EDITING A NORMAL SCIENCE JOURNAL IN SOCIAL SCIENCE

by

Linton C. Freeman
(University of California, Irvine, lin@aris.ss.uci.edu)

Résumé –

Abstract: This paper displays some differences between "normal science" journals in fields like physics and chemistry and non-normal science fields in the social sciences. It shows that one journal, *Social Networks*, looks more like a normal science than a typical social science. I argue that the normal science properties of social network research stem from its use of both graphic images and mathematical models and from the availability of computers that permit analysis of its relatively complex data structures.

INTRODUCTION

In a personal communication, the eminent anthropologist, A. K. Romney, distinguished between scientists and social scientists. "Scientists," said Romney, "compete against nature; social scientists compete against each other."

The scientists Romney is talking about are engaged in what Thomas Kuhn (1962), called "normal science;" the social scientists are not. Kuhn defined normal science as a community endeavor. A collection of individual scientists come to share a common set of beliefs both about which problems are appropriate for study and about acceptable ways of seeking solutions to those problems. In Kuhn's words, they share a *paradigm* for research.

Because they share a paradigm, normal scientists, like physicists and chemists, work together in a systematic effort to uncover nature's secrets. But Romney suggests that social scientists, like sociologists and anthropologists, lack a paradigm. Instead of attempting to uncover nature's secrets, they seem to struggle with each other in a never ending effort to re-define what should be studied and how.

The lack of a paradigm in social science was brought home to me many years ago when I served as an associate editor of a journal in social psychology. As he received manuscripts the editor sent each of them to two associate editors for review. At the top of each review sheet was a rating scale like the one shown in Figure 1. Each associate, then, provided an overall numeric rating for each manuscript reviewed. And at the end of the year the editor sent a list of all the manuscripts reviewed to each of the associate editors. The list included the pair of ratings that had been assigned to each. I ran a correlation between the pairs of ratings and the result was -.02—almost exactly zero. This could occur only in a field where there was no paradigm to guide research and evaluation.

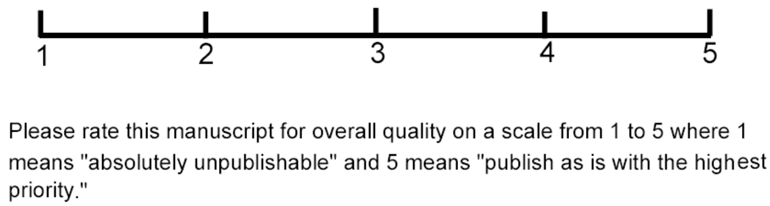

Figure 1. Rating Scale from an Early Social Psychology Journal

Normal science fields, that are guided by a paradigm, should differ from those that lack a paradigm in at least three important ways:

1. Since, given a paradigm, writers and reviewers should agree, a normal science journal should accept almost all manuscripts submitted. But in a science that lacks a paradigm one would expect little agreement between writers and reviewers and, consequently, acceptance rates should be much lower.

2. When a paradigm is present the articles published in each journal should tend to follow one or a few lines of inquiry. Thus, they should tend to cite articles previously published in that same journal. But without a paradigm, fewer tendencies for that kind of self-citation should be displayed.

3. When a paradigm is present, the average lengths of articles should be relatively short. Each article in a normal science is contributing to an ongoing process of building cumulative knowledge. Each, therefore, can be expected simply add its bit to the ongoing process, and do so in relatively few pages. But without consensus, contributions to a non-normal science must all go back to first principles and try to lay out the foundations for their approach. In that case, articles should tend to be longer.

In the next section I will use data from normal and non-normal sciences to explore these ideas.

PUBLISHING PRACTICES IN NORMAL AND NON-NORMAL SCIENCES

Figure 2 shows the acceptance rates for four physics and chemistry journals and four journals from sociology and anthropology. The differences in acceptance rates between these two kinds of journals are dramatic. It is clear that the normal science fields do accept almost all submissions; the non-normal fields accept practically none.

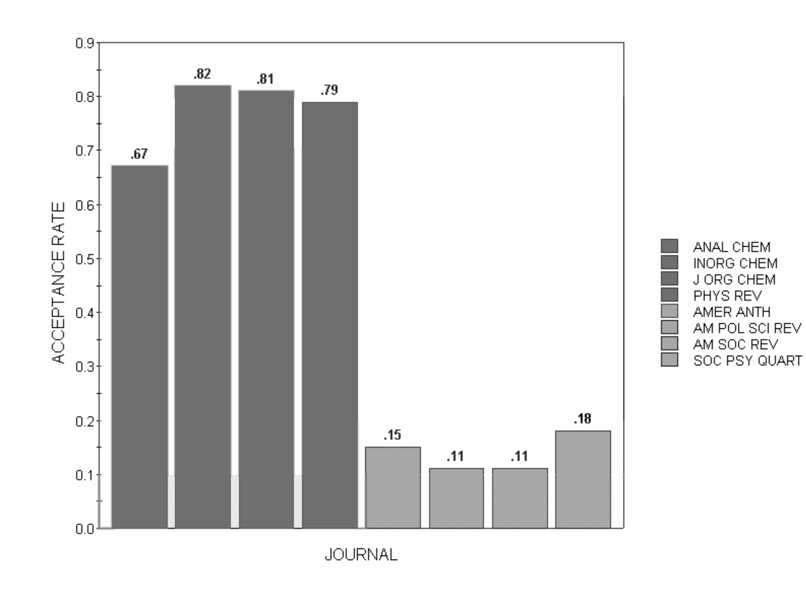

Figure 2. Recent Acceptance Rates for Eight Journals[1]

Figure 3 shows the self-citation patterns for five journals from physics and chemistry and five from sociology, anthropology and political science. Again it is dramatically clear that the normal sciences display a much larger tendency toward self-citation.

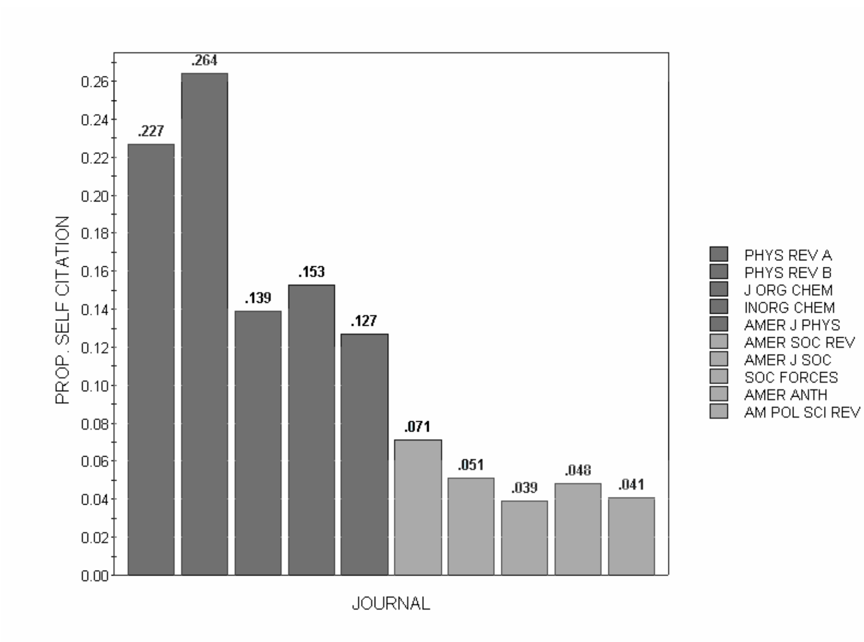

Figure 3. Recent Self-Citation Rates for Ten Journals

And Figure 4 shows the average number of pages per article for four physical science and three social science journals. Here again, the two kinds of journals seem to differ markedly in their styles. Articles in the social science journals seem, on average, to be considerably longer.

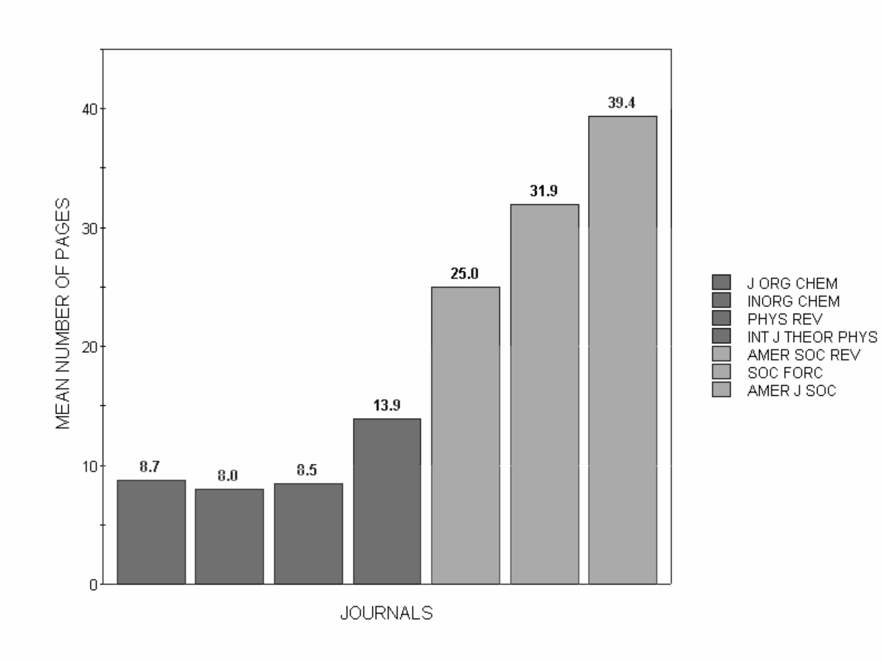

Figure 4. Average Article Lengths in Seven Journals

The expected differences between journals in physical sciences and those in social sciences are supported by these data. They differ in acceptance rates, self-citation rates and article lengths. It is clear, then, that in general there are important differences in publication policies and styles between normal and non-normal sciences. In the next section I will describe a social science journal that deviates from these generalizations.

A DEVIANT SOCIAL SCIENCE JOURNAL: SOCIAL NETWORKS

In 1978 I was the founding editor of a new social science journal, Social Networks. Originally it was published by Elsevier Sequoia in Lausanne Switzerland. But in 1982 it was moved to the parent company, Elsevier North Holland, in Amsterdam.

The aim of Social Networks was to provide a forum for a then small community of mathematicians and social scientists whose work embodied a structural perspective in social research. The new journal had to establish an identity, so the first few submissions represented a wide range of approaches; many were simply inappropriate for Social Networks. But by the third year the journal had succeeded in communicating its perspective and almost all of the new submissions were appropriate.

After 15 years of publication, Hummon and Carley (1993) examined the citation patterns in Social Networks. Citations, they found, were systematically patterned. There were

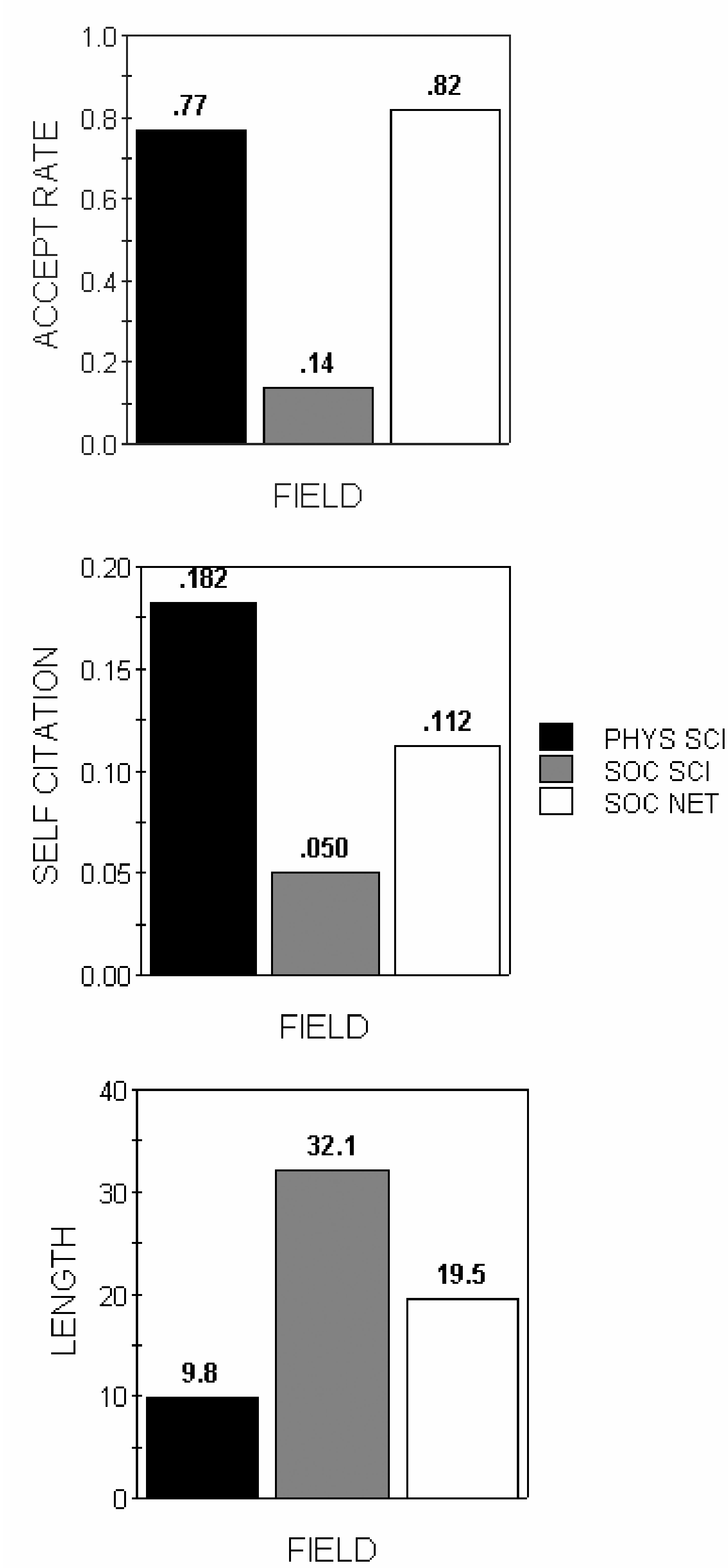

Figure 5. Social Networks Compared with Physical Science and Social Science Journals

multiple citations to most authors, the same authors reappeared and the citation paths displayed a single coherent substantive concern. They reported that, "There are no major divisional splits, either institutional or paradigmatic, and the members of the specialty attend to each others' work." They concluded that, ". . . the type of science engaged in within social networks is what Kuhn has labeled 'normal science'." The question here, then, is: "How does Social Networks stack up against other physical and social science journals in terms of acceptance rate, self-citations and article length?"

Figure 5 compares Social Networks with the averages for physical science and other social science journals in all three of these respects. In terms of acceptance rates, Social Networks is almost exactly like the physical science journals and both are completely unlike the social science journals. In terms of self-citations, Social Networks more than doubles the average rate of the other social science journals, but it still falls somewhat short of the physical sciences. And Social Networks articles are nearly twice as long as those in physical science, but they are still far shorter than those in other social science journals. All in all, then, it appears that, though it has not yet come as far as the journals in physics and chemistry, Social Networks resembles the journals in physical science more than it does its sister journals in social science.

This result leaves an obvious question: "Why?" How was social network analysis able to get away from the standard social science norm? In the next section I will explore some possible answers to this question.

HOW DID SOCIAL NETWORKS GET TO BE NORMAL?

I would, of course, like to claim credit for a brilliant editorial policy that established Social Networks as a normal science journal. I am sure, however, that the development of the social network paradigm stems from the nature of the field and not from the editorial policy of the journal. So the question becomes, how the field of social network analysis succeeded in becoming normal when normal science is apparently so difficult to establish in the social sciences.

I will argue that three features of the social network field are responsible for the fact that it is normal. First, it uses graphic images to explore data and to generate intuitive ideas. Second, it uses mathematics to develop models and to examine their consequences. And third, it is new enough that it developed as a field in a context in which computers were available.

Klovdahl (1981) stressed the importance of graphic imagery in the development of social network analysis. Indeed, graphic images of social linkages were produced long before the field emerged (Freeman, 2004, pp. 21-25). Klapisch-Zuber (2000) reports that images of kinship networks were introduced in Europe as early as the ninth century.

Kinship diagrams have been produced regularly over the centuries, but finally in the 1930s images of networks that depicted other kinds of relationships began to appear.

Moreno (1934) produced pictures in which individuals were shown as points and interpersonal ties, like friendship or enmity, were shown as lines connecting pairs of points.

An early image is shown in Figure 6. That image displays the pattern of friendships observed in a set of fourteen workers in the Bank Wiring Room of the Western Electric plant (Roethlisberger and Dickson, 1939). In this image, points are workers and they are drawn in locations that correspond to their work stations in the room. Lines connecting pairs of workers indicate that they are friends. A quick inspection of the picture, suggests that these workers had formed two distinct friendship groups that were linked by the tie between $\mathbf{S_1}$ and $\mathbf{W_7}$.

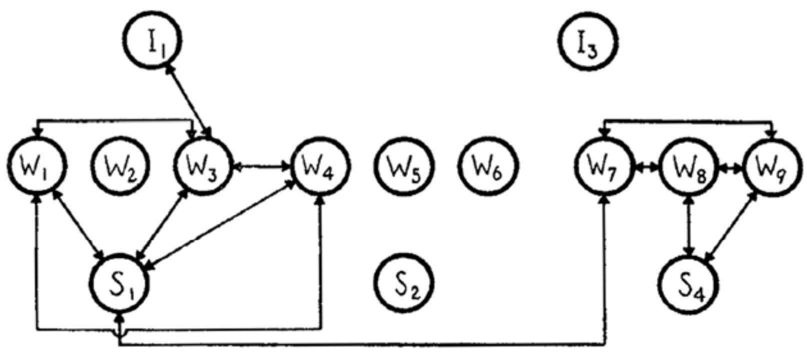

FIGURE 43
FRIENDSHIPS
BANK WIRING OBSERVATION ROOM

Figure 6. Image of Friendships in the Bank Wiring Room.

Over the years these point and line images were refined and elaborated. Figure 7 shows one of my own contemporary images (Freeman, 2004, p.131). There, the individuals who were among the founders of social network analysis reported the names of those who influenced them. The image is computer drawn and the points are located according to a model that places points close together when the persons they represent report similar patterns of influence. The overall picture suggests that, in terms of who provided influence, the field had two fairly distinct groups of founders.

Graphical applications to social network problems, then, began centuries before the field of social network analysis emerged. It was already in place and it was absorbed into the network field from the beginning. These images turned out to provide powerful devices that allowed analysts to develop a sense for important structural features of the networks they examined.

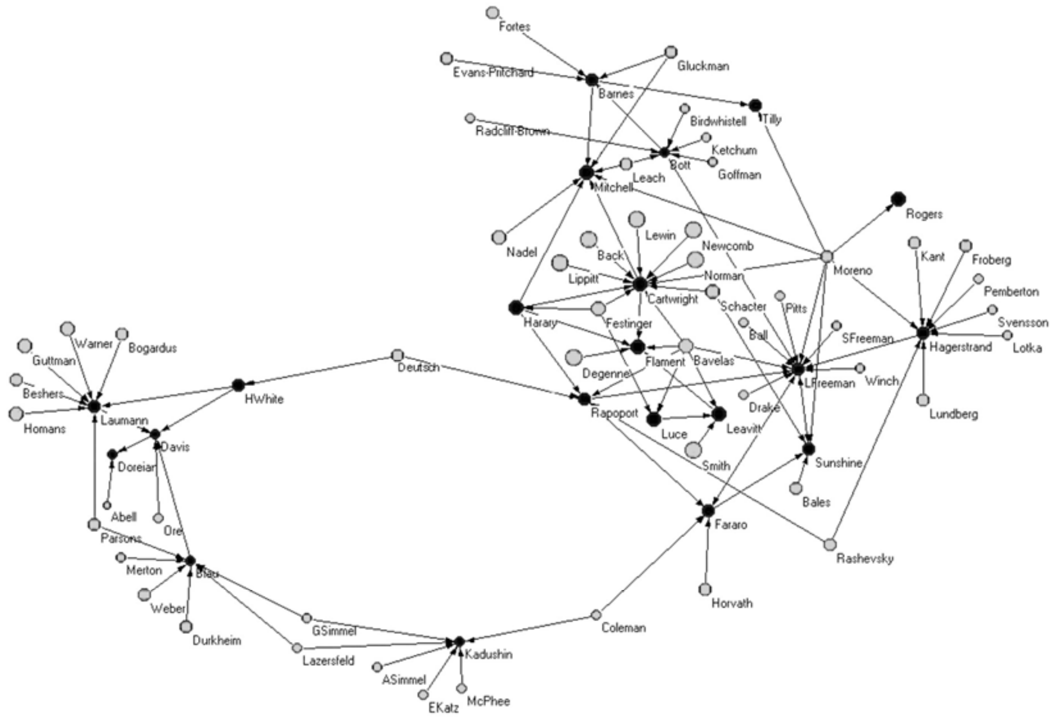

Figure 7. Patterns of Influence among Early Social Network Analysts

Like graphic images, mathematical models of network phenomena emerged long before the field of network analysis was born. The earliest mathematical model I can find that can be clearly identified as pertaining to a social network phenomenon was published in 1845. Bienaymé (1845), a French probability theorist, developed a model for the disappearance of family names.[2] His model was based on the number of offspring produced by each family and it showed the conditions under which a family name would disappear and those under which it would continue.

Following Bienaymé, other mathematicians have attacked problems that refer to social networks and they continue to do so right up to the present time. I have been able to dig up the names of forty-seven mathematicians who have made direct contributions to the development of the field. The list includes such notables as Andre Weil and John Kemeny. Weil was the founder and intellectual leader of Bourbaki, a group of young French mathematicians that made important contributions to the foundations of mathematics. Kemeny served as Einstein's mathematical assistant and later was President of Dartmouth College. He was also the creator of the computer programming language, BASIC.

Some of these mathematicians worked independently but many were teamed with social scientist partners. That kind of partnering began in 1875 when a scientist, Francis Galton, enlisted the aid of a mathematician, Henry William Wallace, to work on the problem of family names.[3] It continued in the 1930s when a psychiatrist, Jacob Moreno, enlisted the collaboration of a Columbia sociologist, Paul Lazarsfeld, whose degree was in mathematics. And, at the same time, students of a Harvard anthropologist, W. Lloyd Warner, recruited a Harvard mathematician, Willard Quine, to help with their project. From the start, then, people working on social network research recognized the need for mathematical tools and set out to acquire them. This practice of joint work involving social network analysts and mathematicians has continued to the present day.

Over the years social network analysis has also drawn on the mathematical skills of a number of physicists. Moreover, a good number of social network analysts are so sophisticated mathematically that they could arguably pass as mathematicians. Overall, then, the ties between social network analysis and mathematics have been and continue to be very strong. As a matter of fact, social network analysis and the modern mathematics specialty, discrete combinatorics—principally graph theory—have emerged and developed side by side. Network analysis has provided problems for discrete combinatorics and discrete combinatorics has provided tools for network analysis (Freeman, 1984).

Social network analysis did not emerge as a recognized field of study until the 1970s (Freeman, 2004). Wolfe (1978) has argued that the presence of computers was essential for social network research to move ahead far enough to be recognized. The kinds of data generated in network research typically display many more dimensions than those faced in other social research areas. Because network analysis is focused on relations linking social actors, rather than on their traits, the magnitude of computational task becomes large so quickly that computation without digital computers is virtually impossible.

The earliest network-oriented computer programs were developed as soon as computers became available in the 1960s. And during the 1970s at least eleven new computer programs for network analysis were released (Freeman, 1988; 2004, pp. 139-140). Most of these early programs were special purpose. They permitted users to calculate only one or two, relatively simple, network properties. But, beginning in the 1980s, general purpose network analytic programs began to be introduced. Most of these newer programs were designed to be used on micro-computers. Many of them, along with a great many newer ones, are widely used by network analysts throughout the world. Today, almost no network research is reported that is not based on analysis involving these general purpose programs.

CONCLUSIONS

As a field, social network analysis developed out of a context in which the use of both graphic images and mathematical models of network phenomena had already been established. From the outset, then, network analysts used graphics to explore data and to communicate their results to others. And from the outset they developed, or encouraged mathematicians to develop, mathematical tools for modeling network phenomena. Finally, once computers were available, network analysts were among the first to use them. Early programs permitted the analysis of relatively large collections of network data. At the same time, they were used to facilitate the production of graphic images of networks.

Together these three features permitted network scientists to develop a paradigm. The use of graphics eased the communication of ideas among researchers. The use of mathematical models helped network analysts to avoid the kind of controversies that characterize much social science research. In other social sciences, misunderstandings and conflicts often emerge as a consequence of the ambiguities inherent in the use of natural language (Freeman, 1960). With the use of mathematical argument these are minimized. Finally, the use of computers made it possible to work out standard procedures for the analysis of combinatorically complex collections of network data.

REFERENCES

Bienaymé, I.-J., 1845; De la loi de multiplication et de la durée des familles. *Bulletin de la Société Philomathique de Paris* 5:37-39.

Freeman, L. C., 1960; Conflict and Congruence in Anthroplogical Theory. In Wallace, A. F. C. (Ed.): *Selected Papers of the Vth International Congress of Ethnological and Anthroplogical Sciences*, Philadelphia: University of Pennsylvania Press, 93-97.

Freeman, L. C., 1984; Turning a profit from mathematics: the case of social networks. *Journal of Mathematical Sociology* 10:343-360.

Freeman, L. C., 1988; Computer Programs and Social Network Analysis" *Connections*, 11:26-31.

Freeman, L. C., 2004; *The Development of Social Network Analysis: A Study in the Sociology of Science*. Vancouver, B. C.: Empirical Press.

Galton, F., Watson, H. W., 1875; On the probable extinction of families. *Journal of the Anthropological Institute of Great Britain and Ireland* 4:138-144.

Hummon, N. P., Carley, K. M., 1993; Social networks as normal science. *Social Networks* 15:71-106.

Klapisch-Zuber, C., 2000; *L'Ombre des Ancêtres: Essai sur l'Imaginaire Médiéval de la Parenté*. Paris: Fayard.

Klovdahl, A. S., 1981; A note on images of networks. *Social Networks*. 3, 197-214.

Kuhn, T. S., 1962; *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Moreno, J. L., 1934; *Who Shall Survive?* Washington, DC: Nervous and Mental Disease Publishing Company.

Roethlisberger, F. J., Dickson, W. J., 1939; Management and the Worker. Cambridge, MA: Harvard University Press.

Wolfe, A. W., 1978; The rise of network thinking in anthropology. *Social Networks* 1:53-64.

---

[1] The data for this and the subsequent tables were generated by examining information on a haphazard sample of journals. Inclusion was determined by the availability of the needed information. In each case, however, the data reported were based on an analysis of one full year of a journal's activity.

[2] This development is traditionally attributed to Galton and Watson (1875), but their work came 44 years later and was less complete (see Freeman (2004) pp. 28-29).

[3] Galton and Watson were apparently unaware of the earlier work by Bienaymé on this same problem.