salancik 1978; Thompson 1967).⁸ According to this view the prevalence of uncertainty creates irregularities and complications in planning, standardization, precision, consistency, and causal linkage between means and ends.

James Thompson (1967, 159) made a paradigmatic observation that links "rationality" and "uncertainty" as binary opposites:

Uncertainty appears as the fundamental problem for complex organizations, and coping with uncertainty, as the essence of the administrative process. Just as complete uncertainty and randomness is the antithesis of purpose and of organization, complete certainty is a figment of the imagination; but the tighter the norms of rationality, the more energy the organization will devote to moving toward certainty. (My emphasis, Y.S.)

This view has been translated as defining uncertainty as "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization" (Galbraith 1973, 5). The root metaphor of uncertainty spawned a variety of strategies and frameworks to fight, reduce, or adapt to uncertainty. The most prominent are known as "buffering" and "bridging" strategies within the "resource dependence" perspective (Pfeffer and Salancik 1978), and "information processing" or "information reduction" strategies within the structural contingency perspective (Galbraith 1973).

The most elaborated explanation was probably that suggested by Oliver Williamson (1975, 1985), a leading contemporary organizational economist. According to his fourfold economic framework, "uncertainty reduction" holds crucial importance for the understanding of "market failures."⁹ This scheme suggests that given "bounded rationality" (Simon 1957, 198) — i.e., the limits of the human mind — it is very costly and sometimes impossible to determine all identifiable future contingencies. Transactions and long-term contracts may therefore be supplanted by hierarchies, which Williamson (1975, 9) calls "internal organization:"

Recourse to the latter [internal organization] permits *adaptations to uncertainty* to be accomplished by administrative processes in a sequential fashion. Thus, rather than attempt to anticipate all possible contingencies from the

barrier to rationality (Thompson 1967), the uncertainty concept was used to explain "structure" (e.g., Galbraith 1973), "isomorphism" (e.g., DiMaggio and Powell 1983), "conspicuous behavior" (e.g., Meyer and Rowan 1977; Scott 1987a), "power" (e.g., Crozier 1964; Hickson et al. 1971), "strategic response" (e.g., Thompson 1967; Pfeffer and Salancik 1978), "segregation" (e.g., Kanter 1977), and "satisfying" decision outcomes (Simon 1957) — among many others.

⁸ In the institutional view, uncertainty is perceived as a powerful force that encourages imitation of organizational structures and practices (DiMaggio and Powell 1983).

⁹ The three other elements consist of "bounded rationality," "small numbers," and "opportunism."

outset, the future is permitted to unfold. Internal organization in this way economizes on the bounded rationality attributes of decision makers in circumstances in which prices are not "sufficient statistics" and *uncertainty is substantial*. (My emphasis, Y.S.)

Williamson introduced an additional dimension: the possibility of opportunistic behavior, including intentional misrepresentation of information.¹⁰ Coupled with "bounded rationality" and "small numbers," "opportunism" poses a barrier to efficient market contracting and also enhances the transition to hierarchies. In formal hierarchies, long-term transactions are expected to be accommodated by trust, uncertainty reduction, and accountability.¹¹ In the course of the historical analysis that follows, I will return to Williamson's analysis.

In summary, the canonical interpretation that dominates mainstream organizational theory regarding the emergence of hierarchies and bureaucracies assumes that economic actors operate under uncertain circumstances and that a high level of uncertainty poses a barrier to rational economic behavior. The striving for rational order, which is assumed to be conducive to efficiency and stability in production, constitutes the impetus behind the transition from markets to hierarchies. Within this framework, hierarchies are conceptualized as a means to implement rational order and to reduce uncertainty.

Before I proceed to challenge the epistemology that gives rise to such an argument, I would like to make a theoretical clarification regarding some variation within mainstream organizational theory. The transition from markets to hierarchies can be understood in organizational literature from the point of view of two different *historical* perspectives. The first perspective was proposed by some leading economists — among them Williamson and Chandler, who capitalized on the notion of uncertainty to explain the emergence of hierarchies. Both included elements of "technological determinism," "efficiency consideration," or "uncertainty reduction" in their schema, which can clearly be labeled a (historical) "rational determinist" argument. Marxist historians of labor — such as Marglin (1974), Stone (1974), and Edwards (1979) — constitute an alternative perspective. They emphasize that hierarchies and factories are not necessarily technologically superior to free markets but rather are devices of control in the course of industrial development under the capitalist system. Their conceptual frameworks leave out the notion of uncertainty. In the few places where they refer to uncertainty, they use it in a positivist sense (to be explained below).

In addition to these two approaches, it is useful to draw a line between three *ahistorical* perspectives prevalent in organizational literature. One perspective, represented by Thompson (1967) and others who emphasize the role of hierarchies

¹⁰ Williamson relies on Machiavelli, who advised his prince that "a prudent ruler ought not to keep faith when by so doing it would be against his interest" (Williamson 1985, 48).

¹¹ Simon argues that even at the physiological level a hierarchy of means-ends serves to integrate behavior (1948, 63).

in reducing uncertainty as described in this section, can be labeled ahistorical "rational determinism." A second perspective, exemplified by Weick (1979), focuses on the phenomenological aspects of organizing processes, including the enactment of uncertainty and ambiguity. However, the latter approach defocalizes the notions of power and interest, lacks the historical orientation to capture the process described in this paper, and is therefore not readily available to be used. A third stream, exemplified by the work of Benson (1977), Goldman and Van Houten (1977), Clegg and Dunkerley (1980), and others, provides a critique to mainstream organizational analysis. This stream of work, which was directed against the "rational determinist" or neo-Weberian perspectives, does not focus on the notion of uncertainty and falls short in understanding the manipulative element in the enactment of uncertainty in the course of domination.¹²

Thus, taking all perspectives together, we lack a critical view of the concept of uncertainty that combines phenomenological elements with the notion of power and human interest and also frees the positivist epistemology from its arbitrariness. In the course of this paper I will use the term "canonical" or "mainstream organizational theory" to refer to literature that uses the "rational determinist" (or the "uncertainty reduction") argument (both the historical perspective represented by Williamson and Chandler and the ahistorical perspective represented by Thompson).

Below, I shall challenge the epistemology within which the argument — of hierarchies as a means to implement rational order and to reduce uncertainty — is perceived to be plausible. Next I shall suggest a view of the transition from markets to hierarchies from a different angle. Only then will we be in a position to reconceptualize the notion of "uncertainty."

2. Epistemology Reconsidered

2.1 *The Quest for Natural Order and Certainty*

Modern social sciences came into existence during the nineteenth century's collective euphoria with empiricism and rationalism. The domination of the positivist "episteme"¹³ was related to the scientific revolution as well as to the rejection of the

¹² Benson (1977, 10), for example, queried: "How are some groups better able than others to influence the major decisions affecting the direction of the organization? Analyses of control over uncertainty . . . have provided important beginnings on such questions." Yet Benson does not proceed to analyze the dialectical nature of uncertainty.

¹³ "Epistemes" in Michel Foucault's (1970) analysis refer to historical frames that have successively governed Western thought. They are "overarching discursive regimes that effectively determined what is appropriate to discuss (and think)" (Park 1989, 58) and are inscribed in the institutions, material practices, and social relations of the epoch (Aronowitz 1988, 364). Although "episteme" and "epistemology" are derived from the same linguistic root, episteme is not the subject of epistemology but rather an a priori condition from which epistemology unfolds.

basis for social order under the ancient regime, to the culmination of experimental empirical philosophy, and to the mechanization of the industrial revolution. The elements of the emergent "episteme" were clearly described by Aronowitz (1988, 152–153):

The "mechanization of the world picture," a leading theme of the scientific revolutions of the sixteenth and seventeenth centuries, that is, the positing of the machine-like character of nature, was consistent with the entire "episteme" of the period. In this particular period, "natural order" was conceived as a system of regularities, subject to quantification and regulation, and, if extrapolated from the multitude of relations of the external environment, could be controlled by a series of reproducible interventions called experiments. The reproducibility of reactions of nature to human interventions were confirmations, it was believed, of the orderliness of nature, its obedience to what was called natural law.

In the zeitgeist of the classical epoch, social scientists expressed a desire to imitate the great achievements of the scientific revolution. Early developments in the social sciences exemplify the adoption of conceptual frameworks, symbols, taxonomies, metaphors, and methods of inquiry of the natural sciences; Petty established "political arithmetic"; Locke was fascinated with Newton's universal laws of mechanics in his attempts to establish an eternal government; and Hobbes saw an analogy between natural and social physics. Adam Smith, Herbert Spencer, and Thomas Malthus all believed in the "natural order of society," in which laissez faire — the very basis of the liberal constitution — replaced the providence of God (Bernal 1965). Likewise, Bentham proposed the quantification of morality, pain, and pleasure, and sociologists used biological metaphors. Nineteenth-century philosophers such as Auguste Comte in France and John Stuart Mill in England made explicit statements regarding the organization of society on a scientific basis, and twentieth-century logical positivism became a cornerstone of scientific inquiry.¹⁴

The most radical form of logical positivism was the unification of the sciences, as expressed by the notion of physicalism.¹⁵ Even a retreat from the strong position of physicalism was satisfied with the belief in the unity of method. This belief emphasized that all scientific knowledge can be accounted for without resort to metaphysics — that is, grounded in experience and logic.¹⁶ Consequently, the

¹⁴ German idealism — the German intellectual milieu that later yielded such philosophers as Nietzsche, Husserl, Heidegger, Marcuse, Habermas, Adorno, and Horkheimer — has reacted strongly against this attempt and has clearly differentiated between natural sciences and *Geisteswissenschaften* (humanities).

¹⁵ For example, Carnap writes regarding psychology: "We are not demanding that psychology formulate each of its sentences in physical terminology. For its own purposes psychology may, as heretofore, utilize its own terminology. All that we are demanding is the production of definitions through which psychological language is linked with physical language" (quoted in Smith 1986, 59).

¹⁶ Following René Descartes' "natural method" and skepticism, or following Francis Bacon's experimental "Novum Organum."

epistemology that was developed viewed the objects of inquiry as independent of and external to the subject. According to this epistemology, natural and social objects alike are unburdened by human interests and manipulation.

It is within such an episteme that the concept of "certainty" was framed. Certainty and "reason," both offspring of the seventeenth-century scientific revolution and eighteenth-century Enlightenment philosophy,¹⁷ became connected. This connection reflects the Cartesian belief in the capacity of the mind to arrive at the truth by a deductive process from a few indubitable premises. It is believed that certainty, which is the ultimate objective in the discovery of scientific knowledge, is achieved through the "reason" of the human mind. The belief in reason led to the conception of "constructive rationality" in which human institutions are expected to emerge from a deliberate design based on human reason. The connection between "rationality" and "certainty" was now perceived as inevitable.

2.2 The Dialectics of Reason: Critical and Constructive Rationalism

Both René Descartes and Francis Bacon were central in changing the meaning of reason from the capacity to recognize truth to a capacity for deductive reasoning based on explicit, indubitable premises. The immediate implication of this philosophy was that all useful human institutions were, and ought to be, deliberate creations of conscious reason. Hayek (1967, 85) has labeled this kind of Cartesian reason "constructivist rationalism" and has contrasted it with David Hume's critical view of reason. Hume saw the desire to subject everything to the dominance of rational control as a divergence from the use of reason and a misconception of its power. Rationality needs to be based on the free interplay among human minds. This kind of rationalism has been labeled by Karl Popper "critical rationalism."¹⁸

Dahrendorf (1968, 215–31) draws an analogy between "critical rationality" and "market rationality" (i.e., the invisible hand) on the one hand and between "constructive rationality" and "plan rationality" (i.e., the visible hand) on the other. Market rationality refers to the liberal pattern in which rationality is a quasi-economic term. It assumes that if social forces are allowed to take their course, they will produce the best political solution. Plan rationality advocates that market arrangements which are nonrational lead to chaos and that human reason should be in charge of building our society, since solutions are the result of controlled and controlling action (*ibid.*, 218).

The ideal of constructive rationalism provided the ideological supplement to the transition from markets to hierarchies. Bureaucracy in this view is the blueprint of

¹⁷ Kant's ([1784] 1950) motto of the Enlightenment ("Have courage to use your own reason") refers to the human ability to free oneself from the bounds of religion and arbitrary regimes.

¹⁸ Popper translated this similar view of science to a political theory in "The Open Society and its Enemies," which he completed during the World War II.

"constructive rationality," designed to implement Cartesian belief in deductive reason. Reason, in this view, is embedded in the very foundation of bureaucracy and the "visible hand" ideology.¹⁹

Dahrendorf, however, argued that the main difference between the two rationalities is epistemological: plan rationality presupposes the possibility of "certainty," whereas market rationality presupposes a fundamental "uncertainty" of knowledge.²⁰ More important, however, claims regarding the desire or possibility of reducing uncertainty can be sustained and legitimated in plan rationality.

With its emphasis on method and means rather than on ends, constructive rationality has produced at least two significant paradoxes. First, recall that the concept of "reason" was used to depict the process of uncovering the laws of nature. "Constructivist rationalism," the offspring of reason, is contrasted with the principle of "nature," since it opposes spontaneous and natural developments of human institutions. Second, the belief in the power of human reason has generated a view that social institutions must be invented with a clear awareness of their desirable consequences. In these institutions, human reason is subjected to rules and procedures whose consequences are not fully understood or predicted. Although reason is the ancestor of "planning" and of "bureaucracy," it has become subjected to their "reasonable social orders."

These institutions not only sterilized human reason, they also facilitated the convergence between "human reason" and "human interest." As Dahrendorf (1968, 226) clearly stated: "Under all conceivable social conditions, the market is a fiction; the game always takes place in front of the City Hall." Planned (constructivist) rationalism is achieved by patronizing professional groups and often accompanied with a quest to increase control of an oligarchy. Furthermore, when planned rationality is not guided by benevolent motives, such concepts as "central planning" and "bureaucracy" can turn into totalitarianism and other undesired practices. Totalitarian ideologies, it should be noted, are always ideologies of certainty (ibid.). Hayek (1967, 94) put it unequivocally: "Reason is like a dangerous explosive, which, handled cautiously, will be most beneficial, but if handled incautiously may blow up a civilization."²¹

Furthermore, the emphasis on human reason in the quest for certainty legitimated the differentiation between "certainty" and "uncertainty" as two distinct states. It led to a false belief that "uncertainty" is temporary, to be ultimately replaced by greater "certainty." This orientation ignores the dialectical nature of the phenomenon in which the definition of "uncertainty" simultaneously includes

¹⁹ The role of reason should also remind us of the distinction between "value rationality," emphasizing the dominance of universal and humanist values, and "instrumental rationality," focusing on methods and procedures.

²⁰ As becomes clear in this paper, the distinction is unwarranted, since uncertainty is equally inherent in both.

²¹ This is of course not to advocate the extreme consequences of the other possibility. We are all aware of the undesired and brutal consequences of the Social Darwinism of Herbert Spencer, Francis Galton, or Thomas Malthus.

the definition of "certainty," and vice versa, exactly as light and shade define each other. The Enlightenment project emphasized knowledge rather than ignorance, illumination rather than darkness. Certainty was a desired end in the construction of this project, since it was conducive to abolishing all dark spots remaining from the Middle Ages. Yet the quest for certainty became an integral part of eighteenth-century human thought, according to the concept of "uncertainty" the same philosophical status. It is the quest for "certainty" that defines the fear of "uncertainty."

Michel Foucault's analysis of Bentham's Panopticon (Foucault 1979) is a striking example that can be used as a partial metaphor for these dialectics. Panopticon is an architectural design of a prison in which a tower is positioned in its center and an annular building at the periphery. The building is divided into cells, each with two windows, the one on the inside corresponding to the windows of the tower, the one on the outside allowing light to reach across the cell from one end to the other. "By the effect of backlighting, one can observe from the tower, standing out precisely against the light, the small captive shadows in the cells of the periphery. They are like so many cages, so many small theatres, in which each actor is alone, perfectly individualized and constantly visible" (ibid., 200). Thus "the heaviness of the old houses of security", with their fortress-like architecture, could be replaced by the simple, economic geometry of a 'house of certainty'" (ibid., 202). According to Foucault, Panopticon is an observatory of human multiplicity that cannot be separated from such optical technologies as the telescope, the lens, and the light beam, which were invented as part of the new physics and cosmology. As a new method of control, using light rather than the shadowy areas of society, Panopticon coincided with the fear of darkness, a formula of "power through transparency, subjection by illumination" (Foucault 1980, 154). Thus as light ostensibly replaces darkness, certainty is presumed to replace uncertainty. But just as the search for light serves as a new mode to exercise power, so does the quest for certainty. Ironically, the inception of modernism — the very moment where man (or woman) invented himself (herself) — simultaneously launched new and more subtle "enlightened" mechanisms of control.

2.3 The Objectivization of Uncertainty

In light of these arguments, I now shift to redefining the epistemological status of "uncertainty." A major point in the reflexivity underlying the epistemological criticism proposed by scholars of the Frankfurt school was the idea that objects of inquiry in the social sciences (with an emphasis on the productive apparatus) are masked in the scientific scheme as natural long-lasting entities, while these objects are themselves human products (e.g., Horkheimer 1947; Marcuse 1964). In this sense these scholars have recourse to Marx's discussion regarding the fetishism of commodities that originate from the peculiar social character of the labor that produces them: "Value, therefore, does not stalk about with a label describing

what it is. It is value, rather, that converts every product into a social hieroglyphic. Later on, we try to decipher the hieroglyphic, to get behind the secret of our own social products" (Marx [1867] 1959, 74). Therefore, the "commodification" of social relations detaches itself from the conditions that produced it (Burawoy 1979, 17). Not only did we as individuals face a fetish consciousness; but also epistemology became subjected to the objects that it attempts to constitute. Along this line, Horkheimer and Adorno (1972) have suggested that we look at social objects as human creations and give them a historical meaning.

We may apply this view to our discussion, at the outset, regarding the relationship between organizational theorists and the conceptualization of "uncertainty." We are then led to the impression that "uncertainty" assumes an autonomy of its own. It appears to be an inevitable and natural phenomenon that exists "out there" as part of nature. There are almost no allowances for the possibility that "uncertainty," a human product, is objectivized and reified in the course of historical circumstances.

Before considering the course of historical circumstances that gave rise to the manipulation and reification of "uncertainty," I should summarize the unsound assumptions that lie at the core of this mainstream organizational theory. First, hierarchies are conceptualized as the outcome of deliberate human design through the omnipotence of reason. It is within this context that the "limitation of the human mind," in the form of "bounded rationality" (Simon 1949), becomes a salient rationale in the construction of hierarchies. In other words, the enactment of "certainty" as a desired outcome results in a parallel enactment of the concept of "uncertainty." It is only when one expects certainty that uncertainty becomes a threat. Second, the relationship between rationality and uncertainty is apparently circular. Rationality presupposes the existence of a predictable and stable social order (certainty), and there is no room for "rationality" and "certainty" to operate as independent objects. The formulation that matches "certainty and rationality" and "uncertainty and nonrationality" eliminates the possibility of a coexistence of "uncertainty and rationality" or "certainty and nonrationality" (see also Hacking 1990, 2). Third, the concept of "uncertainty reduction" is conceivable, feasible, and desirable. It is conceptualized as a linear, unilineal process that provides progressive approximation toward certainty. Fourth, uncertainty is assumed to be external to organizations, real, and objective. There are seldom allowances for the fabrication, manipulation, and enactment of contingent uncertainties. Fifth, organizations are sometimes perceived as monolithic unified entities. Cleavages and conflicts within organizations are masked in such cases by the conception of a harmonious culture in which all organizational members similarly experience "rational order" or are threatened by "uncertainty" in the same fashion.

It is the validity of these assumptions that we must now question. Let us first turn the theoretical discussion to such questions as "How are uncertain structures created?" "Who benefits from uncertain structures?" "Who claims for uncertainty?" "Who benefits from claims regarding uncertainty?" "How does the rhetoric of

uncertainty unfold?" and "Whose uncertainty is increased with the increased certainty of the other?"²² Only then will we be able to deal with the question of how such claims as "uncertainty appears as the fundamental problem for complex organizations" (Thompson 1967, 159) are formulated and reproduced, thus fostering the belief that "uncertainty" is an object external to and independent of human creation and human interest.

3. The Role of Uncertainty in the Historical Transition from Markets to Hierarchies

Turning back to the historical process of transition from "markets" to "hierarchies," several distinct organizational modes can be observed throughout the process. In the early stages of the industrial revolution the "putting-out" system was widespread. Under the system, the entrepreneur supplied raw materials to subcontractors, who performed the work at home using their own machines and equipment. The subcontractors were not independent entrepreneurs, and they were not permitted to sell their products in the open market (Williamson 1985, 216). To be sure, this mode was widespread and preceded the factory system in England; but in the United States this was less the case, with the exception of such consumer goods industries as boots and shoes, straw hats, and ready-made clothing (Buttrick 1952, 206).

"Inside contracting," the earliest mode within the factory system, consisted of a somewhat refined version of the putting-out system of manufacture. Under this mode, management provided capital and craftsmen who, as subcontractors, received a piece-rate from the company for the completed goods. In the mid-nineteenth century, inside contracting dominated both American and British industry.

The next stage, Taylorism, was an American creation of the late nineteenth century, part of the "systematic management" movement (Litterer 1961). Taylor's system was a first attempt to introduce hierarchical management and to rearrange the division of labor within the factory. The next stage, "scientific management," was aimed at undermining craft production and replacing it with a centralized hierarchical order of salaried workers. In effect, by separating the "conception" of labor from its "execution" (Braverman 1974), scientific management represented another stage in the separation between capital and labor.

One could describe the next stages in this process as the rise of the first assembly lines (or Fordism, as Sabel 1982 has labeled it) or the process of market integration (Chandler 1962, Williamson 1975).²³ In general, a consolidation of markets into

²² The notions of intentionality or consciousness of the actors, although present, are of lesser importance.

²³ For a fuller account of the process, see Pollard 1965, Landes 1969, Bendix 1974, Braverman 1974, Edwards 1979, Clawson 1980, and Williamson 1985, among others.

hierarchies was witnessed, and resulted in a consolidation of power. (Below, following the argument, each stage will be described in detail.)

An argument on the role of uncertainty. In light of the epistemological reconsideration of the historical process, I suggest the following concerning the role of uncertainty. Each "rational" stage in the "market failure" process (to be described in detail below) reflects a new social order, in which employers/managers increase control over the production process by attempting to reduce their uncertainty regarding the labor process.²⁴ As a result of the interdependence of employers and employees, "uncertainty reduction" on the part of the employers implies "certainty reduction" on the part of the workers. Employers delegate part of their uncertainty to the workers.

For example, in the early stages of the putting-out system entrepreneurs faced uncertainty regarding the production process in the homes. Hence they mobilized the political arm of the state to reorganize that process, thereby reducing their uncertainty and increasing their certainty (i.e., control).

In the inside contracting system, craft workers, who had the most technical know-how, faced a relatively low level of uncertainty regarding the production process. However, employers' uncertainty (i.e., lack of control) regarding the production process was extremely high. By reorganizing the production process along new lines — according to a concept that was labeled "scientification" or "mechanization" — employers acquired the necessary know-how and reduced their uncertainty. Consequently, they gained control and power. Workers' uncertainty had now been increased.²⁵

The logic of justification in each of these stages concerns efficiency, rationality, and uncertainty reduction. In practice, one social order was replaced with another enabling greater control and increased power. Thus the generation of uncertainty, as well as claims regarding uncertainty, can be seen as inherent in the maintenance of rationality as a dominant idea in the organization of manufacturing.

By so arguing, I am not ignoring the fact that technological developments accompanied the transition from markets to hierarchies. For example, the spinning jenny which was constructed in 1764 and was a crude ancestor of the mule, had sixteen or eighteen spindles compared with only one in the old spinning wheel (Engels [1895] 1958, 12). It is obvious that the spinning jenny enabled the production of more yarn than formerly. However, I do not subscribe to the technological deterministic perspective, which stresses that the necessity of a central power source to operate machinery precludes people from continuing to work in homes

²⁴ I refer to "technical know-how" as the focus of labor-related uncertainty. This uncertainty may stem from two sources: a lack of theories and of understanding of cause and effect (Thompson 1967) and interdependencies among the elements in the social relations of production (Pfeffer and Salancik 1978).

²⁵ Although the notion of workers' uncertainty is relatively undeveloped, I urge the reader to be aware of the changing locus of uncertainty from employers to employees in the course of the historical process analyzed below.

scattered all over the country. Similarly this perspective argues that mechanization necessitates a changing social order. Such an approach is limited in that it views technology as an exogenous, inevitable, natural, and value-free phenomenon reflecting the progress of science and technology. The functional necessity argument fails to see technological development itself as a fetish, a human product. Both Marglin (1974) and Stone (1974) challenged the technological determinism perspective and saw the emergence of hierarchies and productive apparatuses as part of capitalists' attempts to control the work force. I subscribe to their argument and suggest that at least the dialectics of technology should be acknowledged.²⁶

Below, I illustrate my argument, using descriptions of the putting-out system, the inside contracting system, and Taylor's scientific management. I strongly urge the reader not to view the cases described below as definitive, exhaustive, or strictly representative of arguments regarding the history of the labor process. I view them as illustrations that were collected, not necessarily chronologically, with the deliberate purpose of demonstrating the issue at hand.

3.1 Uncertainty in the Putting-Out System

Attempts to coordinate the production of goods in the early days of the industrial revolution were described in the historical literature as overwhelmingly "uncertain" for entrepreneurs. The putting-out system was plagued by problems of irregularity of production, loss of materials in transit, slowness of manufacture, lack of uniformity and uneven product quality (Braverman 1974, 6). "The employer of domestic weavers can never tell within a fortnight or three weeks when every web sent out to the neighbouring villages will be returned" (Pollard 1965, 33-34). And: "The spinners, weavers, knitters, nailmakers, and so on were often unpunctual in returning their work; textile workers mixed butter and grease with the fabric to increase weight, and nailmakers substituted inferior iron for the rods they had received from the warehouse" (Ashton 1948, 54).

Despite the hostile environment that entrepreneurs faced in the early stages of industrialization in England, they were able to activate the state's political arm to help reduce these uncertainties. The political system helped in discipline, surveillance, legislation of the "New Poor Laws" (Bendix 1974, 22-116), and internalization of the labor force into factories to create industrial feudalism. Rational law was mobilized to reduce entrepreneurs' uncertainty: "In the eighteenth century Parliament twice enacted laws requiring domestic woolen workers to complete and return work within specified periods of time. In 1749 the period was fixed at twenty-one days, and in 1777 the period was reduced to eight days" (Marglin 1974, 93).

²⁶ For historical evidence regarding these dialectics see Clawson 1980, 42-55.

Regarding the ineffectiveness of efforts to deal with the state of disarray, a leading historian of the industrial revolution, concluded:

The eighteenth century saw a persistent effort to halt the theft of materials by making embezzlement a criminal offense, providing employers and law officers with special rights of search and seizure, placing the burden of proof on any person holding materials he could not account for, and repeatedly increasing the penalties for violation. These last included corporal punishment, for fines were of no effect on penniless spinners and weavers. The very iteration of these acts is the best evidence of their ineffectiveness; by the last quarter of the century the black market in wool and yarn had become an organized business and many a cotton manufacturer was said to have begun his career by buying materials from this source. Similarly the laws to compel workers to finish their tasks promptly and to fulfill their obligation to one employer before hiring out to another — a problem that apparently grew with the demand for labour — were little more than admissions of difficulty and expressions of intent." (Landes 1969, 59–60)

Even further uncertainties were apparent. The entrepreneurs could not increase work productivity. They had no way of compelling their workers to perform a given number of hours of labor since the domestic craftsman was master of his time. The employers could raise the piece rates with an aim to encouraging diligence; but they usually found that this actually reduced output, since the workers, who had a fairly rigid conception of what constituted a decent standard of living, preferred leisure after earning a certain amount. "Thus precisely at those times when profit opportunities were greatest, the manufacturer found himself frustrated by this unreasonable inversion of the laws of sensible economic behaviour: The supply of labour decreased as the price rose" (*ibid.*, 58–59).

To be sure, entrepreneurs' uncertainties and their failures to reduce these uncertainties can be explained by the very fact that workers were using their own means of production and therefore were relatively free of the entrepreneurs' control. Capitalism, then, moved a step forward, to concentrate the means of production in the hands of entrepreneurs. The first factories started to emerge, not without help from the state. Contributing to this major change, the General Enclosure Act simplified the appropriation of land and reduced its costs (Ashton 1948, 60). In addition the reduction in legal interest rates from 10 percent in 1625 to 3 percent in 1735 enabled investment in fixed capital (*ibid.*, 10).

Even T. S. Ashton, who clearly believed in technological determinism, admitted that part of the reason for this concentration of workers in factories was to avoid the embezzlement of materials (*ibid.*, 109). It is fairly clear that workers did not express a strong desire to congregate in large establishments. Williamson (1975) would have argued that the desire for efficient production and the reduction of opportunism were the main reasons for this congregation. However, such an analysis is clearly biased. Opportunistic behavior was not solely the characteristic

of workers; employers themselves were engaged in opportunistic behavior:

Some employers used false weights in giving out yarn or iron, and demanded from the workers more cloth or nails than the material would run to. Others gave out faulty raw material or were irregular in their payments. In the more remote areas, where there were few retail shops, and where the supply of money was inadequate, truck was common. (Ashton 1948, 54)

It is true that consolidation in factories reduced opportunism and uncertainty of one kind, but it simultaneously produced another type of uncertainty for the workers, who had now been dissociated from the means of production. Employers' control increased dramatically. Furthermore, if Williamson's argument that "small numbers" increase the likelihood of opportunism is valid, then the concentration of capital in the hands of fewer capitalists clearly increased the likelihood of opportunism on the part of employers.

In the putting-out system, entrepreneurs were dependent on (apart from labor) workers' means of production. At the next stage (inside contracting), the means of production were concentrated in the hands of employers, thus transferring the locus of uncertainty from entrepreneurs to workers.

3.2 Uncertainty in the Inside Contracting System

Under the inside contracting system, the employer owned the means of production. He/she provided floor space and machinery, supplied raw material and working capital, and arranged for the sale of the final product. "The gap between raw material and finished product, however, was filled not by paid employees arranged in the descending hierarchy but by contractors, to whom the production job was delegated. They hired their own employees, supervised the work process, and received a piece rate from the company for completed goods" (Buttrick 1952, 205–6).²⁷

Once they had acquired ownership of the means of production, the locus of employers' uncertainty shifted to technical know-how. For instance, in the case of the Winchester Repeating Arms Company from 1855 onward:

The company officials did not know the actual piece rates paid by [the contractor] to his/her workers, since the payroll he submitted gave only the total amount due each worker. Nor did they know precisely how much profit he made, since inventory control was virtually nonexistent. Moreover, they knew very little of the actual techniques used in manufacture, and nothing of the profit made by [the contractor] on each separate component. (Buttrick 1952, 209)

²⁷ Some argue that even today the construction industry is organized on inside contracting principles (Williamson 1985, 218).

To take another example:

It was impossible to specify in advance how long it should take a worker to understand a particular blueprint or drawing, and it was pointless to hurry the worker since errors of understanding could prove extremely costly. (Clawson 1980, 143)

Moreover, it was to the contractor's advantage to manipulate the outpayments made on his account so that the profit would appear small in any year in which a price cut was imminent. Similarly, there was inducement to hold back innovation until after a price cut occurred. It was difficult for employers to predict and control the production process:

There was only a superficial check on the flow of raw material going to each contractor and on the amount of spoilage . . . therefore a clever contractor could build up a private inventory which could be sold to the company during future periods while it spread his apparent profit over time in an advantageous manner. (Buttrick 1952, 211)

Employers at the Singer Sewing Manufacturing Company had a similar experience:

It will be seen that, with this order of things, the management could be kept in almost total ignorance of the real course of affairs in any contractor's department, and, in point of fact, was kept in ignorance so far as the contractors could avoid giving information. (Clawson 1980, 117)

The monopolistic position of the company was thus threatened by the monopolistic power of contractors. This power depended not only on the contractor's private and secret knowledge of production methods, but also on the employees' loyalty to him and on his position within the factory's social system.²⁸

Under these circumstances it is not surprising that many of the members of the managerial staff sought to replace the contractor by some system offering the company greater predictability and control over the work force and over the manufacturing process (Buttrick 1952, 215).²⁹ To be sure, it is not a rise in

²⁸ Sidney Pollard (1965) emphasized that in the early days of the newly established factories in the eighteenth century, British experiments with appointed managers were disastrous: disloyalty, bribery, alcoholism and stealing were widespread. A predominant solution was the appointment of managers on the basis of trust and loyalty rather than proven managerial skills. As typifying cases where uncertainty is perceived to be high, trust became a prominent feature in the construction of social ordering. Kanter (1977, 51) reported that in 1912 J. P. Morgan testified before the House Committee on Banking and Currency and insisted that what ruled the financial world was "character" rather than money or property. Likewise Buttrick (1952, 215) reported that during the prevalence of the "inside contracting" system, "Management scrutinized the accounts of the more important contractors quite systematically and in some cases attempted to keep production records and estimate inventory position. There is even evidence that the company occasionally sent loyal employees to get jobs in some of the departments."

²⁹ Organizational literature makes an explicit link between uncertainty — or perceived uncertainty — and lack of control, and vice versa (see Pfeffer and Salancik 1978; Scott 1987b).

efficiency or productivity that prompted changes in the system. There is much evidence that it was in the interests of the contractors to increase productivity as much as possible. Harold Williamson constructed an index in which he showed that contractors improved productivity dramatically and cut down their prices by half over a period of twenty years (Clawson 1980, 81). Even Henry Roland, who opposed the contracting system, admitted that it ensured constant reduction of cost (ibid, 81). Clawson concluded that "neither consideration of efficiency nor dissatisfaction with inside contracting's technical capacity to perform the work were significant issues at the time" (ibid., 119).

At a later stage, managers and employers introduced a major change: employees, even those who were employed by contractors, were hired (and fired) by management. Contractors could not hire their own assistants; rather, they were only able to select workers from among those whom the foreman had already hired. This constituted a significant move toward replacing the contractual system. The next step was the introduction of Frederick W. Taylor's "scientific management." According to Buttrick, younger company officials who introduced scientific management showed not only that contractors could be replaced but also that this change would result in reduced costs. Needless to say, reduced costs were primarily a consequence of lowered labor costs. The extent to which "scientific management" has been practically applied in American firms has been widely debated. However, broad agreement exists with regard to the philosophy that guided the movement and the adoption of most of its principles (Bendix 1974).

The two examples dealt with thus far described how employers' uncertainty was shifted to workers. Uncertainty here is derived from the unpredictability of human nature. In the next example, there is a further development — a phenomenon whereby employers deliberately manufacture uncertainty to further their own control.

3.3 Scientific Management and the Manufacturing of Uncertainty

Scientific management emerged at the turn of the century as an offspring of systematic management, a movement of mechanical engineers who attempted to systematize knowledge regarding production and productivity. Taylor recognized that workers possessed more knowledge of the production process than did management. From the beginning of the industrial revolution, the crafts or skilled trades were the cornerstones of the production process. In each craft the worker was the master of a body of knowledge about methods and procedures. This knowledge left employers in a constant state of uncertainty, and Taylor's main mission consisted of transferring such knowledge (which he labeled "guild secrets") into the hands of management, under the banner of "social physics" — a science of production that aimed to be "objective," "systematic," "rational" and "efficient." "The managers assume . . . the burden of gathering together all of the traditional

knowledge which in the past has been possessed by the workmen and then of classifying, tabulating, and reducing this knowledge to rules, laws, and formulae" (Braverman 1974, 112). Taylor believed that brain work should be clearly removed from the shop and centered in the planning room, to separate conception from execution and to organize work hierarchically from top to bottom, rather than vice versa.³⁰

Taylor acknowledged that "ownership of knowledge" was a crucial factor in generating ignorance if used opportunistically:

Foremen and superintendents know, better than anyone else, that their own knowledge and personal skill falls far short of the combined knowledge and dexterity of all the workmen under them . . . men with the deliberate object of keeping their employers *ignorant* of how fast work can be done. (Quoted in Clawson 1980, 213-14; my emphasis, Y.S.)

He opted to change the nature of production, specifying that management should learn what workers already know:

The first of these principles of scientific management is the deliberate gathering in on the part of those on the management's side of all the great mass of traditional knowledge, which in the past has been in the hands of the workmen. . . . The knowledge which the workmen had . . . was in many cases quite as exact as that which is finally obtained by management. (1912, quoted in Clawson 1980, 217)

Rationality of the workplace, which in the early stages of industrialization was expressed by big clocks placed in the front entrance to the factories, was now symbolized by the "planning room" of the firm. Once established, "all possible brain work should be removed from the shop and centered in the planning or laying-out department" (1903, quoted in Clawson 1980, 218). Consequently, workers received a set of written instructions specifying in detail the tasks they should perform.

Taylor's controversial statement "You are not supposed to think . . . there are other people paid for thinking around here" (ibid.), is an ironic testimony to one of the many contradictions that the system has produced. The illiteracy and ignorance that Taylor produced in the name of science negated Kant's "Sapere aude!" (Dare to know), the motto of rationalism and the Enlightenment.

From the hearings of a House of Representatives committee nominated to investigate the strike and the introduction of scientific management at Watertown Arsenal, it became apparent that workers had no reason to think, as Taylor made the production process incomprehensible to them (ibid., 231). The Watertown

³⁰ There are a few strong "crafts," most noticeably medicine, which were able to escape managerial hierarchy and to retain the market elements either outside or inside the organization. Interestingly enough, the issue of "efficient boundaries" in internal hierarchies ceases to be relevant in this case.

instruction cards increased the dependence of workers on managers and helped generate uncertainty. Once knowledge had been obtained by managers, Taylor was able to replace one system of knowledge with another, swapping workers for managers in this "musical chairs" of ignorance.

Clawson reports that a new set of symbols was introduced as part of system management, and that all tools and machines were to be known by these symbols, which involved a series of letters and numbers to replace customary names. The formal rationale for the change was ease of writing; in practice, however, the symbols generated chaos, insecurity, ignorance, and uncertainty in the workers. The inanity and arbitrariness of the abbreviation system were apparent:

As a matter of policy, workers were not allowed to see the symbols, so they could learn the new names of the tools and machines. . . . During the hearings one machinist produced a copy of the symbols which had been passed to him by someone else, probably a toolroom or planning-room worker, though the machinist refused to say. He used the list to establish that the foreman testifying, who had said he no longer had trouble with the symbols, was unable to identify tools which any of the machinists could identify by their common names. (Ibid., 232)

In this case the language of science, reduced to its formal symbols and syntax, was used to strip workers of craft knowledge, making them intentionally illiterate. It generated a hierarchy of knowledge whereby some people were defined as "knowledgeable" and others as "illiterate," some worthy of certainty, others not. Apparently, Taylorism was not aimed at demystifying labor processes but rather the opposite: recreating the Tower of Babel syndrome.

4. Uncertainty Reconsidered

The discourse on "uncertainty" in the mainstream organizational theory, which stems from a standard modernist perspective, implies information that one does not know, "ought to know," and can feasibly know. Uncertainty reduction is accordingly conceptualized as a linear and unilineal process in which each piece of information provides a better approximation to certainty. The historical narrative presented thus far illustrates otherwise, suggesting that the modernist perspective falls short by creating a false dichotomy between certainty and uncertainty. As argued earlier, strategies to increase certainty necessarily result in more uncertainty. Furthermore, there is no one definition of uncertainty. Rather, the definition can be enacted and manipulated through the action of social agents.

As the above examples indicate, uncertainty is mostly derived from interdependencies between groups and constitutes a relational rather than an objective, unified, or symmetrical property. One should bear in mind that as long as free behavior, free choice and free reason exist there is always something to know;

uncertainty is eternal. Furthermore, conceptually, it is conceivable that progress along the line of "knowing" can clarify how much we did not know and will not know, as exemplified by Socrates' statement that he knew enough to know that he knew nothing. Pandora was uncertain regarding what would be found in the box and could be satisfied with the certainty of "not knowing." By discovering the desired "truth" or "knowledge," she generated another sphere of "knowing" that defined new "uncertainties," new pieces of information that needed to be obtained.

The generation of uncertainty is thus inherent in our attempts to reduce uncertainty. Firms that grow in size and monopolize greater market shares reduce initial uncertainties but create new and bigger ones. This is analogous, metaphorically, to achieving a better observation post by climbing a mountain. By so doing, the observer is no longer restricted to the old range of visions, and the new horizons constitute additional knowledge that must be grasped and understood.

However, the misleading equation — more knowledge equals reduced uncertainty — allows for an endless process where claims regarding uncertainty are always legitimate, whereas certainty is never possible. This conclusion is also basic to Popper's philosophy of science. The asymmetry between conjectures and refutations is derived from the realization that science, a multilinear complex knowledge structure, is directed toward correcting errors rather than achieving certainty.

Having made these statements, an apparent contradiction now appears more clearly. Analytically speaking, uncertainty is presented as a barrier to rational behavior. If, however, we consider uncertainty as a social product, not ignoring the dialectical nature of the phenomenon in the sense that uncertainty and certainty do in fact come together,³¹ we can argue that increased rationality increases the certainty of one group but the uncertainty of another. Uncertainty can be conceptualized in such a framework as a major source of power. Uncertainty was asymmetrically objectivized and reified in the course of organizations history, reflecting the domination structure of one group over another, while claims regarding uncertainties perpetuated and legitimated domination. There is much contemporary evidence showing that claims to uncertainty are associated with claims to power (Crozier 1964; Hickson et al. 1971; Kanter 1977; Pfeffer and Salancik 1978).³²

In this sense rationality and uncertainty can coexist. The organizational literature that tends to present organizations as unified collectivities (where the distinction between groups is invisible) amplifies the uncertainty of the dominated group

³¹ This is somewhat analogous to the tension between "rationality" and "irrationality." The very act of defining and demarcating what is considered rational implies what is considered "irrational." A conceptual frame in which the trade-offs between uncertainty and certainty do not hold might exist *only if* we could consider "uncertainty vis-à-vis nature" a plausible concept. In this case we might be able to assume that the risks and benefits associated with uncertainty are determined by pure chance and not as a property manipulated by human beings. However, since the effects of "natural uncertainty" are mediated by social structures, this assumption is not plausible.

³² Kanter (1977) in particular has shown that uncertainty motivates management to become socially restricting and to keep control in the hands of a relatively homogeneous group of people.

and manifests its attempt to enhance rationality. Along the way, this literature abandons (workers') uncertainty as described by "the sound of the tune of defeat." Furthermore, in the wake of ambiguity and confusion regarding the linkage between workers' uncertainty and employers' uncertainty, and the attempts to create the impression that the organization is a monolithic entity, employers incorporate workers' uncertainty into their own schema so as to impose further changes on the structure. That is, employers incorporate "uncertainties" that emerge from their own behavior in order to become carriers of claims to "uncertainty" that legitimize further restructuring. Structural "rational changes" — such as augmented hierarchies, departmentalization, staff-line differentiation, centralization, or matrix projects, to name a few — are justified as arrangements to reduce uncertainty whereas they in fact increase workers' uncertainty. We find a vicious circle in which structuralization increases complexity, which in turn increases uncertainty, which in turn calls for rational solutions that invite restructuring. Such structural practices, designed to reduce "uncertainties," are institutionalized and become taken for granted as rationalized myths that are deeply ingrained in, and reflect a widespread understanding of organizational reality (Meyer and Rowan 1977).

Furthermore, some of the changes made in the name of "rationality" and "uncertainty reduction" were deliberate attempts to increase workers' uncertainty. The example taken from Taylor demonstrates how the "subjectivity" of managers and employers becomes the "objectivity" of the workers. Modifying Hegel's argument that "the rational is real and the real is rational," I maintain that the ideology of rationality defines the state of reality in which the particularism of managers, who are the carriers of rationality, becomes "universalized" in the course of domination. Changes in the social order rearrange the hierarchy of knowledge to make workers illiterate and unknowledgeable, naturalizing and artificial, and thereby forcing employees to assimilate and accommodate themselves to the new structures.

I argue, then, that carriers of rationality, whose main objective was to reduce uncertainty, were simultaneously interested in maintaining a certain level of uncertainty. Thompson (1967) was concerned with a similar paradox regarding the function of administration, albeit from a different perspective. On the one hand, the major role of administration was defined by Thompson as the reduction of uncertainty and its conversion into relative certainty. On the other hand, administration was seen as searching for flexibility, which in turn increases uncertainty. To resolve Thompson's paradox, one should recognize and allow for the possibility that "uncertainty" and "claims regarding uncertainty" might be loosely coupled. One can always make claims for uncertainty and remain on safe ground, since "uncertainty" always exists.³³ That is, claims regarding uncertainty can be

³³ As argued above, discovering new evidence and information might reduce uncertainty on the one hand but generate new uncertainties on the other.

made irrespective of any "objective state." Claims regarding uncertainty, and the resulting strategies to cope with and reduce uncertainty, enhance the power and legitimacy of "uncertainty fighters."

Also, Thompson ignored the point that "uncertainty" is not a natural state of nature with which all individuals are symmetrically confronted. Rather it is a relational phenomenon in which the action of one group — whether intentional or unintentional — generates uncertainty for the other. This formulation does not allow for the manipulation of uncertainty in the relationship between employers and employees. Burawoy (1979), for example, suggested that the complete elimination of uncertainty is not necessarily a desired outcome and argued that securing workers' cooperation rests on generating a minimal uncertainty on the job. The task of the operator in "quota" piece work was a challenge as long as elements of uncertainty were present in the outcome. If control was complete, it became a routine. It lost value, however, if the element of uncertainty became too predominant (ibid., 87). This is an example of how the technical environment can be manipulated and how easily uncertainty can be socially constructed.

Werner Heisenberg's indeterminacy principle has released physics from the infinite and Sisyphean quest for certainty and from the heavy burden of Cartesian reason. Lyotard has noted that far from decreasing uncertainty through more precise knowledge, modern science has had the opposite effect: uncertainty increases with precision (Lyotard 1984, 53; see also Cooper and Burrell 1988). Phenomenological philosophy — mainly Edmund Husserl — acknowledged that the principles on which the natural sciences stand are problematic. There was recognition that human mind and action are central in the formation of the object. Despite the fact that modern science has reached the conclusion that certainty is beyond our reach, it has not penetrated the realm of mainstream organizational theory, which still operates under the antiquated assumption of the positivist epistemology. This is probably in part because claims to certainty easily link to claims to power. The question is then: does organizational theory play the role and express the rhetoric reserved for managerial ideologies? The answer is yes.

5. Epilogue: Organizational Theory as Managerial Ideology

The problem of labor control arises from inherent contradictions between the interests of capitalists and those of workers over maximization of productivity and over the surplus value of production. These contradictions have been manifest in the history of industrial relations in the late nineteenth and early twentieth centuries. The managerial revolution (Berle and Means 1932; Chandler 1977) has created new problems of control. Whereas ownership of capital traditionally provided the basis and justification for control, the separation of ownership from salaried management has generated a need for an alternative basis. Consequently, employers and managers have engaged in developing effective control strategies.

Rationality and cognate ideas have become means that were translated into bureaucratic control (Edwards 1979) and into normative control through the development of ideologies (Bendix 1974) or organizational cultures (Kunda 1991).

It should be emphasized that the idea of rationality is typically espoused by its proponents in its narrowest sense, as equaling "technical rationality." Technical rationality ignores the value or the validity of the ends to be achieved, and rationality is reduced to ascertaining and implementing means to achieve given ends in the most efficient way. It requires only that participants possess an understanding of and theories regarding cause and effect. It does not imply that participants (or organizational theorists) should question or examine the value premises — the ends or the desires.³⁴ Rational purposive human action packaged in the concept of "technical rationality" is now subordinated to the purposes and objectives of the organization of domination.

Within the "technical" and "plan" rationality perspectives, "uncertainty reduction" is conceptualized as feasible, desired and taken for granted. Suggestions to improve coordination, formalization, effectiveness, and the like are overwhelmingly prevalent. The notion of "market rationality" has been removed from this terminology. Not only has this literature failed to acknowledge the dialectical nature of "uncertainty" and "rationality" and their erroneous epistemology as objects of inquiry; it has also become absorbed by the ideology of rationality. Rationality, too evasive to be incorporated into the study of organizations, became an a priori scheme for the constitution of objects in organizational literature.

In the theoretical scheme of organization theory, argumentations regarding "uncertainty reduction" make sense and are logically convincing, especially when linked with efficiency increases. In that sense, the canonical organizational theory reified and glorified rationality in its technical formulation and established it as an integral part of its rhetoric. The conceptualization of rationality has been subjected to the ends of interested groups and mobilized in the service of domination in the course of the industrial and managerial revolutions. Mary Douglas (1992) pointed out the conspicuous proximity between the rationality of actors (or their logic of justification) — in our case the rhetoric of management — and the epistemological foundation upon which a theory is based. Criticizing Chester Barnard, a distinguished management theorist, she argued:

His classifications came from the world in which the organizations themselves function. This is using what anthropologists call actor's categories. In other words, he started with and stayed with the agents' own functioning classifications. These classifications impede theorizing: The anthropologist ends up saying what the agent under study had been saying all along. . . .

³⁴ "The Elimination of Chance," 1914. *American Machinist*, March 5:434.

Sometimes he wrote as if the main objective was to distill the wisdom of successful directors.

And she sums up: "At least it ensures that the people he is writing about will understand the book." The critique implies that the epistemology of the theoretical text is confused with the epistemology of its subjects. The origin of the managerial ideology about "uncertainty" can be traced to the beginning of the century. Early management texts described "uncertainty" as a neutral, ideologically free concept and reserved the role of dealing with it to engineers and their offspring: management consultants. For example, the editors of the *American Machinist*, a magazine that was a pioneer in publishing articles on production management in the nineteenth century, maintained that "there are innumerable uncertainties to be cleared up" and that it is the role of engineers to "serve humanity in the elimination of chance" ("The Elimination of Chance" 1914). This ideological overtone became an integral part of organization theory. Organizational literature perpetuates this ideological character, as manifested by the manner in which uncertainty resides in the language of managerial rhetoric.

Take as an additional example Williamson's (1975, 9) account of the limitation of the human mind in the formulation and solution of complex uncertain problems. According to Simon (1957) "bounded rationality" focuses on the limitations of "small brains" faced with "big problems." Again, the seeds of the argument were already sown in the nineteenth-century ideological view of management.³⁵ Systematic management was developed by conceptualizing the enterprise as a unified whole, controlled and coordinated in a systematic rational fashion, in light of the chaotic state of factory practices (Litterer 1963, 388; Jelinek 1980, 72). It especially emphasized the limits on any individual rationality. Jelinek (1980, 65) argued that systematization of management implies an attempt to transcend dependence on the capacity of any single individual and to build a solution into the formal system in order to achieve *greater predictability* in coordination and *forecasting*.

Indeed, a related bounded rationality argument can be found in the formulations of Alexander Hamilton Church. In Church's view (1900, cited in Jelinek 1980, 72), the justification for managerial coordination in the newly developed factories of the late nineteenth century rested on the limitation of the human mind faced with exploding complexity: "The necessity for co-ordination . . . is an inevitable result of the evolution of the factory, no one mind can grasp and hold all the details."

Organizational theory introduces the notion of bounded rationality and by so doing distracts attention from the fact that it is especially "constructive rationality" that produces more complexity than the human mind can grasp. Moreover, "bounded rationality" implies the feasibility of rationality.³⁶ Thus mainstream

³⁵ Not to mention Habermas' (1970) criticism, in which the distinction between means and ends was reversed. In Habermas' view means became ends and ends became means.

³⁶ This view probably derives from eighteenth-century utilitarian philosophy.

organizational theory plays a central role in institutionalizing and reproducing the myths of "rationality" and "uncertainty."

As a final example, the "rationalization" of markets into bureaucracies was not solely an intra-organizational affair. It also took place in the economy at large, as evident by the wake of mergers that started in the late nineteenth century in the United States. In the organizational literature these mergers were partially explained by the need for "uncertainty reduction" (e.g., Aldrich 1979; Pfeffer and Salancik 1978; Williamson 1975). For example, Jenks quotes John R. Dunlap, an editor of the New York monthly *Engineering Magazine* (founded in 1891) and one of the central ideologists of the management movement of his period who held a similar attitude:

Dunlap was stirred by the merger movement to varied responses, but in 1902 he saw the great combinations not only as using staffs to gather information about coming events; "they also in great measure control these events. The old laws of supply and demand included in the idea of a freedom for the action of natural laws which at the present time is often absent . . . it is altogether possible to create and control artificial resistances which may materially change the direction of the currents. (Dunlap 1903, cited in Jenks 1961, 439)

At the turn of the century many administrative texts of this kind were generated. Some of them dominated the managerial discourse long before implementation and became models for imitation. The phenomenon of "theory" that precedes "practice,"³⁷ has become a part of organizational literature. The theories and rhetorical devices of early management consultants (e.g., Taylor) appear in academic textbooks as building bricks of the theory of organization (e.g., March and Simon 1958). Science, the legitimate and the ultimate mechanism for rationality, has in this sense been recruited in the service of rational and managerial ideologies.

Acknowledgements

Abraham Kordova and Gideon Kunda made useful comments on various drafts of this paper. I also thank the following individuals with whom I discussed the paper: José Brunner, Yinon Cohen, Michal Frenkel, Yitzchak Haberfeld, Eva Illouz, Al Goldberg, Anat Leibler, Marc Ventresca, and Ora Setter.

³⁷ Even studies that heavily criticized the rational model as unrealistic (Cyert and March 1963; Kahneman et al. 1982; Simon 1957) or that were ostensibly directed at the *deconstruction of rationality* — such as the "garbage can model" of decision making in organized anarchies, which are characterized by "ill defined preferences," "unclear technology," and "fluid participation" (Cohen et al. 1972) — were anchored in the notion of technical rationality.

³⁸ See Kunda 1991 for a similar account regarding organizational culture.

References

- Aldrich, Howard E. 1979. *Organizations and Environments*. Englewood Cliffs, N.J.: Prentice-Hall.
- Aronowitz, Stanley. 1988. *Science as Power*. Minneapolis: University of Minnesota Press.
- Ashton, T. S. 1948. *The Industrial Revolution 1760-1830*. Oxford: Oxford University Press.
- Bendix, Reinhard. 1974. *Work and Authority in Industry: Ideologies of Management in the Course of Industrialization*. Berkeley: University of California Press.
- Benson, Kenneth J. 1977. "Organizations: A Dialectical View." *Administrative Science Quarterly* 22:1-21.
- Bentham, Jeremy. [1798] 1970. *An Introduction to the Principles of Morals and Legislation*. London: Methuen.
- Berle, Alfred A., and G. C. Means. 1932. *The Modern Corporation and Private Property*. New York: Macmillan.
- Bernal, J. D. 1965. *Science in History*. Vol. 4: *The Social Sciences*. Cambridge, Mass.: MIT Press.
- Braverman, Harry. 1974. *Labor and Monopoly Capital*. New York: Monthly Review Press.
- Burawoy, Michael. 1979. *Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism*. Chicago: University of Chicago Press.
- Buttrick, John. 1952. "The Inside Contract System." *Journal of Economic History* 14:205-21.
- Chandler, Alfred D., Jr. 1962. *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*. Cambridge, Mass.: MIT Press.
- . 1977. *The Visible Hand: The Managerial Revolution in American Business*. Cambridge, Mass.: Harvard University Press.
- Chiot, Daniel. 1985. "The Rise of the West." *American Sociological Review* 50:181-95.
- Clawson, Dan. 1980. *Bureaucracy and the Labor Process: The Transformation of the U.S. Industry, 1860-1920*. New York: Monthly Review Press.
- Clegg, Stewart, and David Dunkerley. 1980. *Organization, Class and Control*. London: Routledge and Kegan Paul.
- Cohen, Patricia Cline. 1982. *A Calculating People: The Spread of Numeracy in Early America*. Chicago: University of Chicago Press.
- Cohen, Michael D., James G. March, and Johan P. Olsen. 1972. "A Garbage Can Model of Organizational Choice." *Administrative Science Quarterly* 17:1-25.
- Cooper, Robert, and Gibson Burrell. 1988. "Modernism, Postmodernism and Organizational Analysis: An Introduction." *Organization Studies* 9:91-112.
- Crozier, Michael. 1964. *The Bureaucratic Phenomenon*. Chicago: University of Chicago Press.
- Cyert, Richard M., and James G. March. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, N.J.: Prentice-Hall.
- Dahrendorf, Ralf. 1968. *Essays in the Theory of Society*. Stanford, Calif.: Stanford University Press.
- Daston, Lorraine J. 1987. "The Domestication of Risk: Mathematical Probability and Insurance 1650-1830." In *The Probabilistic Revolution*, edited by Lorenz Kruger et al. Cambridge, Mass.: MIT Press.
- DiMaggio, Paul J., and Walter W. Powell. 1983. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48:147-60.
- Douglas, Mary. 1985. *Risk Acceptability According to the Social Sciences*. New York: Sage Foundation.
- Douglas, Mary. 1992. *How Institutions Think*. New York.
- Edwards, Richard. 1979. *Contested Terrain: The Transformation of the Workplace in the Twentieth Century*. New York: Basic Books.
- Engels, Friedrich. [1895] 1958. *The Condition of the Working Class in England*. Stanford, Calif.: Stanford University Press. (Originally written in 1845.)
- Fayol, Henry. [1919] 1949. *General and Industrial Management*. London: Pitman.
- Foucault, Michel. 1970. *The Order of Things*. London: Tavistock.
- . 1979. *Discipline and Punish: The Birth of the Prison*. New York: Vintage.
- . 1980. *Power/Knowledge: Selected Interviews and Other Writings 1972-1977*. Edited by Colin Gordon. New York: Pantheon.
- Galbraith, Jay. 1973. *Designing Complex Organizations*. Reading, Mass.: Addison-Wesley.
- Gigerenzer, Gerd, Zeno Swijtink, Theodore Porter, Lorraine Daston, John Beatty, and Lorenz Kruger. 1989. *The Empire of Chance*. Cambridge: Cambridge University Press.
- Goldman, Paul, and Donald R. Van Houten. 1977. "Managerial Strategies and the Worker: A Marxist Analysis of Bureaucracy." *Sociological Quarterly* 18:108-25.
- Gulick, Luther, and L. Urwick. 1937. *Papers on the Science of Administration*. New York: Institute of Public Administration.
- Habermas, Jürgen. 1970. *Toward a Rational Society*. Boston: Beacon Press.
- Hacking, Ian. 1990. *The Taming of Chance*. Cambridge: Cambridge University Press.
- Hayek, Friedrich A. 1967. *Studies in Philosophy, Politics and Economics*. Chicago: University of Chicago Press.
- Hickson, David J., C. R. Hinings, C. A. Lee, R. E. Schneck, and J. M. Pennings. 1971. "A Strategic Contingencies' Theory of Intraorganizational Power." *Administrative Science Quarterly* 16:216-29.
- Horkheimer, Max. 1947. *Eclipse of Reason*. New York: Oxford University Press.
- Horkheimer, Max, and Theodor Adorno. 1972. *The Dialectics of Enlightenment*. New York: Herder and Herder.

- Jelinek, Mariann. 1980. "Toward Systematic Management: Alexander Hamilton Church." *Business History Review* 54:63-79.
- Jenks, Leland H. 1961. "Early Phases of the Management Movement." *Administrative Science Quarterly* 5:421-47.
- Kahneman, Daniel, P. Slovic, and A. Tversky. 1982. *Judgment under Uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press.
- Kant, Immanuel. [1784] 1950. "What Is Enlightenment?" In *From Foundations of the Metaphysics of Morals*, edited and translated by Lewis White Beck. Chicago: University of Chicago Press.
- Kanter, Rosabeth M. 1977. *Men and Women of the Corporation*. New York: Basic Books.
- Kunda, Gideon. 1991. *Engineering Culture: Control and Commitment in a High-Tech Corporation*. Philadelphia: Temple University Press.
- Landes, David S. 1969. *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*. Cambridge: Cambridge University Press.
- Litterer, Joseph A. 1961. "Systematic Management: The Search for Order and Integration." *Business History Review* 35:461-76.
- . 1963. "Systematic Management: Design for Organizational Recoupling in American Manufacturing Firms." *Business History Review* 37:369-86.
- Lyotard, J. F. 1984. *The Postmodern Condition: A Report on Knowledge*. Manchester: Manchester University Press.
- March, James G., and Herbert A. Simon. 1958. *Organizations*. New York: Wiley.
- Marcuse, Herbert. 1964. *One Dimensional Man*. Boston: Beacon Press.
- Marglin, Stephen A. 1974. "What Do Bosses Do? The Origins and Functions of Hierarchy in Capitalist Production." *Review of Radical Political Economics* 6:60-112.
- Marx, Karl. [1867] 1959. *Capital: A Critical Analysis of Capitalist Production*, vol. 1. Moscow: Foreign Languages Publishing House.
- Meyer, John W. 1986. "Social Environments and Organization Accounting." *Accounting Organizations and Society* 11:345-56.
- Meyer, John W., and Brian Rowan. 1977. "Institutionalized Organizations: Formal Structure as Myth and Ceremony." *American Journal of Sociology* 83:340-63.
- Park, Ian. 1989. "Discourse and Power." In *Texts of Identity*, edited by John Shotter and Kenneth J. Gergen, 56-69. London: Sage Publications.
- Parsons, Talcott. [1960] 1981. "Social Systems." In his *Structure and Process in Modern Societies*. Reprinted in *The Sociology of Organizations*, edited by Oscar Grusky and George A. Miller, 98-109. New York: Free Press.
- Pfeffer, Jeffrey, and Gerald R. Salancik. 1978. *The External Control of Organizations*. New York: Harper and Row.
- Pollard, Sidney. 1965. *The Genesis of Modern Management: A Study of the*

- Industrial Revolution in Great Britain*. Cambridge, Mass.: Harvard University Press.
- Sabel, Charles F. 1982. *Work and Politics: The Division of Labor in Industry*. Cambridge: Cambridge University Press.
- Scott, W. Richard. 1987a. "The Adolescence of Institutional Theory." *Administrative Science Quarterly* 32:493-511.
- . 1987b. *Organizations: Rational, Natural, and Open Systems*. Englewood Cliffs, N.J.: Prentice-Hall.
- Simon, Herbert A. 1948. *Administrative Behavior*. New York: Macmillan.
- . 1957. *Models of Man, Social and Rational*. New York: Wiley.
- Smith, Adam. [1776] 1922. *The Wealth of Nations*. London: J. M. Dent and Sons.
- Smith, D. 1986. *Behaviorism and Logical Positivism*. Stanford, Calif.: Stanford University Press.
- Stone, Katherine. 1974. "The Origins of Job Structures in the Steel Industry." *Review of Radical Political Economics* 2:113-73.
- Thompson, James D. 1967. *Organizations in Action*. New York: McGraw-Hill.
- Weber, Max. 1946. "Characteristics of Bureaucracy." In *From Max Weber: Essays in Sociology*, translated and edited by H. H. Gerth and C. Wright Mills. Oxford: Oxford University Press.
- Weick, Karl. 1979. *The Social Psychology of Organizing*. Reading, Mass.: Addison-Wesley.
- Williamson, Oliver E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press.
- . 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Department of Sociology and Anthropology
Tel Aviv University