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Co-Citation of Prominent Social Network Articles in Sociology Journals: The Evolving Canon

David Lazer[1]
Ines Mergel[2], **Allan Friedman**[1]

[1]*Kennedy Kennedy School*
Harvard University

[2]*Maxwell School of Citizenship and Public Administration*
Syracuse University

Abstract

Social network analysis has been a particularly hot area across the social (and some non-social) sciences. How has this growth, in turn, affected the field of social network analysis within sociology, the discipline which has served as the primary home of social network analysis over the last several decades? In order to answer this question, we examined the citation patterns of the social network papers in the two leading general sociology journals, the *American Sociological Review* and the *American Journal of Sociology*, from 1990-2005, focusing on the body of literature that was cited by at least two social network papers in a given year. We produced two network snapshots of the social network canon during this period.

These analyses reveal a combination of great change and substantial continuity. There was a substantial increase in interest in social networks in sociology throughout this period, and, in particular, an enormous rise in interest in small world issues, coupled with the abrupt entry of mathematicians and physicists into the sociology social network canon. However, during this entire period Granovetter's work remained squarely at the center of the canon, with Granovetter (1973) as the most cited piece at both the earlier and later snapshots.

Introduction

The study of networks has been one of the major growth areas within scholarly research over the last decade. Particularly striking has been the growth of research on networks within physics, dating from Watts and Strogatz's (1998) work on small world networks. What impact has this growth had on the study of networks within sociology, a discipline that has served as the primary home for the study of networks for the last several decades? In this paper, we examine the co-citation pattern of papers published in the two leading generalist journals within sociology, the *American Sociological Review* (ASR) and the *American Journal of Sociology* (AJS), for 1990-2, 2000, and 2005. A co-citation is a shared reference of two articles to a third source. The list of co-cited references of social network research within ASR and AJS for a given year offers a rough measure of what the field collectively believes is within the canon: those sources worthy of attention and acknowledgement. How has the content of the canon evolved over the years? In particular, what impact has the work within physics had on the study of social networks within sociology? What is the underlying structure of the canon? For example, is there a common core of sources that all social network articles cite? Or does the field have a more decentralized structure?

Our analysis reveals a combination of great change and substantial continuity in the field. There was a major increase in interest in social networks in sociology during this period, and, in particular, an enormous rise in interest in small world issues, coupled with the abrupt entry of mathematicians and physicists into the sociology canon. However, across all periods, Granovetter's work remained squarely at the center of the canon, with Granovetter (1973) as the most cited piece in both the early and late periods.

Co-citation analysis

The list of citations within a published article offers a glimpse into what is considered the *canon* at a particular point in time of the field, reflecting the collective wisdom of the author, editor, and referees as to what prior research acts as the foundation for the findings of that article. The list of citations for a particular article will certainly reflect the idiosyncrasies of that particular author, and details of the article's subject area. However, the *body* of articles published in a given year reflects a communal consensus as to what the collective research agenda is, and, in particular, what prior research is worth paying attention to. We therefore used the concept of *co-citation analysis* from bibliometrics (White/Griffith 1981). A co-citation occurs when two articles share a reference. Co-citation analysis is used in different ways: it can help to identify so-called "invisible colleges" in forms of clusters of authors who cite similar references; it can also detect emerging trends within a research field or shows bridges among research disciplines (see Table 1 for examples).

Table 1. Examples of Co-citation Analysis

Study	Field	Authors
Co-Authorship in Management and Organization Studies	Organizational Behavior	(Acedo/Barroso et al. 2006)
Search for invisible colleges	Methodological evaluation	(Gmuer 2003)
Bridges between research disciplines	Information Science	(Karki 1996)
Intellectual Development of MIS: clusters/invisible colleges	Management Information Science	(Culnan 1987)

We contrast co-citation research with the recent work on co-authorship networks that illuminates the emerging structure of collaboration among academics within different disciplines (Newman 2001; Barabasi/Jeong et al. 2002; Newman 2004). While co-authorship networks reflect the structure of collaboration within a research community, co-citation networks reflect the *structure of attention* within a research community—that is, what prior research is worth paying attention to (de Solla Price 1965).

The standard procedure to conduct a co-citation analysis is presented by McCain (1990), see also description of the process in Ahlgren/Jarneving et al. (2003, p. 550). In our study, we have adopted the following procedures:

- Identify articles that are primarily focused on the study of social networks in the top two generalist sociology journals—AJS and the ASR—for 1990-92, and in 2000 and 2005. (We aggregate 1990-92 in order to produce a list of seed articles of a comparable size as 2005, allowing useful structural comparisons.) We therefore do not claim to offer an overall picture of social network analysis as a field but rather of social network analysis within sociology. Articles were selected by hand-coding the abstracts (see Appendix A).

- The citations from each article were collected, where for each period studied, we eliminated cited literature that was only referenced by one article. In short, inclusion in the canon requires a minimum of "two votes" from top journals.

The resulting graphs offer a picture of the evolution of structure of the sociologically-based social network analysis as a field.

Social Network articles in ASR and AJS

A comparison across the years highlights the increase in the quantity of research on social networks. For example, while there were 20 articles published 1990-92 that examined social networks, there were none in 1995, 7 in 2000, and 14 publications in 2005. This increase is consistent with, but not as dramatic as, findings described by Borgatti and Foster (2003) in their review of the applications of social network analysis in the field of organizational behavior. Perhaps this contrast reflects that social network analysis was starting from a higher base in sociology. In addition, across all of the years, AJS appears to be far more likely to provide a venue for social network research than ASR. Figure 1 portrays the co-citation structure for ASR and AJS from 2005. The seed articles are circles, and the cited papers and books are squares. We also distinguish between articles from ASR (yellow) and AJS (red). We note that AJS featured a "Special Issue on Computation" in 2005 that prominently featured social network research, contributing five of the fourteen articles from that year. We denote these articles with a dark outline and consider them further below. The black squares are from the social sciences, and grey squares from mathematics and physics.

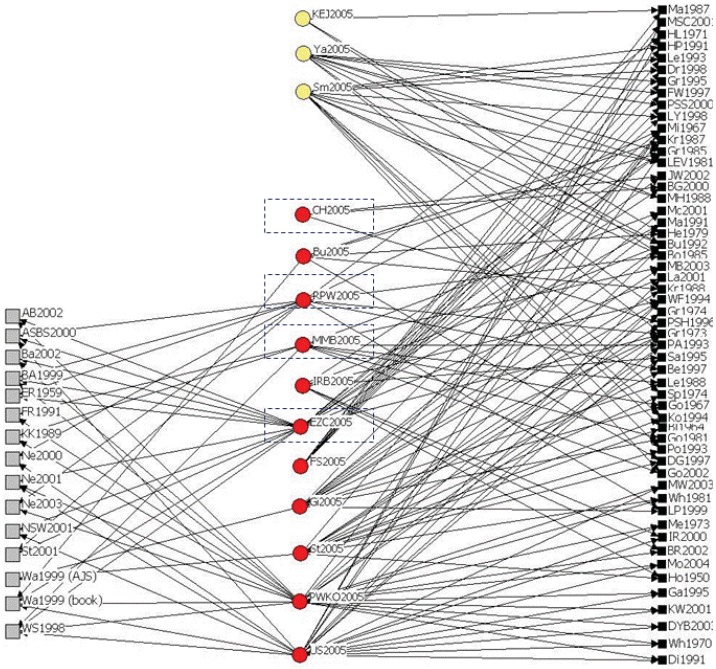

Figure 1. Co-citation Patterns 2005[1]

A comparison over the years also reflects the fact that the average number of total citations in each article grew during this period. Figure 2 highlights the growth of the number of citations where the average social network article had 47% more references in 2005 than in the early 1990s. (This partly reflects the secular trend during this period toward the inclusion of more references where the average non-network articles in AJS/ASR experienced approximately a 26% increase in number of references.)

[1] An earlier version of this figure appeared in Heyman (2006: p. 606).

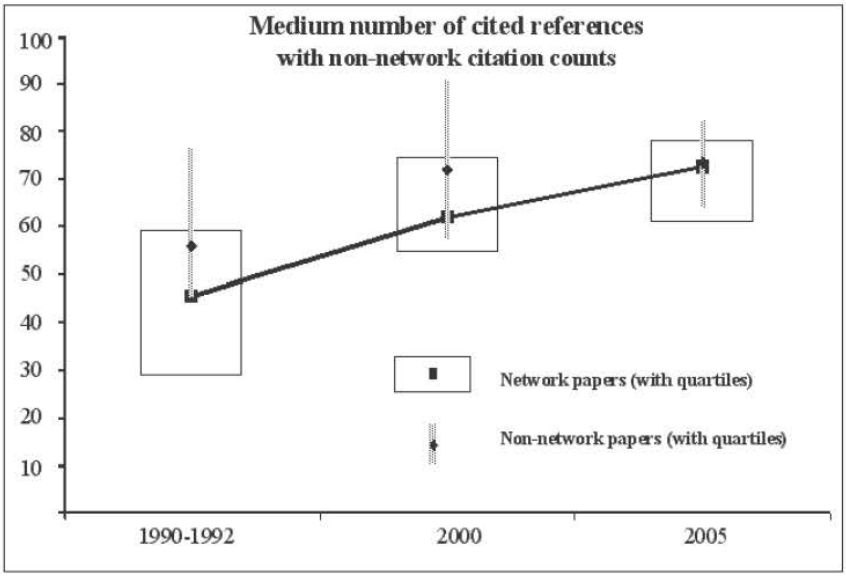

Figure 2. Comparison of Total Number of Articles Cited by Year (1990-2005) (overlaid with non-network citation pattern distribution)

The data embedded in these figures also reveals the "erosion" of older pieces of the canon, i.e., how the probability of being cited declines over time. Figure 3 plots the proportion of papers cited for each of the three periods against the year of the citation. It generally appears that attention is maximized about four years after an item is published, dropping about 50% every 5-7 years after that.[2] We would note, however, of the top four articles cited in 2005, one is from the early 1990s, one from the 1980s, one from the 1970s, and one from the 1960s (see Table 2). Figure 3 thus reflects the fact that most articles largely disappear after a decade, but a handful of classics continue to receive citations for long after.

[2] We would note that the "decline" for the 2005 data is exaggerated by the fact that there likely more references in the preceding five-year period than any other period that references were observed.

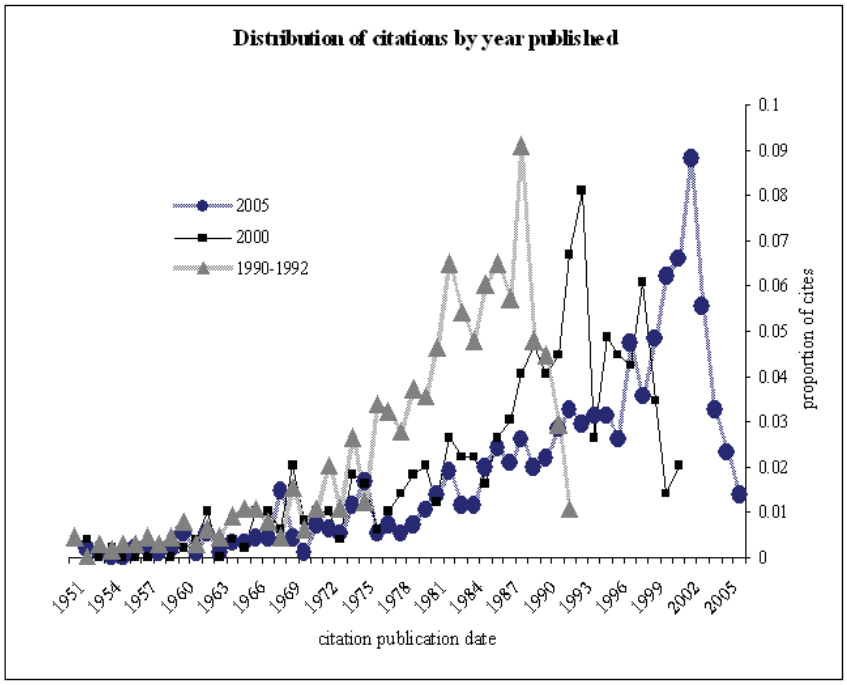

Figure 3. Distribution of Citations by Year Published

Of the 46 articles cited multiple times in 1990-1992, three are cited at least twice in 2000. Notably, Granovetter (1973), Granovetter (1974) and Lin/Ensel et al. (1981) also reappear in 2005, along with four others found in the early 1990s. Of the 20 articles in the canon of 2000, five remain in the 2005 canon. In addition, there were 16 articles from the 1980s or earlier that appeared in the canon in 2005 that did not appear in 2000 or the early 1990s (in comparison, 45 co-cited articles in the early 1990s were from the 1980s or earlier). This certainly reflects the vagaries of the particular articles that happened to appear in the time periods we looked at, where, for example, Krackhardt (1987; 1988) was certainly in the canon during the 1990s. However, it is also clear that some research veins that had faded over the years have returned to prominence - in particular, with respect to "small world" research. For example, Milgram (1967) was not co-cited in the earlier periods, but became the second most cited article in 2005, likely due to its complementarity with Watts (1999) and Watts and Strogatz (1998). Similarly, fairly old work on random graphs was also resurrected - e.g., Erdös and Renyi (1959).

Other items, at the center of the canon in the early 1990s - e.g., Homans (1974) and Fischer (1982a; 1982b) - essentially disappeared. These shifts, in part, reflect the movement of the field into different areas. In addition, concepts such as network centrality that used to demand a specific citation are now accepted generic

metrics. And, of course, the nature of academic trends demand a fresh set of underpinnings for each wave of analysis in the forward progress of the field. Appendix B presents the articles and books that were cited at least twice in any of the time periods we examined.

The most striking change in the canon, however, is what Bonacich (2004) termed "*the invasion of the physicists*." We identify the recent work by mathematicians and physicists, which made a rapid entry into the canon after 2000—from *no* co-citations in the early 1990s and 2000 to 37 (23% of the total) of all co-citations in 2005. The AJS special issue on computation drives a disproportionate number of these citations. A full 28 of the 37 (~75%) of those co-citations are from the special issue, where three of the four heavy science citers are found in this issue.

Table 2 provides an additional sense of evolution of the field: it includes a list of the most co-cited articles during these three periods; and a list of the most co-cited authors. The mathematicians/physicists are highlighted in italics.

Table 2. Most Cited Articles and Author by Year

Most cited articles by year		
1990-92	**2000**	**2005**
Granovetter 1973 (4) Fischer 1982 (4) Homans 1974 (4)	Fernandez and Weinbert 1997 (3) (Multiple articles at 2)	Granovetter 1973 (6) Granovetter 1985 (5) Milgram 1967 (5) Burt 1992 (5) *Watts and Strogatz 1998 (4)* *Watts 1999 (4)* Wasserman and Faust 1994 (4)
Most cited authors by year		
1990-92	**2000**	**2005**
Granovetter (13) Marsden (11) Fischer (6) Lin (5) Freeman (5)	Granovetter (6) (No one else above 3)	Granovetter (14) *Watts (12)* *Newman (9)* *Strogatz (8)* *Barabasi (7)*

The table highlights the striking dominance of Granovetter in this field across all periods. However, equally remarkable is that four of the five most cited authors in 2005 are mathematicians and physicists.[3]

In order to get another view of the evolution of the canon, we converted the 2-mode seed-article-by-co-citation matrix into a 1-mode reference-by-reference affiliation matrix. That is, references A and B are are assumed to be linked if they were on the same list of references (and the more that they appear together, the more strongly they are linked). Figure 4 shows the resulting graph using valued data for 1990-1992, where the link strength is based on the number of times two articles appeared on a reference list together. The figure shows only papers with more than one shared reference. There are a number of clusters of references that tend to be cited together where one cluster is dominated by Granovetter's strength of weak ties work (1973, 1974, 1982), and, to a lesser extent, by Wellman (1982, 1988) and Fischer

[3] This is not a completely fair comparison in that some of this work was co-authored among these individuals. However, coauthorship among physicists/mathematicians was not obviously higher than sociologists (with the notable exception of Granovetter, who was single author on all of his co-cited pieces, making his dominance in Table 2 all the more striking).

(1982a, 1982b). There are two other clusters, bridged by Yamagishi et al. (1988), one of which is dominated by Homans (1974) and Blau (1964), and the other by Freeman (1979). The canon in the early 1990s, while all connected, looks easily decomposable into multiple areas, the biggest of which focused on the strength of weak ties, the second on exchange, and the third on centrality.

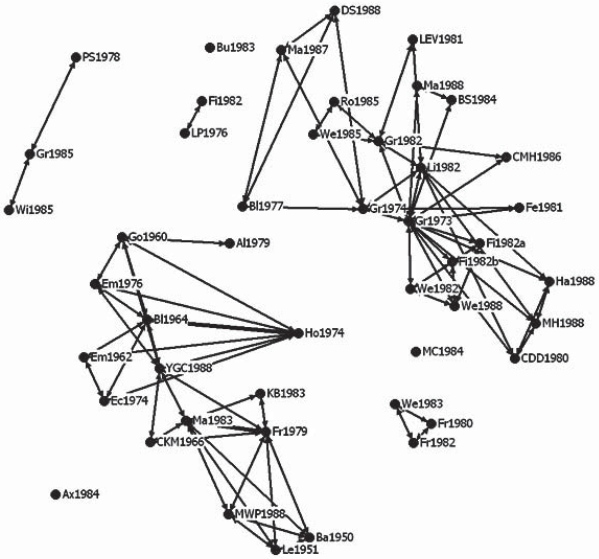

Figure 4. Affiliation Diagram: Subgroups Among Co-cited Articles (1990-1992)

Figure 5 provides the equivalent figures for the 2005 data, with the physics/mathematics articles highlighted as grey squares. The graph of the 2005 data looks dramatically different than the early 1990s. Whereas the 1990s had a number of fairly equally balanced clusters, the 2005 data reveal a clear core-periphery structure, where the core is dominated by a set of strongly connected articles by physicists/mathematicians. This comes through most clearly in Figure 5, where there is one, very large, well-connected component to which all of the physics articles belong, a few small components (e.g., around Goffman), and a number of isolates. In short, there appears to be a core in the reference structure of sociological social network research, to which all of the physicists belong, but also a large diffuse penumbra, which is only loosely connected to the core. This penumbra is connected to the core through a few key articles, such as Granovetter (1973; 1985), Burt (1992) and Milgram (1967).

While we would be hesitant to predict that this core-periphery structure will be reflective of the citation pattern of a more extended period because of the AJS special issue in 2005, it is notable that of the eight social network articles not from the special issue, half cite at least one of the physicists.

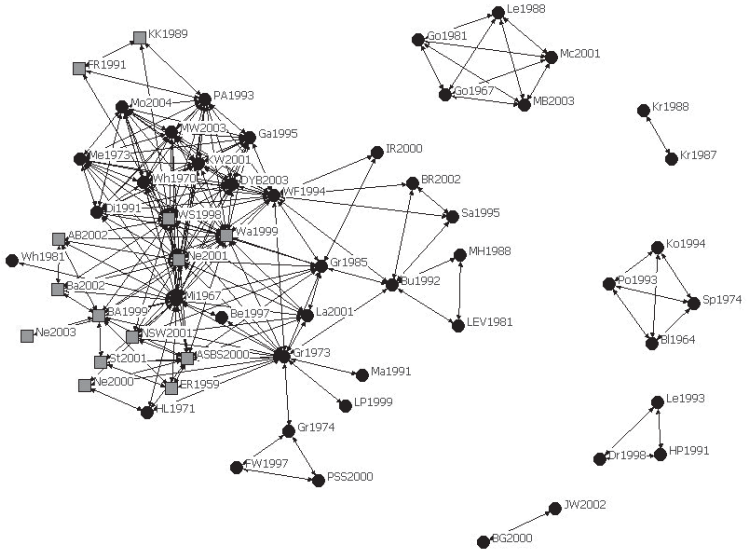

Figure 5. Affiliation Diagram: Subgroups Among Co-cited Articles (2005)

Conclusion

Our co-citation analysis of the social network literature within sociology highlights the rapid evolution of the field in the period 1990-2005. While our analysis suggests that there is a durable core of the field (most notably, around Granovetter's research), it also highlights the rapid entry of the physicists into the canon between 2000 (where no physicists were co-cited) and 2005 (where four of the top five co-cited authors were physicists), and a possible centralization of the field around small-world networks related research.

References

Acedo, F., J., Barroso, C., et al. (2006). Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis. Journal of Management Studies 43: 957-982.

Ahlgren, P., Jarneving, B. et al. (2003). Requirements for a Cocitation Similarity Measure, with Special Reference to Pearson's Correlation Coefficient. Journal of the American Society for Information Science and Technology 54(6): 550-560.

Barabasi, A. L. Jeong, H., et al. (2002). Evolution of the social network of scientific collaborations. Physica A: Statistical Mechanics and its Applications, 311(3-4): 590-614.

Bonacich, P. (2004). The Invasion of the Physicists. Social Networks 26(3): 285-288.

Borgatti, S. P., Everett, M. G. et al. (2002). Ucinet for Windows: Software for Social Network Analysis. Harvard, MA, Analytic Technologies.

Borgatti, S. P., Foster, P. B. (2003). The network paradigm in organizational research: A review and typology. Journal of Management, 29(3): 991–1013.

Burt, R. S. (1992). Structural Holes. Cambridge, Cambridge University Press.

Culnan, M. J. (1987). "Mapping the Intellectual Structure of MIS, 1980-1985: A Co-Citation Analysis." MIS Quarterly 11(3): 341-353.

de Solla Price, D. J. (1965). "Networks of Scientific Papers." Science 149(3683): 510-515.

Erdös, P./A. Renyi (1959). "On Random Graphs. I." Publicationes Mathematicae (Debrecen) 6: 29-97.

Fischer, C. S. (1982a). To Dwell Among Friends: Personal Networks in Town and City. Chicago, University of Chicago Press.

Fischer, C. S. (1982b). What Do We Mean by 'Friend'?, Social Networks 3: 287-306.

Gmuer, M. (2003). Co-citation analysis and the search for invisible colleges: A methodological evaluation. Scientometrics 57(1): 27-51.

Granovetter, M. S. (1973). The Strength of Weak Ties. American Journal of Sociology, 78: 1360-80.

Granovetter, M. S. (1974). Getting a job: A Study of Contacts and Careers. Cambridge, Mass., Harvard University Press.

Granovetter, M. S. (1985). Economic Action and Social Structure: The Problem of Embeddedness. American Journal of Sociology, 91: 481-510.

Heyman, K. (2006). Sociology: Making Connections. Science, 313(5787): 588-691.

Homans, G. C. (1974). Social Behavior: Its Elementary Forms. New York, Harcourt Brace Jovanovich.

Karki, R. (1996). Searching for Bridges between Disciplines: An Author Co-citation Analysis on the Research into Scholarly Communication. Journal of Information Science, 22(5): 323-334.

Krackhardt, D. (1987). QAP Partialling as a Test of Spuriousness. Social Networks, 9: 171–86.

Krackhardt, D. (1988). Predicting with Networks: Nonparametric Multiple Regression Analysis of Dyadic Data. Social Networks, 10: 359–81.

Lin, N./W. M. Ensel, et al. (1981). Social Resources and Strength of Ties: Structural Factors in Occupational Status Attainment. American Sociological Review, 46(4): 393-405.

McCain, K. W. (1990). Mapping Authors in Intellectual Space: A Technical Overview." Journal of the American Society for Information Science and Technology, 41(6): 433-443.

Milgram, S. (1967). The Small World Problem. Psychology Today, 2: 60-67.

Newman, M. E. J. (2001). The structure of scientific collaboration networks. Proceedings of the Natioanl Academy of Sciences of the United States of America, 98(2): 404-409.

Newman, M. E. J. (2004). Coauthorship networks and patterns of scientific collaboration. Proceedings of the Natioanl Academy of Sciences of the United States of America, 101: 5200-5205.

Wasserman, S., Faust K. (1994). Social Network Analysis: Methods and Applications. Cambridge, Cambridge University Press.

Watts, D. (1999). Networks, Dynamics, and the Small-World Phenomenon. American Journal of Sociology, 105(2): 493-527.

Watts, D., Strogatz, S. H. (1998). Collective dynamics of 'small-world' networks. Nature, 393: 440-442.

White, H. D., Griffith, C. (1981). Author Cocitation: A Literature Measure of Intellectual Structure. J. ASIS, 32(3): 163-171.F

Appendix A. Seed Articles by Year

1990-1992

Code	ASR	AJS	Seed Reference	Total # of Citations
BO1992			Baum, Joel A. C./Oliver, C. (1992): Institutional Embeddedness and the Dynamics of Organizational Populations, in: *American Sociological Review,* 57/4:540ff.	45
B01990			Bonacich, P. (1990): Communication Dilemmas in Social Networks: An Experimental Study, in: *American Sociological Review,* 55/3 pp. 448-459.	26
Fe1991			Feld, S. L. (1991): Why Your Friends Have More Friends Than You Do, in: *American Journal of Sociology*, 96/6:1464-1478.	8
Fr1991			Friedkin, N. E. (1991): Theoretical Foundations for Centrality Measures, in: *American Journal of Sociology*, 96/6:1478-1505.	61
LGT1992			Lincoln, J. R/Gerlach, M. L./Takahashi, P. (1992): Keiretsu Networks in the Japanese Economy: A Dyad Analysis of Intercorporate, in: *American Sociological Review,* 57/5.	75
Mo1992			Montgomery, J. D. (1992): Job Search and Network Composition: Implications of the Strength-Of-Weak-Tie, in: *American Sociological Review,* 57/5: 586-596.	27
Mo1990a			Moore, G. (1990): Structural Determinants of Men's and Women's Personal Networks, in: *American Sociological Review*, 55/5:726-736.	34
Mo1990c			Molm, L. (1990): Structure, Action, and Outcomes: The Dynamics of Power in Social Exchange, in: *American Sociological Review*, 55/3:427-448.	38
Sh1990			Shrum, W. (1990) Status Incongruence among Boundary Spanners: Structure, Exchange, and Conflict. *American Sociological Review*, Vol. 55, No. 4 pp. 496-511	71
RW1990			Raub, W./Weesie, J. (1990): Reputation and Efficiency in Social Interactions: An Example of Network Effects, in: *American Journal of Sociology*, 96/3:626-655.	23
Ue1990			Uehara, E. (1990): Dual Exchange Theory, Social Networks, and Informal Social Support, in: *American Journal of Sociology*, 96/3:521-558.	65
WW1990			Wellman, B./Wortley, S. (1990): Different Strokes From Different Folks: Community Ties and Social Support, in: *American Journal of Sociology*, 96/3, 558-589.	91
We1991			Wegener, B. (1991): Job Mobility and Social Ties: Social Resources, Prior Job, and Status Attainment, in: *American Sociological Review*, 56/1:60-72.	54

2000

Code	ASR	AJS	Seed Reference	Total # of Citations
FCM2000			Fernandez R. M./Castilla E. J./Moore P. (2000) Social capital at work: Networks and employment at a phone centers, in: *American Journal of Sociology*, 105/5:1288-1356.	61
Ha2000			Hargens, L. L. (2000) Using the literature: Reference networks, reference contexts, and the social structure of scholarship. *American Sociological Review*, 65/6:846-865.	70
HHB2000			Hurlbert, J. S./Haines, V. A./Beggs, J. J. (2000): Core networks and tie activation: What kinds of routine networks allocate resources in nonroutine situations?, in: *American Sociological Review*, 65/4:598-618.	58
PSS2000			Petersen, T./Saporta, I./Seidel, M.-D. L. (2000): Offering a Job: Meritocracy and Social Networks, in: *American Journal of Sociology*, 106/3:763-816.	48
HSS2000			Hedström, P./Sandell, R./Stern, C. (2000): Mesolevel Networks and the Diffusion of Social Movements: The Case of the Swedish Social Democratic Party, in: *American Journal of Sociology*, 106/1:145-173.	51
My2000			Myers, J. D. (2000): The Diffusion of Collective Violence: Infectiousness, Susceptibility, and Mass Media Networks, in: *American Journal of Sociology*, 106/1:173-209.	83
PR2000			Pescosolido, B.A./Rubin, B.A. (2000) The Web of Group Affiliations Revisited: Social Life, Postmodernism, and Sociology, in: *American Sociological Review*, 65/1.	132

2005

Code	ASR	AJS	Seed Reference	Total # of Citations
KEJ2005			Korinek/Entwisle/Jampaklay (2005): Through Thick and Thin: Layers of Social Ties and Urban Settlement among Thai Immigrants, in: *American Sociological Review*, 70:779-800.	72
Ya2005			Yakubovich, V. (2005) Weak ties, information, and influence: How workers find jobs in a local russian labor market. *American Sociological Review*, 70/3:408-421.	
Sm2005			Smith, S. S. (2005): Don't put my name on it": Social Capital Activation and Job-Finding Assistance among the Black Urban, *American Journal of Sociology*; 111:1:1-57.	

Code	ASR	AJS	Seed Reference	Total # of Citations
St2005			Stewart, D. (2005): Social Status in an Open-Source Community, in: *American Sociological Review,* 70:823-842.	49
CH2005			Chang, M-H, Harrington, J.E. (2005) Discovery and Diffusion of Knowledge in an Endogenous Social Network. *American Journal of Sociology*, 110:4.	
Bu2005			Burris, B. (2005): Interlocking Directorates and Political Cohesion among Corporate Elites1, in: The *American Journal of Sociology*, 111/1:249ff.	93
MMB2005			Moody, McFarland, Bender-deMoll (2005: Dynamic Network Visualization, in: *American Journal of Sociology,* 110/4:1206–41.	75
IRB2005			Ingram, P./Robinson, J./Busch, M. L. (2005): The Intergovernmental Network of World Trade: IGO Connectedness, Governance, and Embeddedness, in: *American Journal of Sociology,* 111/3:824ff.	61
EZC2005			Eguiluz, V.M., Zimmerman, M.G., Cela-Conde, C.J., San Miguel, M. (2005) Cooperation and the Emergence of Role Differentiation in the Dynamics of Social Networks, in: *American Journal of Sociology*, 110:4.	74
FS2005			Fernandez, R. M./Sosa, M. L. (2005): Gendering the Job: Networks and Recruitment at a Call Center, in: *American Journal of Sociology*, 111/3:859ff.	84
Gi2005			Gibson, D. (2005): Taking Turns and Talking Ties: Networks and Conversational Interaction, in: *American Journal of Sociology*, 110/6:1561-1597.	64
PKWO2005			Powell, W.W. White, D.R., Koput, K.W., Owen-Smith, J. (2005) Network Dynamics and Field Evolution: The Growth of Interorganizational Collaboration in the Life Sciences, in: *American Journal of Sociology*, 110/4.	92
RWP2005			Robins, G./Pattison, P./Woolcock, J. (2005): Small and Other Worlds: Global Network Structures from Local Processes, *American Journal of Sociology* , 110/4: 894–936.	71
US2005			Brian Uzzi, Jarrett Spiro (2005): Collaboration and Creativity: The Small World Problem, in: *American Journal of Sociology,* 111/2:447ff.	77

Appendix B: Co-cited items[4]

Code	2005	2000	90-92	Citation	Total Co-Citations
AB2002	2			Albert, R., and A.-L. Barabási. 2002. "Statistical Mechanics of Complex Networks." *Review of Modern Physics* 74:4797.	2
Al1979			3	Allan, Graham. 1979. *A Sociology of Friendship and Kinship*. London: Allen & Unwin.	3
ASBS2000	3			Amaral, L. A. N., A. Scala, M. Barthélémy, and H. E. Stanley. 2000. "Classes of Small-World Networks." *Proceedings of the National Academy of Sciences of the United States of America* 97:1114952.	3
Ax1984			2	Axelrod, Robert. 1984. *The Evolution of Cooperation*. New York: Basic.	2
Ba1950			2	Bavelas, Alex. 1950. "Communication Patterns in Task Oriented Groups." *Journal of the Acoustical Society of America* 22: 271-282.	2
BA1999	3			Barabási, A. L., and R. Albert. 1999. "Emergence of Scaling in Random Networks." *Science* 286:50912.	3
Ba2002	2			Barabasi, A. L. 2002. Linked: The new science of networks.Cambridge, M.A.: Perseus Publishing.	2
Be1997	2			Bearman, P. 1997. "Generalized Exchange." American Journal of Sociology 102:13831415.	2
BG2000	2			Bala, V., and S. Goyal. 2000. "A non-cooperative model of network formation." Econometrica 68:1181-1229	2
Bl1964	2		3	Blau, P. M. 1964. *Exchange and Power in Social Life*. New York: Wiley.	5
Bl1977			3	Blau, P. M. 1977. Inequality and Heterogeneity: A Primitive Theory of Social Structure. Free Press.	3
Bo1985	3			Bollobas, B. 1985. *Random Graphs*. London: Academic Press.	3
BR2002	2			Busch, M. L., and E. Reinhardt. 2002. "Testing International Trade Law: Empirical Studies of GATT/WTO Dispute Settlement." Pp. 457-81 in The Political Economy of International Trade Law: Essays in Honor of Robert E. Hudec, edited by Daniel L. M. Kennedy and James D. Southwick. Cambridge: Cambridge University Press.	2

[4] The list of co-cited references is sorted alphetically in the order of codes for each reference, so that finding the reference in the network diagrams is easier. The codes for each cited article were generated by using the first two letters of the author plus the year of the publication. In caseof multipleauthors, the first letter of each last name plus the year (for the first three authors only).

Code	2005	2000	90-92	Citation	Total Co-Citations
BS1984			2	Blau, P. M., and Joseph Schwartz. 1984. *Crosscutting Social Circles*. Orlando, Fla.: Academic Press.	2
Bu1983			2	Burt, R. S. 1983. Range, Chapter 9 in Burt and Minor (eds.) Applied network analysis: A methodological introduction. Beverly Hills: Sage.	2
Bu1992	5			Burt, R. S. 1992. *Structural Holes*. Cambridge: Cambridge University Press.	5
CDD1980			2	Corcoran, M., Linda Datcher, and Greg Duncan. 1980. "Information and Influence Networks in Labor Markets," 1-37, in Duncan, Greg J., and James N. Morgan,eds., Five Thousand American Families, Vol. VIII, Institute for Social Research,University of Michigan.	2
CMH1986			2	Campbell, K., Peter Marsden, and Jeanne Hurlbert. 1986. "Social Resources and Socioeconomic Status." *Social Networks* 8: 97-117.	2
Co1988		2		Coleman, J. S. 1988. "Social Capital in the Creation of Human Capital." American Journal of Sociology 94(supp.):S95-5120.	2
DG1997	2			Davis, G. F., and Henrich R. Greve. 1997. "Corporate Elite Networks and Governance Changes in the 1980s." American Journal of Sociology 103:1-37.	2
Di1991	2			DiMaggio, P. J. 1991. "Constructing an Organizational Field as a Professional Project: U.S. Art Museums, 1920-1940." Pp. 267-92 in The New Institutionalism in Organizational Analysis, edited by W. Powell and P. J. DiMaggio. Chicago: University of Chicago Press.	2
Dr1998	2			Drentea, Patricia. 1998. "Consequences of Women's Formal and Informal Job Search Methods for Employment in Female-Dominated Jobs." Gender and Society 12: 321-38.	2
DS1988			2	Davis, J. A, and Smith, TW (1988) General Social Surveys, 1972-1988	2
DYB2003	2			Davis, G. F, Mina Yoo, and Wayne Baker. 2003. "The Small World of the American Corporate Elite, 1982-2001." Strategic Organization 3:301-26.	2
Ec1974			2	Eckhoff, T. (1974). Justice: Its determinants in social interaction. Rotterdam, The Netherlands: Rotterdam University Press.	2
Em1962			2	Emerson, R. E., 1962 "Power-Dependence Relations", American Sociological Review, 27:31-40	2
Em1976			2	Emerson, R. M. 1976. "Social Exchange Theory." *Annual Review of Sociology* 2: 335-62.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
En1992		2		England, P. 1992. *Comparable Worth: Theories and Evidence*. Hawthorne, N.Y.: Aldine de Gruyter.	2
ER1959	2			Erdös, P., and A. Renyi. 1959. "On Random Graphs. I." *Publicationes Mathematicae (Debrecen)* 6:29097.	2
Fe1981			3	Feld, Scott L. 1981. "The Focused Organization of Social Ties." *American Journal of Sociology* 86: 1015-35.	3
Fi1982a			4	Fischer, C. S. 1982a. To dwell among friends: personal networks in town and city. University of Chicago Press, Chicago.	4
Fi1982b			2	Fischer, C. S. 1982b. "What Do We Mean by 'Friend'?" *Social Networks* 3: 287-306.	2
Fr1979			3	Freeman, L. C. 1979. "Centrality in Social Networks: Conceptual Clarification." *Social Networks* 1: 215-39.	3
Fr1980			2	Freeman, L. C., Douglas Roeder, and Robert R. Mulholland. 1980. "Centrality in Social Networks: II. Experimental Results." *Social Networks* 2: 119-41.	2
Fr1982			2	Friedkin, N. E. 1982. "Information Flow through Strong and Weak Ties in Intraorganizational Social Networks." *Social Networks* 3: 273-85.	2
FR1991	2			Fruchterman, T. J. J., and Edward Reingold. 1991. "Graph Drawing by Force-Directed Placement." *SoftwarePractice and Experience* 21:112964.	2
FW1997	2	3		Fernandez, R. M., and Nancy Weinberg. 1997. "Sifting and Sorting: Personal Contacts and Hiring in a Retail Bank." American Sociological Review 62:883-902.	5
Ga1995	2			Garebian, K. 1995. The Making of West Side Story. Ontario: Mosaic.	2
Go1960			3	Gouldner, A. W. 1960. "The Norm of Reciprocity: A Preliminary Statement." *American Sociological Review* 25: 161-78.	3
Go1967	2			Goffman, E. 1967. *Interaction Ritual: Essays on Face-to-Face Behavior*. Garden City, N.Y.: Anchor Books.	2
Go1981	2			Goffman, E. 1981. *Forms of Talk*. Philadelphia: University of Pennsylvania Press.	2
Go2002	2			Gould, R. 1995. *Insurgent Identities: Class, Community, and Protest in Paris from 1848 to the Commune*. Chicago: University of Chicago Press.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
Gr1973	6	2	4	Granovetter, M. S. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78	12
Gr1974	3	2	3	Granovetter, M. S., Getting a job: A Study of Contacts and Careers. Cambridge, Mass.: Harvard University Press, 1974. *(Including 1995 2nd edition)*	8
Gr1981		2		Granovetter, M. S., 1981. "Toward a Sociological Theory of Income Differences." Pp.1354 Networks and Employment 11 – 48 in Sociological Perspectives on Labor Markets, edited by Ivar Berg. New York: Academic Press.	2
Gr1982			3	Granovetter, M. S., 1982. "The Strength of Weak Ties: A Network Theory Revisited." Pp. 105-30 in *Social Structure and Network Analysis*, edited by Peter Marsden and Nan Lin. Beverly Hills, Calif.: Sage.	3
Gr1985	5		3	Granovetter, M. S. (1985): Economic Action and Social Structure: The Problem of Embeddedness, in: American Journal of Sociology, 91: 481-510.	8
Ha1983		2		Hammer, M. 1983. "`Core' and `Extended' Social Networks in Relation to Health and Illness." Social Science and Medicine 17:40511.	2
Ha1988			2	Halaby, C. N. (1988). "Action and Information in the Job Mobility Process: The Search Decision." American Sociological Review 53: 9–25	2
He1979	2			Heckman, J. J. 1979. "Sample Selection Bias as a Specification Error." Econometrica 47:153-61.	2
He1994		2		Hedstroem, P. 1994. "Contagious Collectivities: On the Spatial Diffusion of Swedish Trade Unions, 1890-1940." *American Journal of Sociology* 99: 1157-79.	2
HL1971	2			Holland, P. W., and S. Leinhardt. . 1971. "Transitivity in Structural Models of Small Groups." *Comparative Group Studies* 2:10724.	2
Ho1950	2			Homans, G. C. 1950. The Human Croup. Cambridge, Mass.: Harvard University Press.	2
Ho1974			4	Homans, G. C. 1974. *Social Behavior: Its Elementary Forms*, 2d ed. New York: Harcourt Brace Jovanovich.	4
HP1991	2			Hanson, S., and Geraldine Pratt. 1991. "Job Search and the Occupational Segregation of Women." Annals of the Association of American Geographers 81 (2): 229-53.Hardin, Russell. 2002. Trust and Trustworthiness. New York: Russell Sage.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
IR2000	2			Ingram, P., and Peter Roberts. 2000. "Friendships among Competitors in the Sydney Hotel Industry." American Journal of Sociology 106:387-423.	2
JW2002	2			Jackson, M. O., and A. Watts. 2002. "The Evolution of Social and Economic Networks." Journal of Economic Theory 106:265-295.	2
KB1983			2	Knoke, D., and Ronald S. Burt. 1983. "Prominence." Pp. 195-222 in *Applied Network Analysis: A Methodological Introduction*, edited by R.S. Burt and M.J. Minor, Beverly Hills, Calif.: Sage.	2
KK1989	2			Kamada, T., and Satoru Kawai. 1989. "An Algorithm for Drawing General Undirected Graphs." *Information Processing Letters* 31:715.	2
Ko1994	2			Kollock, P. 1994. "The Emergence of Exchange Structures: An Experimental Study of Uncertainty, Commitment, and Trust." American Journal of Sociology 100 (2): 313-34.	2
Kr1987	2			Krackhardt, D. 1987. "QAP Partialling as a Test of Spuriousness." Social Networks 9:171–86.	2
Kr1988	2			Krackhardt, D. 1988. "Predicting with Networks Nonparametric Multiple Regression Analysis of Dyadic Data", Social Networks, 10: 359-81.	2
KW2001	2			Kogut, B., and Gordon Walker. 2001. "The Small World of German Corporate Networks in the Global Economy." American Sociological Review 66:317-35.	2
La2001	2			Lazer, D. 2001. "The Co-evolution of Individual and Network." Journal of Mathematical Sociology 25 (1): 69-108.	2
LD1992		2		Land, K.C., and G. Deane. 1992. "On the Large-Sample Estimation of Regression Models with Spatial or Network Effects Terms: A Two-Stage Least-Squares Approach." Pp. 221-48 in *Sociological Methodology* 1992, edited by P. Marsden. Oxford: Basil Blackwell.	2
Le1951			2	Leavitt, H. J. 1951. "Some Effects of Certain Communication Patterns on Group Performance." *Journal of Abnormal and Social Psychology* 46: 38-50.	2
Le1960		2		Le Bon, G. (1895) 1960. *The Crowd*. New York: Viking	2
Le1988	2			Leifer, E. M. 1988. "Interaction Preludes to Role Setting: Exploratory Local Action." *American Sociological Review* 53:86578.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
Le1993	2			Leidner, R. 1993. Fast Food, Fast Talk: Service Work and the Routinization of Everyday Life. Berkeley and Los Angeles: University of California Press.	2
LEV1981	2	2	2	Lin, N., Walter M. Ensel, and John C. Vaughn. 1981. "Social Resources and Strength of Ties: Structural Factors in Occupational Status Attainment." American Sociological Review 46 (4): 393-405.	6
Li1982			3	Lin, N. 1982. "Social Resources and Instrumental Action." Pp. 131-45 in Social Structure and Network Analysis, edited by Peter V. Marsden and Nan Lin. Beverly Hills, CA : Sage.	3
LP1976			2	Laumann, E. O., and Franz U. Pappi. 1976. *Networks of Collective Action*. New York: Academic Press.	2
LP1999	2			Lazega, E., and P. E. Pattison. 1999. "Social Capital, Multiplex Generalized Exchange and Cooperation in Organizations: A Case Study." *Social Networks* 21:6790.	2
LY1998	2			Lawler, E., and Jeongkoo Yoon. 1998. "Network Structure and Emotion in Exchange Relations." American Sociological Review 63 (6): 871-94.	2
Ma1983			3	Marsden, P. V. 1983. "Restricted Access in Networks and Models of Power." *American Journal of Sociology* 88: 686-717.	3
Ma1987	2		2	Marsden, P. V. 1987. "Core Discussion Networks of Americans." American Sociological Review 52:122-31.	4
Ma1988			2	Masrden, P. V. 1988. "Homogeneity in Confiding Relations." *Social Networks* 10: 57-76.	2
Ma1991	2			Maynard, D. W. 1991. "Interaction and Asymmetry in Clinical Discourse." *American Journal of Sociology* 97:448–95.	2
MB2003	2			McFarland, D., and Skye Bender-deMoll. 2003. "Classroom Structuration: How Interaction Patterns Get Reproduced and Transformed." Working Paper. Stanford University.	2
MC1984			2	Marsden, P. V., and Karen E. Campbell. 1984. "Measuring Tie Strength." Social Forces 63: 482-501.	2
Mc1988		2		McAdam, D. 1988. *Freedom Summer*. New York: Oxford University Press.	2
Mc2001	2			McFarland, D. 2001. "Student Resistance: How Formal and Informal Organization of Classrooms Facilitates Student Defiance." *American Journal of Sociology* 107 (3): 61278.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
Me1968		2		Merton, R. K. 1968. Social Theory and Social Structure. 3d ed. New York: Free Press.	2
Me1973	2			Merton, R. K. 1973. The Sociology of Science. Chicago: University of Chicago Press.	2
MH1988	2		2	Marsden, P. V. and Jeanne S. Hurlbert. 1988. "Social Resources and. Mobility Outcomes: A Replication and Extension." Social Forces. 66:1038-59.	4
Mi1967	5			Milgram, S. 1967. "The Small World Problem." *Psychology Today* 2:6067.	5
MMS1997		2		Munch, A., J. Miller McPherson, and Lynn Smith-Lovin. 1997. "Gender, Children, and Social Contact: The Effects of Childrearing for Men and Women." American Sociological Review 62:509-20.	2
Mo1991		2		Montgomery, J. D. 1991. "Social Networks and Labor-Market Outcomes: Toward an Economic Analysis." American Economic Review 81:1408-18.	2
Mo2004	2			Moody, J. 2004. "The Structure of a Social Science Collaboration Network: Disciplinary Cohesion from 1963-1999." American Sociological Review 69:213-38.	2
MP1990		2		Marsden, P. V., and J. Podolny. 1990. "Dynamic Analysis of Network Diffusion Processes." Pp. 197-214 in *Social Networks through Time*, edited by J. Weesie and H. Flap. ISOR: University of Utrecht.	2
MSC2001	2			McPherson, M., Lynn Smith-Lovin, and James Cook. 2001. "Birds of a Feather: Homophily in Social Networks." Annual Review of Sociology 27:415-44.	2
MW2003	2			Moody, J., and Douglas R. White. 2003. "Social Cohesion and Embeddedness: A Hierarchical Conception of Social Groups." American Sociological Review 68: 103-27.	2
MWP1988			3	Markovsky, B., David Willer, and Travis Patton. 1988. "Power Relations in Exchange Networks." *American Sociological Review* 53: 220-36.	3
Ne2000	2			Newman, M. E. 2000. "Models of the Small-World: A Review." *Journal of Statistical Physics* 101:81941.	2
Ne2001	3			Newman, M. E. 2001 "The Structure of Scientific Collaboration Networks." Proceedings of the National Academy of Sciences 98:404-9.	3
Ne2003	2			Newman, M. E. 2003. "The Structure and Function of Complex Networks." *SIAM Review* 45:167256.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
NSW2001	2			Newman, M. E., Steve Strogatz, and Duncan Watts. 2001. "Random Graphs with Arbitrary Degree Distributions and Their Applications." Physical Review E 64:1-17.	2
PA1993	3			Padgett, J. F., and Christopher K. Ansell. 1993. "Robust Action and the Rise of the Medici, 14001434." *American Journal of Sociology* 98:12591319.	3
Pe1992		2		Pescosolido, B. A. 1992. "Beyond Rational Choice: The Social Dynamics of How People Seek Help." American Journal of Sociology 97:1096-1138.	2
Po1993	2			Podolny, J. M. 1993. "Status-Based Model of Market Competition." American Journal of Sociology 98 (4): 829-72.	2
PS1978			2	Pfeffer, J. and G. R. Salancik, 'The External Control of Organizations: A Resource Dependence Perspective' (Harper & Row, 1978).	2
PSH1996	2			Podolny, J. M., Toby E. Stuart, and Michael T. Hannan. 1996. "Networks, Knowledge, and Niches: Competition in the Worldwise Semiconductor Industry, 1984–1991." American Journal of Sociology 102:659–89.	2
PSS2000	2			Petersen, T., Ishak Saporta, and Marc-David L. Seidel. 2000. "Offering a Job: Meritocracy and Social Networks." American Journal of Sociology 106 (3): 763-816.	2
Ro1985			2	Rosenthal, C. 1985. "Kinkeeping in the Familial Division of labor." *Journal of Marriage and the Family* 47 (November): 965-74.	2
Sa1995	2			Salancik, G. 1995. "Wanted: A Good Network Theory of Organization." Administrative Science Quarterly 40:345-49.	2
Sp1974	2	2		Spence, A. M. 1974. Market Signaling: Informational Transfer in Hiring and Related Processes. Cambridge, Mass.: Harvard University Press.	4
St1990		2		Stacey, J. 1990. Brave New Families. New York: Basic Books.	2
St2001	2			Strogatz, S. H. 2001. "Exploring Complex Networks." *Nature* 410:26876.	2
Wa1999	4			Watts, D. J. 1999. Small Worlds: The Dynamics of Networks between Order and Randomness. Princeton, N.J.: Princeton University Press.	4
Wa1999	2			Watts, D. J. 1999. "Networks, Dynamics, and the Small-World Phenomenon." *American Journal of Sociology* 105:493–527.	2

Code	2005	2000	90-92	Citation	Total Co-Citations
We1982			2	Wegner, B. 1982 (ed) Social Attitudes and Psychophysical measurement. Hillsdale, NJ. Erlbaum.	2
We1983			2	Wellman, B. 1983. "Network Analysis: Some Basic Principles." Pp. 155-200 in *Sociological Theory* 1983, edited by R. Collins. San Francisco: Jossey-Bass.	2
We1985			2	Wellman, B. 1985. "Domestic Work, Paid Work and Net Work." Pp. 159-91 in *Understanding Personal Relationships*, edited by Steve Duck and Daniel Perlan, London: Sage.	2
We1988			2	Wellman, B. 1988. "The Community Question Re-evaluated." Pp. 81-107 in *Power, Community and the City*, edited by Michael Peter Smith. New Brunswick, N.J.: Transaction.	2
WF1994	4			Wasserman, S., and Katherine Faust. 1994. *Social Network Analysis*. Cambridge: Cambridge University Press.	4
Wh1970	2			White, H. C. 1970. "Search Parameters for the Small World Problem." Social Forces 49:259-64.	2
Wh1981	2			White, H. C. 1981. "Where do markets come from?" American Journal of Sociology 81: 730-79.	2
Wi1985			2	Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.	2
WS1998	4			Watts, D. J., and Steven H. Strogatz. 1998. "Collective Dynamics of `Small-World' Networks." Nature 393:44042.	4
YGC1988			3	Yamagishi, T., Mary R. Gillmore, and Karen S. Cook. 1988. "Network Connections and the Distribution of Power in Exchange Networks." American Journal of Sociology 93: 833-851.	3