markets. Neoclassical theorists see any interference with the wages set by the market as an intolerable invitation to inefficiency and inequity. Institutionalists, on the other hand, view the wage-setting process as much less a contest of impersonal and ultimately equitable market forces and much more a process of pricing and allocation carried out by fallible human beings governed by rules and customs in labor markets that are largely internal to the firm. Institutional economists are thus much more comfortable with the notion of comparable worth than are their neoclassical counterparts.

As its title implies, the book is concerned both with justice and with the paradox of achieving justice through a combination of the bureaucratic state and the technocratic process of job evaluation. The authors are struck by how small a role self-determination and workplace democracy play in bringing about wage justice.

One of the most interesting parts of the book reports on a June 1985 survey of about 500 employees of the state of Minnesota. About 80% of employees queried (about 87% of women and 76% of men) supported the notion of comparable worth. (The specific question asked was: "If studies showed the work of delivery van drivers and clerk typists required the same level of skill, training, responsibility, and so forth, should an employer pay these types of positions the same?" [p. 106]). Moreover, about 80% of respondents had heard of comparable worth (termed "pay equity" in the survey), and of those who had heard of it almost all (94%) understood that men as well as women could receive pay equity raises.

However, although state employees supported and understood the concept of comparable worth, they often did not know whether or not they themselves had received a pay equity raise. Of those respondents who according to state payroll data had actually received such raises, only 56% knew they had received them. Twenty-two percent thought they had not received a raise when in fact they had, and another 22% never heard of the policy even though they had received the raise. As the authors point out, these findings suggest caution in assuming that employees are knowledgeable about and keep close tabs on their remuneration, an assumption routinely made in economic theory. The findings also suggest that the potential of comparable worth either to disrupt the workplace or to radically transform women's views of themselves has been overdrawn.

On the other hand, an implementation strategy with more fanfare on the part of the union might have produced different results at the state level. The American Federation of State, County, and Municipal Employees, the primary union involved in the state implementation, chose to downplay the issue, for fear of stirring up difficulties in primarily male bargaining units. Implementation of the legislation at the local level was far more complex and less harmonious than it was at the state level. Chapter 6 provides a fascinating and richly textured discussion of the multiple patterns of compliance at the local level—from school districts that seemed to want to get an "A" in implementation to the Association of Minnesota Counties, whose stance was one of "philosophical opposition" and "begrudging compliance" (p. 140).

Forecasts that comparable worth would lead to financial doom, like forecasts that it would disrupt the workplace or transform women's views of themselves, have not been borne out by the Minnesota experience. What has been borne out is that through job evaluation it is possible to compare a wide variety of jobs and to make some estimates of their value relative to one another. The process seems to have produced a more equitable situation than the one it replaced. Indeed, perhaps the most interesting perspective noted in the book came from the personnel director of one of the large school districts in Minnesota. In his view, the comparable worth exercise rationalized what was otherwise an irrational as well as an inequitable system: Comparable worth, he said, was "the greatest thing since popcorn" because it "forces us to be good managers based on data, not power, biases, and personal relations" (p. 154). Ironically, wage justice is far more likely to be achieved if comparable worth is seen as a useful management tool than if it is viewed as a revolutionary notion to achieve equity.

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Tools of Persuasion

The Consequences of Economic Rhetoric. ARJO KLAMER, DONALD N. MCCLOSKEY, and ROBERT M. SOLOW, Eds. Cambridge University Press, New York, 1988. xii, 305 pp. $39.50. From a conference, Wellesley, MA, 1986.

The subject of economic rhetoric was first presented in 1983 by Donald McCloskey, who had thitherto written as a conventional economist with special expertise in economic history. The treatment was elaborated in *The Rhetoric of Economics* (University of Wisconsin Press, 1985) with vigor and wit, and a minor cult has emerged to exploit the approach. The volume under review is a miscellany of conference papers and reprinted articles that ostensibly address the question What follows for economics from the study of rhetoric?

Rhetoric has been defined by McCloskey as the study of how people persuade. Scholars (of all disciplines, he argues) may persuade by logic and empirical evidence, but these are a small part of the scholarly arsenal. The larger part is literary culture: the use of metaphors and analogies, colorful parables, striking examples, and emotion-laden figures of speech. Thus, McCloskey estimated that only 15 percent of the confidence placed by economists in the law of demand (people buy less at higher prices) comes from logic and statistical evidence, 85 percent from "literary" rhetoric. Appropriately enough, he supports this thesis by a rhetoric that gives little space to logic or evidence.

What plausibility the rhetorical approach possesses is due, in large part, to the fact that scientific discourse (written as well as oral) usually does not linger long in disputes over logic and empirical evidence. Arguments over logic are usually quickly settled, and, as a rule, arguments over empirical evidence gradually converge to a consensus. In the normal interchange between two scholars, each attempts to change the other's view of a subject, and often both succeed. Each uses complex arguments of which technical analysis is only one element.

The rhetoricians gloss over a fundamental problem in intellectual relationships: it is extremely difficult, and often impossible, to identify the types and even the source of discourses that effectively influence a person. Ask yourself where you received your ideas on a significant subject in your discipline—say, for the economist, the roles of labor unions in the determination of wage rates. The sources are varied and scattered over the past and possibly include subtle inferences from seemingly unrelated knowledge. When the rhetoricians tell us which kinds of arguments are persuasive, they are guessing.

And now, what does this book tell us about the consequences of the study of rhetoric for economics? Most of the 18 essays do not even address the question. Five papers argue the reasonable and unsurprising thesis that scholars use a different language in speaking to laymen or congressmen than to fellow scholars. Two authors blame rhetoric for contributing to the traditional (but now rapidly declining) practice of assigning women primarily to the nonmarket world (households). I accept their description of the past but find it odd to complain against a rhetoric that accurately reflected centuries of social fact. Other papers tell us of the rise of metaphorical rhetoric in physical sciences and in mathematical economics, but with little attention to substantive consequences. Only the two main leaders of the movement, Klamer and McCloskey, explicitly address the question of consequences (Solow, the third editor of the book, is a sympathetic skeptic).

We are told that if we explicitly recognize and study the rhetoric of our profession, we should become more understanding, better-tempered, and especially more effective in persuasion—unless, I suppose, the other party to the dialogue also studies rhetoric. In short, we are told to lead a well-rounded, moral life and even our narrowest scientific studies will prosper. Aside from the costly admonition to remedy the academic deficiencies in our upbringing, this sermon seems innocuous. Yet it is not unanimous: a guru among literary critics, Stanley Fish, tells us to ignore literary studies if our discipline is working fairly well (p. 22). To date, the only clear consequence of the study of rhetoric for economics appears to be conferences and volumes such as these.

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An Industrial Research Program

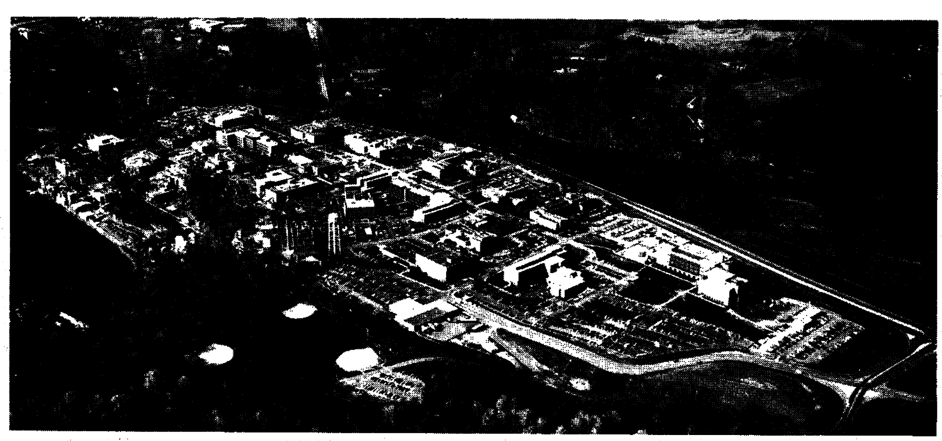
Science and Corporate Strategy. Du Pont R&D, 1902–1980. DAVID A. HOUNSHELL and JOHN KENLY SMITH, JR. Cambridge University Press, New York, 1988. xx, 756 pp., illus., + plates. $39.50. Studies in Economic History and Policy.

Corporate managers today recognize that research is fundamental to remaining competitive, but this has not always been the case in the history of American industry. Indeed, relatively few companies around the turn of the century dedicated space and manpower to research; firms that did, such as General Electric, Parke Davis, and Bell Telephone, were exceptional. Hounshell and Smith's incisive study of the evolution of research at Du Pont examines how one of the leading research-intensive firms in corporate America institutionalized so-called "R&D." Du Pont established two laboratories for research and development within the first decade of this century. One laboratory was more oriented to the everyday missions of the firm's several divisions, whereas the other focused on topics not directly related to divisional interests. This two-pronged approach to research strategy—centralization versus decentralization—remained a characteristic of Du Pont throughout the century.

Its coffers swollen from the spoils of World War I, Du Pont applied its substantial capital to a diversification strategy wherein it acquired new technology, not so much by developing in-house discoveries as by taking over companies with an established interest in a particular technology and then building on that knowledge base. Thus, soon after World War I this munitions monopoly acquired firms specializing in dyestuffs, finishes, and other products. Through the 1920s and early 1930s Du Pont R&D emphasized commercialization over invention, resulting in high-profile products such as Duco finish, tetraethyllead, rayon, and cellophane. Du Pont supplemented this strategy by contracting with the British-based Imperial Chemical Industries for a general exchange of research information.

However, Depression-era economic realities and reemerging antitrust concerns led Du Pont to begin shifting from a commercialization strategy to a plan of developing entirely new ideas for products within the firm, beginning in the late 1920s. Du Pont hired a number of promising young chemists to staff its new fundamental research program, among whom was Wallace Hume Carothers. How the company interpreted the mission of fundamental research depended on the administrator heading that enterprise. At first the program aimed to understand the science underlying Du Pont technology, but by the later 1930s and thereafter fundamental research at Du Pont meant that "scientists move into uncharted fields to be pioneers, scouting out the territory and laying claim to its riches before others appear on the scene" (p. 366). The first discoveries by the fundamental research group in the 1930s, neoprene and nylon, were among the most profitable in the history of the firm.

As was the case in many other firms during World War II, Du Pont researchers engaged in a variety of projects for the government, including development of protection against gas warfare, synthesis of pharmaceuticals, and, most of all, adaptation of Du Pont products for wartime uses. Du Pont research in the late 1940s and 1950s was the basis of assorted commercial successes with fibers (such as Orlon and Da-



The Du Pont Experimental Station in 1925 (top) and 1987 (bottom). [From *Science and Corporate Strategy*]