

Crane D. *Invisible colleges: diffusion of knowledge in scientific communities*. Chicago, IL: University of Chicago Press, 1972. 213 p.
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Through discussions of (1) "Scientific communities and the growth of knowledge," (2) "The social organization of research areas," (3) "Social organization and the diffusion of ideas," (4) "Variations in scientific growth," (5) "Interactions between scientific communities," and (6) "The structure of science" an attempt is made to identify social networks among scientists and to identify the basic components of the sociological processes of scientific growth. [The *SCI*® and *SSCI*® indicate that this book has been cited in over 385 publications.]

How Scientists Communicate

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In the late 1960s, there was little interest in the sociology of science among American sociologists. Robert K. Merton¹ had published some seminal works in the field in the late 1930s and early 1940s, but he was not active in the field at that time. To a considerable extent, the impetus for the development of the sociology of scientific research specialties and research areas came from outside sociology, from works by Derek J. de Solla Price² and Thomas S. Kuhn,³ which were published at the beginning of the 1960s. Their writings presented models of scientific growth and change that had important implications for sociological studies of science.

Moreover, Price undertook specifically to encourage sociological research on these topics by bringing together, at a small conference in his office at Yale University, several researchers who were beginning to work along these lines, including Susan Crawford, Nicholas Mullins, Gerald Zaltman, and me. Our first studies were intended to show wheth-

er or not a sociology of scientific research areas was justified. Did scientists communicate with one another about their research? Did they form social groups in some meaningful sense of the word? Alternatively, did they simply read each other's work without having any personal contact with one another?

These early studies revealed the existence of a distinctive type of social structure that is described in this book. The emphasis was upon how scientists communicate and much less upon what they communicate. Consequently, these studies attempted to identify social networks among scientists. Given the enormous variation among scientific fields, it seemed important to me to attempt to develop a very general model that would capture the essentials of the social aspects of scientific change. The model was, in a sense, highly speculative. Our data at the time were very limited. It was an attempt to guess what the most general characteristics of the sociological processes of scientific growth might be.

The model that I presented in *Invisible Colleges* is not typical of sociological models in that it deals with changes over time. Since social structures in science are continually changing, the model had to show how these changes take place, in spite of the fact that empirical studies were done at a single point in time. My awareness of the importance of change over time was undoubtedly heightened by my readings of Kuhn and Price.

Another influence on my work was the study of social networks, broadly defined, including studies of communication and influence, the diffusion of innovations,⁴ and C. Kadushin's work on social circles.⁵ Some of these studies, such as those on the diffusion of innovations, also dealt with the evolution of social communities over time.

For the most part, subsequent studies have substantiated the ideas presented in the book.⁶ In 1982 Daryl E. Chubin published a lengthy bibliography and review of research on invisible colleges.⁷

1. Merton R K. *The sociology of science: theoretical and empirical investigations*. Chicago, IL: University of Chicago Press, 1973. 605 p. (Cited 565 times.)
2. Price D J D. *Little science, big science*. New York: Columbia University Press, 1963. 119 p. (Cited 855 times.) [See also: Price D J D. Citation Classic. (Smelser N J, comp.) *Contemporary classics in the social and behavioral sciences*. Philadelphia: ISI Press, 1987. p. 59.]
3. Kuhn T S. *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press, (1962) 1970. 210 p. (Cited 3,435 times.)
4. Rogers E M. *Diffusion of innovations*. New York: Free Press of Glencoe, 1962. 367 p. (Cited 770 times.)
5. Kadushin C. Power, influence and social circles: a new methodology for studying opinion makers. *Amer. Sociol. Rev.* 33:685-98, 1968. (Cited 55 times.)
6. Mulkey M J, Gilbert G N & Woolgar S. Problem areas and research networks in science. *Sociology* 9:187-203, 1975. (Cited 45 times.)
7. Chubin D E. *Sociology of sciences: an annotated bibliography on invisible colleges, 1972-1981*. New York: Garland, 1983. 202 p. (Cited 10 times.)

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