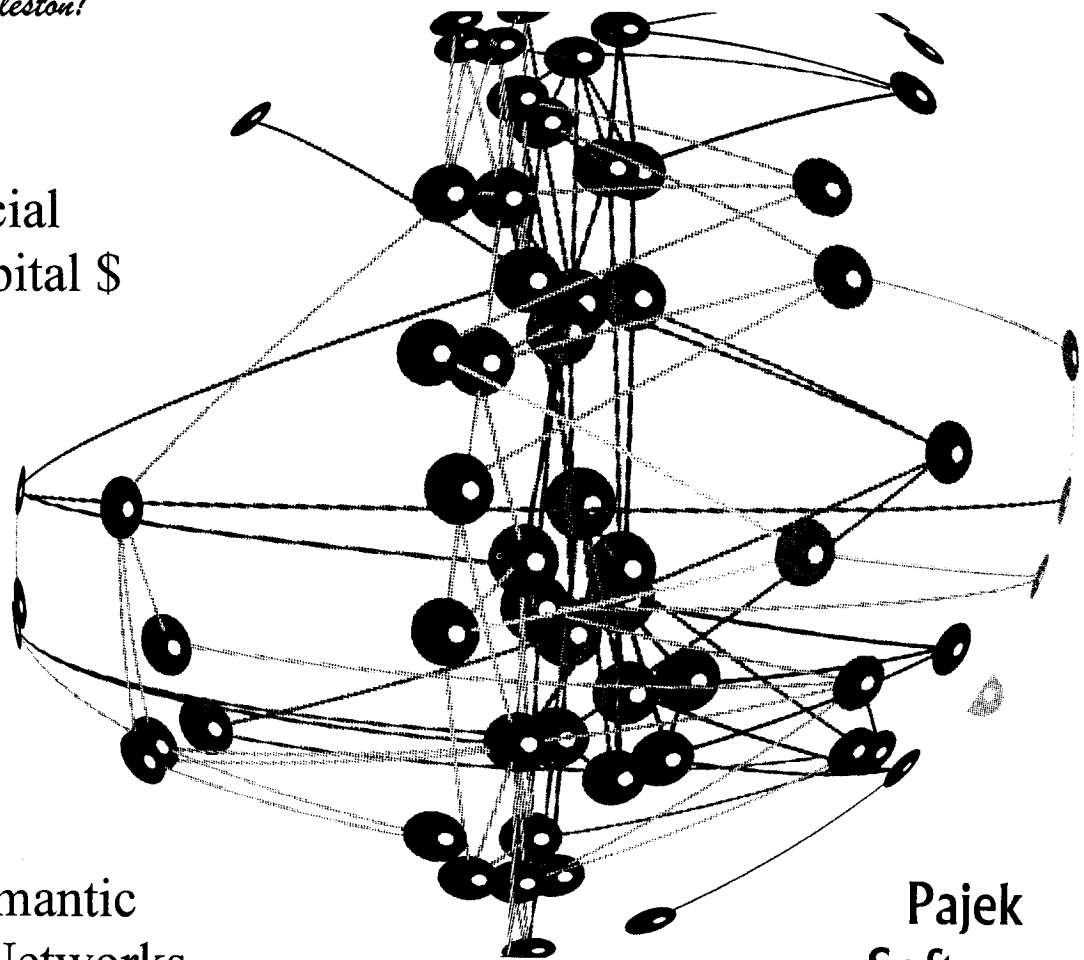


CONNECTIONS

1998 Volume 21 Issue 2

*Sunbelt
Annual Conference:
Charleston!*

Social
Capital \$



Semantic
Networks

Pajek
Software

Official Journal of the International Network for Social Network Analysis

CONNECTIONS

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Mission. CONNECTIONS is an official publication of INSNA. Its primary purpose is to support network analysis in general and INSNA members in particular by providing a method of pooling and sharing news about the membership, tools for teaching and research, data for analysis and results of scientific investigations. Wherever possible, items referenced in CONNECTIONS (such as data and software) are made available electronically via our WWW site, located at <http://www.heinz.cmu.edu/project/INSNA/>. The web site provides access to a directory of members' email addresses, network datasets, software programs, and other items that lend themselves to electronic storage. In addition, the web site provides updated information on upcoming conferences.

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1999

February

Sunbelt International Social Networks Conference. Feb 17-21. Charleston, South Carolina.
www.heinz.cmu.edu/project/INSNA/

May

Socio-Economic Research and Geographic Information Systems: Socio-Economic Analysis and Geographic Information. 22 - 27 May. Espinho, Portugal.
Contact: G. Martinotti (Milano)

August

American Sociological Assoc. August 6-10: Chicago, Illinois
<http://www.asanet.org/>

Academy of Management. August 8-11. Chicago, Illinois. Hyatt Regency Chicago.
<http://www.aom.pace.edu>

4th European Sociological Conference. 18th - 21st August 1999, Amsterdam.

American Psychological Association. August 20-24, Boston.

European Sociological Assoc. Aug 27-30. Colchester, UK.
ESA97@essex.ac.uk

September

American Political Science Assoc. Sept. 2-5. Atlanta, GA.
<http://www.apsanet.org/>

Society For Psychological Anthropology. Sep 21-26. Albuquerque, NM.
Contact Phil Bock at pbock@unm.edu

November

American Anthropological Assoc. Nov 17-21. Chicago, IL
<http://www.ameranthassn.org>

New Leadership For INSNA

Coordinator. When I put out a call for nominations for coordinator of INSNA a year ago, I received two nominations. One was Martin Everett, and the other has since been withdrawn by the candidate. I have discussed Martin's candidacy with the INSNA board, and they agree that Martin would be a good choice. As Head of the School of Computing and Mathematical Sciences at the University of Greenwich, Martin has the resources to manage the job effectively. He would also be the first European to hold the position since INSNA was founded in 1978. And he's willing to do it!

If no other candidate appears before noon, February 21st, I will ratify Martin's election at the business meeting in Charleston. Otherwise, we will hold an election by mail immediately after the conference.

Editor of Connections. According to our by-laws, the Editor of CONNECTIONS is appointed by the President of INSNA. If you are interested in being the next editor, you should contact the incoming President as soon as he or she has been ratified.

Mr. Coordinator? It has been brought to my attention that whereas the head of every other professional association is called "President", the head of INSNA is called "Coordinator". In order for the head of INSNA to be able to hold his or her head up high at those well-known meetings where the heads of all the big associations meet over champagne and caviar, it would be nice to change the name of the office to President. It would also look better on the individual's resume.

As it happens, our bylaws already state that the official name of the head of INSNA is

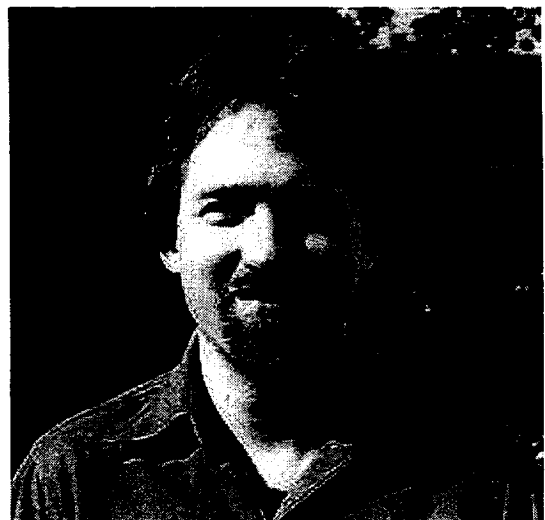
President – we just need to actually start using the title. I'll bring this up at the business meeting in Charleston.

Promotion Manager. I'd like to take this opportunity to publically thank Devon Brewer for the exception work he has been doing as INSNA promotion manager. Devon makes sure that other professional associations know about INSNA and the Sunbelt meetings, placing items in their newsletters. He also has been working to get abstracting services to pick up CONNECTIONS. Thanks Devon — nice job!

Miscellaneous. I want to apologize for being so late with this issue of CONNECTIONS. I hope to do better on the next one!

That's the news ... See you in Charleston!

Steve Borgatti
INSNA Coordinator
borgatts@bc.edu



SUNBELT XIX INTERNATIONAL SOCIAL NETWORKS CONFERENCE

Hawthorn Suites Hotel, Charleston, South Carolina
February 18-21, 1999

The Conference: The International Sunbelt Social Network Conference is a major forum for social scientists, mathematicians, computer scientists, and all others interested in social networks. The conference provides an opportunity for individuals interested in theory, methods, or applications of social networks to share ideas and common concerns. Sponsors of Sunbelt XIX are the International Network for Social Network Analysis (INSNA) and the Department of Sociology at the University of South Carolina.

The Program: Current session topics include: Corporate and Inter-organizational networks; Intra-organizational Networks; Personal Community Networks; Networks and Health; Networks and Game Theory; Diffusion; Networks Through Time; Social Support; Cognitive Networks; Biological Networks; HIV/AIDS; Communication Networks; Network Exchange; Methods and Statistics for Network Analysis. This list is preliminary. If you wish to organize a session, contact the conference organizers at the addresses below.

The Keynote Speaker: Nan Lin, Professor of Sociology and Director of the Asian Pacific Studies Institute, Duke University, will deliver the keynote address entitled "Building a Network Theory of Social Capital."

Workshops: Planned workshops include: Steve Borgatti and Martin Everett's "Introduction to the Analysis of Network Data"; Lin Freeman "Generating Images of Networks"; Stanley Wasserman and Company "Statistical Methods for Social Networks," and Barry Wellman's "A Non-Technical Introduction to Social Network Analysis". A detailed description of each workshop is enclosed.

To Submit A Paper: To submit a paper, send an abstract of no more than 200 words by email or in an ASCII file on diskette for DOS platforms and a hard copy to one of the organizers no later than December 15, 1998. Submission of more than one multiple-authored paper is acceptable. But, we may need to limit program participation to the equivalent of one single-authored paper per person.

SUNBELT XIX

International Social Network Conference

The Setting: The Hawthorn Suites Hotel is located in the heart of Charleston, adjacent to the old Slave Market and within walking distance of fine restaurants and shops, historic homes, Waterfront Park, and the Battery. Some Charleston websites of interest include:

www.charleston.net/charlestoncity/ -- the city of Charleston;
www.charlestoncvb.com/ -- Convention and Visitors Bureau; and
www.charleston.com -- Official Guides to Charleston, Inc.

Hotel Reservations: Please make your reservations early. The room blocks will be held only until 17 January 1999. Call 1-800-527-1133 or 1-843-577-2644 with a credit card number to make reservations at the Hawthorn Suites. Or fax your request to 1-843-577-2697. Be sure to mention the International Network for Social Network Analysis to get the conference rate. All accommodations are suites. Rates are \$99.00 for a one bedroom/two double beds suite and \$179.00 for a two bedroom suite plus taxes of 12%. (There is an extra charge of \$15 for a third person sharing a room.) All suites have a couch that converts to a bed. The room rates include a breakfast buffet and an afternoon reception with complimentary beer and wine daily except Sunday. Parking is \$9.00 per day.

Graduate students and others wishing to share less expensive quarters can contact The Days Inn at 1-843-722-8411. We have reserved a block of 10 rooms for 1-4 persons at \$75.00 per night plus 12% tax. When you call be sure to indicate you are with group CG-INSNA to get the conference rate.

Conference Registration: Pre-registration is \$50.00 for INSNA members, \$75.00 for non-members, \$25.00 for students, and \$15.00 for registration-in-absentia for INSNA members (\$30.00 for non-members). All fees will be \$10.00 higher for registration at the conference. Deadline for preregistration is 1 February 1999.

Information: Contact John Skvoretz or Katie Faust.

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Columbia, SC 29208
skvoretz-john@sc.edu
(803) 777-4968

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or visit the INSNA website:

<http://www.heinz.cmu.edu/project/INSNA>

Conference Workshops

Stephen Borgatti and Martin Everett: "Introduction to the Analysis of Network Data." A beginner's tutorial on the concepts, methods and data analysis techniques of social network analysis. The course begins with a general introduction to the distinct goals and perspectives of network analysis, followed by a practical discussion of network data, covering issues of collection, validity, visualization, and mathematical/computer representation. We then take up the methods of detection and description of structural properties such as centrality, cohesion, subgroups, cores, roles, etc. Finally, we consider how to frame and test network hypotheses. An important element of this workshop is that all participants are given a free copy of UCINET IV and KRACKPLOT software, which we use to provide hands-on experience analyzing real data using the techniques covered in the workshop. Participants also receive a glossary of network terminology, a set of detailed exercises (with answers), and a set of lecture notes. In order to participate fully in the workshop, participants are advised to bring laptop computers so that they can run the analyses on their machines at the same time that they are demonstrated by the instructors. (Thursday 8:30-4:00) Cost: \$50 for students, \$100 for all others.

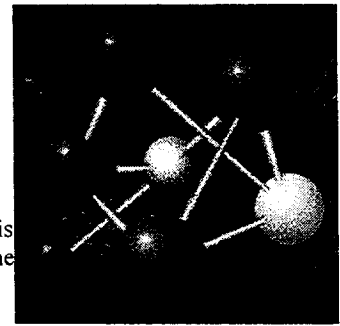
Lin Freeman: "Generating Images of Networks." This is a tutorial on generating network images for exploratory data analysis, publication and web display. Those enrolled will be introduced to the available programs and given a chance to try their hands. Each will be provided with a CD-ROM containing all the programs that are currently used. Particular emphasis will be placed on MAGE, a 3D color display program that is now available to authors writing for the journal, *Social Networks*. Thursday (12:30 - 4:30) Cost: \$25 for students, \$50 for all others.

Noshir Contractor, Brad Crouch, Laura Koehly, Pip Pattison, Garry Robins and Stanley Wasserman: "Workshop on p^* : Introduction, Generalizations, and Applications." Wasserman and Pattison (1996, *Psychometrika*) introduced a family of models, p^* , to the social network community. These models, which can be fit approximately using logistic regressions, are based on the breakthrough Markov random graph distributions of Frank and Strauss (1986, *JASA*). The models, which have been elaborated upon extensively during the past three years, hold much promise for social network analysis. The purpose of this (free!) workshop is to introduce p^* , and to describe its many generalizations, including extensions to multiple relational networks, valued networks, and networks containing collections of actor attribute variables. In addition, applications of these models to a variety of substantive problems will be described (including cognitive social structures). We will also discuss (briefly) the mathematics behind the models, and techniques to estimate the model parameters. p^* models are auto-logistic regressions, and arise from research on spatial processes. The p^* formulation also allows network measurements to be viewed in a standard response/explanatory variables setting in which the response variable is the log odds of the probability that a relational tie is present. The explanatory variables can be quite general, including network structural properties like the tendency towards mutuality or transitivity, as well as nominal, discrete or continuous actor attributes and the interactions between these elements. (Friday and Saturday 12:00 - 3:00) Cost: free.

Barry Wellman: "A Non-Technical Introduction to Social Network Analysis." The workshop introduces the underlying philosophy of social network analysis. It sketches the history of the paradigm, identifies its principles, distinguishes between whole network and ego-centered network research, and provides an overview of basic research methods, including block-modeling, clustering, and egocentric approaches using standard statistical packages such as SAS. It reviews highlights of substantive research in a number of areas (including community analysis, social support, intercorporate relations, politics, migration, and world-systems). Barry Wellman, University of Toronto, was the founder of INSNA. (Friday 12:00-3:00) Cost: \$30.

Ties & Bonds

Ties & Bonds is a regular column written by Barry Wellman. The contents of this column are solely determined by Barry Wellman and do not necessarily reflect the opinions or concerns of INSNA. Contact Barry at atwellman@chass.utoronto.ca.



BBS

Christine Avenarius (Köln) and **Jeffrey Johnson** (East Carolina) happily holding hands at the Sitges Sunbelt. They have the distinction, I believe, of being the Sunbelt's first marriage: Met at Charleston'97.... **Nan Lin** Vice President Elect of the Amer Soc. Assoc: he becomes VP 8/99.... **Holly Raider** appointed to INSEAD, Paris -- the elite French management school. Husband **Ron Burt** will be in a commuting marriage -- at INSEAD and U Chicago Business School.... **Peter Bearman** has moved from Chapel Hill to Soc, Columbia... **Vicente Espinoza** appointed to the American Studies division of the Universidad de Santiago de Chile.... **Martina** Morris promoted at Penn State to Prof of Soc & Stats.... **Bernice Pescosolido** promoted to Full Prof at Soc, Indiana & awarded a "Chancellor's Professorship".... Two visitors to U Toronto gang: **Fleur Thomése** (Soc, Free U Amsterdam), April-July 1998, and **Gustavo Mesch** (Soc, Haifa), June-July 1998.... **Charles Kadushin** spent Spring, 1998 at Hebrew U.... **Ron Breiger** spending current academic year at Soc, U Cal-Santa Barbara.... **John Hagan** moving (Summer/99) to Northwestern U & Amer Bar Fdn. As John has left Toronto in the past, for Arizona, Wisconsin & Chapel Hill, and always returned, some colleagues wonder if this is really the last move.... **Barry Wellman** spending Jan-May/99 as Visiting Prof, Schl of Info Mgmt & Systems, U Cal - Berkeley. Barry is also new Chair of the Community & Urban section, Amer Sociological Assoc, and has been awarded the Int'l

Network for Personal Relationships Mentoring Prize.... **George Barnett** (Communic, SUNY-Buffalo) running for president of Communic & Tech. section of Intl Communic Assoc.... **Peter Marsden** (Soc, Harvard) appointed one of 3 Principal Investigators on the US General Social Survey. (Jim Davis is another.).... **Wayne Baker** (chair), **Mark Granovetter**, **Brian Uzzi** and **Harrison White** leading the push for a new Economic Sociology section at the Amer Soc Assoc.

Conferencing

Sitges: Although you'll no doubt read heavier stuff about Sunbelt98 elsewhere in this issue, I thought it was marvelous. The conference was well-organized, the town wonderful, the food great, the men beautiful, the women handsome. Some of us even discovered a special beach. And the papers reflected a move to substantive findings and away from purely methodological and programmatic pieces. I also thought I detected a convergence between European and North American types of papers. By my count, about 45% of the attendees were North American, 50% were European, and 5% from Asia, Latin America, Australia. BTW, "networks" is *xarxes* in Catalan. Juan Pablo Zuluaga (of Colombia & Carnegie Mellon) wonders if it's similar in origin to the Spanish *zarzas* which means blackberry bush bramble. Some Spanish analysts use the term *ramje* (branches) to talk about networks, but it doesn't have the *espinas* (thorns) that the more apt *zarzas* has.

The Potteries: I had a more complex time at a small social network conference held at Keele U in the Potteries (Wedgwood, Doulton and all that), England, 7/98. Although Britain is clearly an ancestral home, substantive British social network analysis has been relatively quiet recently, although Martin Everett's math-based stuff is going great guns. So the first exciting thing is that this conference was held. A score gathered (I was the only non-resident), especially excited by the New Labour government of Tony Blair's interest in using social networks for job searching and community integration. (Perhaps too much so, as English papers were filled while I was there by accounts of how "insider lobbyists" were capitalizing on their alleged access to the political elite.) Labour advisor Perri 6 (that's his name; he's at the Demos think tank) gave a fascinating, wide-ranging paper showing how network ideas and findings were policy-relevant. I also appreciated the papers by Ray Pahl & Liz Spencer (on friendship), Clare Wenger (on social support for the elderly), Chris Phillipson (reporting on a survey family and community life of the elderly), Francis McGlone (national survey of kinship networks), and Graham Crow & Graham Allan (community relations). Smart folks, good ideas. I was disturbed, though, by a Little England insular ambience. There was little awareness of — or apparent interest in — what unBritish network analysts have been doing. Only Graham Allan has attended the Sunbelt with any interest. There are good people and good stuff happening in Britain, but one has to reach out to get it.

World Congress of Sociology: Network analysis has been associated with the quadrennial World Congress of Sociology since 1974 in Toronto. (We're still recovering from the big pre-INSNA party in my backyard that year.) We have usually organized sessions as an ad hoc organization or as part of an Int'l Soc Assoc research committee especially the folks in Methods and Community. For the past few years, INSNA has paid to be officially affiliated with the ISA, and as a result, it

received the right to organize 2 sessions in its own name. Peter Carrington organized two others for the Methods folks, and there were other papers and sessions scattered around.

The papers were quite solid this time. You can see their abstracts elsewhere in this issue. World Congress organization was dreadful before the conference, but good during the conference itself. Participation was disappointing in the 2 INSNA sessions, even though we were in wonderful Montreal. If Toronto folk hadn't made the short trip, we would have only had enough papers for one session. My sense is that it is better to have network papers as part of the regular Research Committees and piggy-back on their numbers and ongoing activity rather than have INSNA be a marginal participant in its own right.

Late-Breaking Book News

☛ The *NY Times Book Review* (27 Sept 98 pp. 20-21) ran a provocative review of Randy Collins' *The Sociology of Philosophies: A Global Theory of Intellectual Change* (Belknap/Harvard U Press). I'm not qualified to evaluate philosopher A.C. Grayling's taking Collins to task about his sources and understand. But Grayling went on to a classic bit of turf protection, in which he does protest much too much. Grayling is distraught by Collins' thesis that "intellectual activity occurs in groups and networks, formed by master-pupil chains and contemporary rivalries." According to Grayling, there's much more underlying agreement at any one time, and differences among philosophers is more between individual than between the three to six schools that Collins describes. It was at this point in the review that I started to write this item, really a thought that Grayling should reread Freud on the narcissism of small differences.

☛ In my own edited book (*Networks in the Global Village*, Westview Press), network analysts from around the world describe/analyze personal communities (ego-centered nets) in their own countries: In it, Barry Lee

and Karen Campbell compare the local networks of black and white Americans; Vicente Espinoza shows how networks support Chilean *barrio* dwellers; Alexis Ferrand, Lise Mounier & Alain Degenne show how personal networks integrate and cleave different components of French society; Endre Sik & I analyze the role of networks in communist and postcommunist Hungary; Yanjie Bian studies job search networks in rapidly changing China; Shinsuke Otani shows the surprising (to me) similarity between Japanese and North American personal networks; Janet Salaff, Eric Fong & Wong Siu-Lun describe how Hong Kong residents use networks to emigrate; Milena Gulia & I place virtual communities in the longstanding tradition of community studies. Of course, East York, Toronto isn't neglected: Stephanie Potter and I use our data to construct typological building blocks of community, and Milena Gulia and I describe which properties of personal networks are associated with the provision of support. Those of you who have gone through the lengthy and finicky process of copyediting a book will appreciate that you take your amusement however you can. Mine came when the politically-correct American copyeditor wanted to change Vicente Espinoza's description of a Chilean husband's extramarital lover to "partner".

Network Intelligence

[reprinted from *Intelligence*, N. 77, 30 March 1998, p. 2. Used by permission.]

In May 1996, *Intelligence* mentioned that Alta Analytics of Columbus, Ohio, had introduced a link analysis "data mining" program, Netmap, which was being "widely used in intelligence and law enforcement". Link analysis is part of a larger category of scientific tools called network analysis and can be applied to all forms of relationships: financial, organizational, command, hierarchical "pecking orders", telephone conversations ("traffic analysis"), emotional support, counselling and advice. As we noted then, the type of network or link analysis programs available

to the general public have been mostly "graphical", meaning new and more attractive ways of presenting data in full color. Alta Analytics went a step further with Netmap by adapting certain scientific tools for intelligence work and for public data mining. Indeed, the DIA Office of National Drug Control Policy "plugged" Netmap into its new Emerald drug interdiction coordination computer network, and other intelligence services have clearly profited from Netmap applications.

Researchers using network analysis usually go from "cleaning up data" -- and presenting it neatly -- into multivariate analysis, and therefore lose the general public and most intelligence professionals. Netmap, like most programs not intended for scientists, makes it simpler by sticking to univariate (single variable) analysis. These limitations for use in intelligence were recently recognized when the American Association of Artificial Intelligence (AAAI) launched its recent "Call for Papers" for its fall symposium on Artificial Intelligence and Link Analysis in Orlando, Florida, on 23-25 Oct 1998. The AAAI recognizes that "computer-based link or network analysis is increasingly used in law enforcement investigations, fraud detection, telecommunications network analysis, pharmaceuticals research, epidemiology, and many other specialized applications. Much of the current software for link analysis is little more than a graphical display tool, but many advanced applications of link analysis involve thousands of objects and links as well as a rich array of possible data models which are nearly impossible to construct manually." In short, formal network analysis is necessary, and, as the symposium organizers stressed, "the focus of the symposium is new technologies, not capabilities and applications embodied in current software." Little wonder that the organizers include William Mills, of the CIA Office of R&D, and Raphael Wong, of the US Treasury Department FinCEN financial "cops" specialized in money laundering pattern recognition. [end reprint]

Network International is part of the Hambros Investment Groups. It runs a large forensic lab in the UK, assist firms with electronic countermeasures such as debugging, and advises governments on collecting unpaid taxes. [London *Times*, 9July98:3].

Netting the Net

☛ *Mage* is a computer program, originating in biochemistry, to display complex structural (and network) images in living color and multidimensional fidelity. For details, see *Social Networks* 20, 2 (4/98) or go to the journal's websites, such as www.elsevier.com/locate/son.

☛ Network analysis has made its entry on the Internet. UCLA graduate sociology student, Marc Smith, and his *Netscan* program analyze USENET topic groups for patterns of interaction such as how many posts were made to a newsgroup during a given time period, how many different people made those posts, and how many of those posts were crossposted to other newsgroups. *Netscan* produces simple bar graphs and numbers and can help generate hypotheses about the social dynamics in the newsgroups and what kinds of experiences each group offers its participants. Although *Netscan* does not actually do multivariate network analysis, it can easily function as the "front-end" of more advanced systems, and Smith intends to develop that aspect. <http://netscan.sscnet.ucla.edu>

☛ I've been arguing for years at various cyberspace conferences that computer networks are social networks. It may finally be taking. I gave an intro Social Network Analysis workshop at the Assoc for Computing Machinery's SIGGROUP97 conference, and I am doing another at CSCW98, November, in Seattle. Participants pay several hundred dollars to attend, getting much the same material as in my (much lower cost) Networks for Newbies workshop at the Sunbelt.

☛ NameBase is a web database (with > 100K names) and set of analytic tools explicitly based on social network analysis. Its proximity search clusters up to 31 names based on the overlap of their mention in American printed sources. (That's why Canadian Prime Minister Jean Chretien and Quebec separatist Premier Lucien Bouchard show up in close proximity: The only time American media thinks about Canadian politics is when separatism becomes salient. And Idi Amin is principally linked to Israelis, as if the Entebbe raid were the prime reason for knowing about him) The program produces an MDS-based map, with color-coded lines portraying links between people. Go to <http://www.pir.org> and click on "proximity search".

☛ Sandia National Labs has developed an algorithm for analyzing connections between 3M scholarly papers. It represents them as a 3D landscape where a mountain range signifying hot research issues in 1 corner of biology may connect to an area in physics by a narrow ridge. Project manager Chuck Meyers says "Connections that were previously hidden" will be revealed, and all scholars will have a sense of perspective. [Steve Steinberg, *Wired*, Jan97:46]

☛ It appears that network analysis and associated pattern recognition methods may have defeated one of the "new pretenders": neural network analysis. According to a recent study by InfoGlide Corporation of Austin, Texas, "neural nets are essentially obsolete for fraud detection" when compared to pattern recognition, although this result may be dependent on the specific methods tested. Usually, neural networks are "trained" by multivariate pattern recognition and network analysis methods before functioning independently. If the objects of analysis suddenly undergo a significant change, such as a new form of fraud, the neural net must be "retrained" by the multivariate methods before it can function again correctly. Since some criminals are not stupid, they often come up with new types

of fraud that initially avoid detection by existing systems.

- ☛ *The Brain* tries to replace *Explorer* by storing files associatively rather than hierarchically, enabling you to link any file to any other file. (It also links to web sites, email.) For example, you can link your latest paper to the websites that extend it, and the SPSS output behind it. Its interface is a Krackplot-looking graph of the nodes (files) and links that you're actively working on. I haven't used it, and so wonder if it can keep track of the 2K+ text and data files I have. But it's only \$49.95. Check www.thebrain.com.

- ☛ *PlantAll* is a contact database. If you register with them, whenever you update your contact information (addresses, etc.), they will notify all of the contacts you've listed. They promised confidentiality when I checked (but didn't register) 9/98, but they've recently been bought by Amazon. www.planetall.com.

- ☛ If you search on "network" in the CIOS (Communic Studies) abstractbase, you get 10 hits to "social network" but 84 to TV and 81 to "news". [my search was 17Sept98]

- ☛ "Facemail" is a new cyberjargon term for a "technologically backward means of communication, clearly inferior to voice mail or e-mail. Involves actually walking to someone's office and speaking to him or her face-to-face. Considered highly inefficient and declassé." [<http://cinepad.com/mslex.htm> as quoted in *NY Times*, 13Aug98] Which reminds me of a talk I gave to businesspeople, 8/98. One commented, "Well I learned one thing. You used the term 'flesh meet' for face-to-face contact, and I now realize that when we put in cubicles we damn well better make sure there is a window in each so no one will think that there is hanky panky." Which further reminds me that at 1 trendy Toronto software company, the entire office is open-plan, except for 3 "romantic recreation rooms." So there is a place for facemail (and more) after all.

Structuralism and Science

Survival of the Altruistic, Hence Fittest, Network — Network Analysis Meets Sociobiology: "The second article of ideological orthodoxy, virtually unchallenged at present by a student of evolution, is that the individual organism is the object seen directly by natural selection.... What is being explicitly denied is that characteristics favorable to the population as a whole will evolve by natural selection, except as a secondary consequence of the greater fitness of individuals over others within the population. So for example, we are not allowed to claim that linguistic communication between humans was favored by natural selection by arguing that a group of protohumans who could talk to each other would be at an advantage in warfare or hunting over other groups who were without language. Somehow it would have to be argued that a single individual with a greater linguistic capacity than others would, as a consequence, leave more offspring.... The difficulty posed by a combination of pan-selectionist optimizing theory with a commitment to the individual organism as the sole locus of natural selection becomes obvious when we consider altruism.... Altruism extends outside the family.... The problem of altruism is regarded by some evolutionists, in particular those who identify themselves as sociobiologists, as the outstanding problem of evolutionary biology and its solution as the outstanding contribution of sociobiological thought.... In considering groups as units of selection, it is important not to take too impoverished a view of what constitutes a group.... For group selection to operate, all this is required is that there be collections of individuals that interact with each other in some way separate from the interactions of other individuals in other groups, and subsequently the groups contribute differentially to the next generation." [R.C. Lewontin, "Survival of the Nicest?" *New York Review*, 22Oct98:60-61]

Once in a While Tree Hierarchies are Better Sources of Understanding than Social

Networks: I've been pushing the intellectual evolutionary line in recent papers that our thinking has evolved from little boxes to social networks. However, Joel Levine's former roommate Stephen Jay Gould makes a persuasive case that hierarchical tree structures work better in classifying life: "Linnaeus [1707-1768] prevailed because the formal rules of his system work well in practical terms, and also because his nested and hierarchal scheme of smaller within larger categories could be slotted into the geological interpretation ... that the discovery of evolution would soon impose upon any formal system of naming.

"[The Comte de] Buffon [1707-1778; author of *Histoire Naturelle*], on the other hand, sought to encompass all the overt complexity of organisms into a nonhierarchical system that recognized different relationships for various properties. (Bats, according to Buffon, stood closer to mammals in anatomy, and closer to birds in function). But this alternative model of a network with multiple linkages, rather than a strict hierarchy of inclusion fails ... to separate the superficial similarity of independent adaptation (wings of bats and birds) from the deep genealogical linkages of physical continuity through the ages (hair and live birth of bats and bears). Buffon's noble vision of equal treatment for all aspects of a species's life — placing ecology, function and behavior at part with traditional anatomy — foundered on a false theory about the nature of relationships." ["The Man Who Invented Natural History." *New York Review*, 22Oct98:84.]

I'm a Levine on My Mother's Side: Chromosome tests have confirmed that the Cohanim priestly caste has descended from father-to-son since the days of the Temple in Jerusalem, 2.5K years ago. There's little variation in their Y chromosomes (both Ashkenazi & Sephardic), unlike other Jews & the pop. at large. Mark Thomas (Univ College London) finds Cohanim genetic variation suggests the passage of 84-130 generations.

Taking 25 years as the average generation, the originating ancestor must have lived between 2.1K and 3.2K years ago. [Article in *Nature* summarized in Nigel Hawkes, "Genes Track the Jewish Priesthood to Exodus," *London Times*, 8July98]

Not All is Orderly: David Meyer and Thad Brown claim to have proven that "collective decisions can be chaotic, even when the views of all participants are known and a standard voting rule is strictly applied. When a group of decision-makers must choose between 3+ options by comparing 2 of them at a time, the collective outcome often depends on the order in which the choices are presented." [*Physical Review Letters*, 24Aug98, as reported by Malcolm Browne, "Science Squints at a Future Fogged by Chaotic Uncertainty," *NY Times* 22Sept98:D9].

Sexy Nets

Too bad you can't patent social network analysis. Otherwise Ed Laumann & assoc. would be mega-rich today. When Pfizer Drugs tested their new anti-impotency pill Viagra (the hottest selling new drug ever on the legal market), they prescribed 8 pills per month because that's what Ed & co. said was the average number of intercoursings that the American couple did. (And what about Lake Woebegon?) Insurance companies, btw, seem only to be paying for 6 pills/month. Killjoys. [*NY Times*, 29April98]

PS: When I sent this around on the Net, Stanley Wasserman responded, 6May98: "And so would Jacob Moreno. He did indeed want to patent the sociogram — see page 12 of Wasserman & Faust, *Social Network Analysis* — he referred to it as an 'invention'. *SNA*'s coauthor, Katie Faust, was the 1 who found the Moreno story in the *NY Times* (April 3, 1933: 17), which reported that Moreno wanted to do a sociogram of all of NYC.

Networking Monica and Bill and Ken and Linda and ...

Liberated Networks: “The Rose Law Firm ... was a snake pit of greed, rivalry and conflicts of interest.... [The other lawyers’ wives made fun of [Hillary Clinton’s] hair and muttered that [convicted felon and Asst Attorney General Webster] Hubbell and [suicided Bill Clinton aide Vince] Foster] would join Hillary for lunch at an out-of-the-way Italian restaurant where they were less likely to be seen drinking wine. Gossips said she was having affairs with both men and, in a Platonic sense, this appears to have been true. ‘We all had relationships with our spouses that, for different reasons, prevented totally frank discussions,’ Hubbell writes [in *Friends in High Places*]. “Hillary knew that Bill was more wrapped up in his own career than in her need for a life of her own... So Vince and each shared a part of ourselves with Hillary that we shared with no other woman.... I call this workplace intimacy.” [Lars-Erik Nelson, “Whatever Happened to Whitewater?” *New York Review*, Summer98].

Core-Periphery: “The [media] reporters and the defense lawyers often see themselves as members of the permanent establishment ... with the lawyers’ clients mere transients. Sometimes, ... the lawyers seem to be disclosing information that might be harmful to their clients or other people purely to build relationships with reporters. Reporters purse those relationships as well as ones with prosecutors because such ties, as much as hard information, are their stock-in-trade, and a means to their own advancement. In newsrooms, ... reporters often speak of a prosecution or defense lawyer who is supplying information as ‘my guy’.... Dense lawyers also use the disclosures to advance strategies for their clients. It is possible to diminish the impact of negative information about a client if it comes out before the announcement of an indictment.” William Glaberson, “Psst, Says Prosecutor to Reporter; I’m All Ears, Is the Reply.” [*NY Times*, 24June98]

Scholarly Pursuits: Should you wish to punditize about the Monica affair, you might

want to prep by reading 3 inadvertently germane recent scholarly articles: Ray Reagans, “Differences in Social Difference: Examining third Party Effects on Relational Stability” (*Social Networks* 20, 2, 4/98: 143-59); Diane Felmler, “‘Be Careful What You Wish For...’ A Quantitative and Qualitative Investigation of ‘Fatal Attractions’” (*Personal Relationships* 5, 3, 8/98: 235-54); Susan Sprecher, Diane Felmler, et al.’s “Factors Associated with Distress Following the Breakup of a Close Relationship” (*Journal of Social and Personal Relationships*, 1998).

Movie Role Predicted: Tori Spelling and Monica Lewinski were 2nd-grade classmates in a Los Angeles private school.

Short Schticks

Woody Remembered? “This land is your land.” Sign seen at Sinai Cemetery, San Fernando Valley, Los Angeles, 8/98.

Belfast: Northern Ireland is becoming the world’s first network state. The essence of the new political arrangements is that it will have fuzzy links with both Britain and Ireland. Someone at the Sitges Sunbelt told me that this is way feudalism worked: multiple, cross-cutting links of partial fealty rather than a “modern” bureaucratic tree structure. Perhaps the network nature of Northern Ireland is not totally accidental: Many IRA and Unionist “terrorists” studied sociology while in the Maze prison. “Their conversation is littered with ‘projects’, ‘paradigms’ and the ‘dynamics of reconciliation’.” [*Economist*, 15 Aug 98 p.50]

Recent Chinese History: “In the 50s we helped people. In the 60s we criticized people. In the 70s we deceived people. In the 80s everybody hired everybody else. In the 90s we ‘slaughter’ [rip off] whoever we see.” [A Short History of Comradely Sentiment,” quoted in Liu Binyan & Perry Link, “A Great

Leap Backward?" *New York Review*, 8 Oct 98 p.22]

Good Networks = Good Health: An Ontario study has found that rich people have good networks, and that these networks help folks in jumping the queue for heart surgery and serious cardiac care: 80% of doctors surveyed and half of hospital CEOs have helped jump the queue. [Article in *Annals of Internal Medicine*, reported in Rita Daly, "Rich Get Faster Heart Care," *Toronto Star*, 23Oct98: A1, A28]

Bad Networks ≠ Assassins: The US Secret Service's "Preventing Assassination" study of 83 people who have attacked a US political figure or celebrity in the past 50 years has found that they rarely had small networks. (Another blow to Community Lost proponents!) However, nearly all had suffered a recent trauma. [Bill Dedman, "Secret Service Challenges Assassin Stereotypes," *NY Times* 9Aug98:A16]

Coaching Networking: "Social networks have fragmented, leaving people feeling lost, adrift and unprotected. Enter the personal coach to pick up the slack. 'Coaching' is a much easier sell in the business world than 'counseling.'" [Barbara Moses, "Best Coaches Do More than Just Pump You Up." *Toronto Globe & Mail*, 10July98]

The Granovetter Employment Service: In the current US economic boom, many organizations that having been having trouble filling positions have turned to networking. For example, Stein Mart stores has a reward program for "employees who refer new store clerks. The recruiting employees are given shirts and hats, and managers get annual \$100 bonuses. Even so, the chain says it takes at least 10 interviews to hire 1 person." [Dennis Blank, "Jobs Going Begging, Companies in Florida Adapt." *NY Times*, 22Sept98:C4]

Social Networks Goes National Geographic: Bonnie Erickson, Keith Hampton

and myself are the 3 network analysts who are a part of a team that designed and will analyze the *National Geographic's Survey2000* on the NG website. Bonnie is looking at Canadian culture, and Keith and I are looking at personal communities and internet participation. Knowing how difficult it is to get survey respondents, we've been amazed and delighted that more than 14K adults answered the survey in the few weeks that it's been up. You — and your kids — can take it too. Go to www.nationalgeographic.com.

Social Networks up the Amazon: When I searched "social networks" as my keyword on Amazon (16Sept98), I came up with 246 books. The books were listed in two alphabetical sections; my guess is that Amazon puts better-sellers (predominantly trade books) first. The very first book listed was *25 Words or Less: How to Write Like a Pro to Find that Special Someone Through Personal Ads*, by Emily Thornton Calvo followed by *The African American Network: Get Connected to More than 5K Prominent People and Organizations....* However, Deborah Bell's *Children's Social Networks and Social Supports* was listed 4th, Much lower down were many Sunbelt favorites.

Linking with Amazon: Here's a way to help folks get the books you've written or had a chapter in. I've recently become an "Amazon Associate". If you go to my website, when you click on any book I've written or had an article in, you go directly to an Amazon order form. By the way, there is no Amazon restriction as to which books I could list on my website. If I had wanted to, I could have listed Winnie-the-Pooh and Ken Starr's porn story.

How to Get Research Done [PG13]: Charles Kadushin has given me permission to divulge the secret of his (and my) success: the "aw fuck it principle." As Prof. Kadushin puts it, "The point is that in doing research one has to know exactly when to say 'aw fuck it.' Too soon, and you have given up without exploring what needs to be explored. Too late, and

you have belabored the point, gotten lost, hate the work, and have allowed someone else to publish your ideas ahead of you. So 'aw fuck it' is not a gross principle; it is a very delicate one and calls for as much artistry as science." *BW*: Nevertheless, great work has come from some who've ignored the principle. Take sculptor/painter Alberto Giacometti, "When I'm not working I think I know what I want to do.... Then when I start, everything changes and I'm lost." [quoted in his Montreal Museum of Fine Arts exhibition, 8/98]

Structuralist Math: French mathematician Andre Weil "took particular pride in the way he solved 'a problem of combinatorics concerning marriage rules in a tribe of Australian aborigines' for Claude Lévi-Strauss." [From Weil's obituary, *Economist*, 22 Aug 98 p. 70]

Structuralist Art: The book, *Installation Art*, defines I.A. as "a kind of art making which rejects concentration on one object in favor of a consideration of the relationship between a number of elements or of the interaction between things and their contexts." [*NY Times*, 9Aug98:2-1]

Deep Thoughts

(1) While giving my Networks for Newbies workshop at the Sitges Sunbelt, I heard myself saying the following aphorism: "We dream in graphs; we analyze in matrices."

(2) Madrid sociologist Tomas Villasante reports that Spinoza was the first social network analyst, asserting "No individual is an individual." (This at a small seminar before the Sitges Sunbelt in which Ron Breiger, Pat Doreian, Narcisso Pizarro, Tomas Villasante, Harrison White and I participated.) Does this mean that John Locke plagiarized his "No man is an island"? Was Locke sexist also, or was he an early feminist, implicitly arguing for women's superior networking skills?

(3) By contrast: "You don't have to help anyone. That's what this country is all about." Uttered in the final Seinfeld episode by his defense lawyer "Jackie Chiles" (a Johnnie Cochrane wannabe). [Writer Larry David, 14May98]

(4) "We're a data-rich and information-poor society. there's lots of data out there. It's how we translate that into information that counts." [US Seafirst Bank chair John Rindlaub, quoted in Toronto *Globe and Mail*, 27July98: B11]

(5) E-mail attachments are the aids and the AIDS of the scribbling classes.



What Constitutes Semantic Network Analysis? A Comparison of Research and Methodologies¹

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INTRODUCTION

What is semantic network analysis? Semantic network analysis is the use of network analytic techniques on paired associations based on shared meaning as opposed to paired associations of behavioral or perceived communication links. In the follow up of Monge and Eisenberg's (1987) review of the organizational network analysis literature, Monge and Contractor (in press) categorized a variety of research articles as semantic network analyses (e.g., Contractor, Eisenberg, & Monge, 1994; Contractor & Grant, 1996; Danowski, 1982; Jang & Barnett, 1994; Krackhardt & Kilduff, 1990; Lievrouw, Rogers, Lowe, & Nadel, 1987; Rice & Danowski, 1993; & Stohl, 1993). Common to these research projects are the use of network analysis techniques to analyze respondents' communication about or perceptions of their organization. However, these projects use different in that the methods to construct "semantic networks." They varied from the use of 7-point scales to measure overlapping dyadic perceptions (Krackhardt & Kilduff, 1990), to the use of textual analysis with automated computer programs (Danowski, 1982; Jang & Barnett, 1994; Rice & Danowski, 1993), to the use of traditional content analysis with human coders (Stohl, 1993).

Semantic network analysis is becoming its own research paradigm as well as a method for analysis. However, the methods with which scholars develop their networks continue to vary. Implicit to the various techniques is a debate about valid measurements of meaning. This article considers recent publications which have been labeled semantic network analyses, delineates their methodologies, and explicates the meaning debate by arguing that there should be a clearer distinction between methods than simply naming the use of network analysis using perceptual or textual data as semantic network analysis.

In answer to Monge and Eisenberg's (1987) suggestion that communication network research should more explicitly tie meaning to its inquiries, semantic network analysis has become a

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method for studying the homogeneity or diversity of subgroups based on members' interpretations of organizational issues (rather than networks which represent who communicates with whom). The articles Monge and Contractor (in press) referenced in their review of semantic network analysis reflect three schools of thought on operationalizing semantic networks. Semantic networks have been constructed in the following ways: (1) based on the relationship among words in a text; (2) based on traditional content analyses of text; and (3) based on overlapping perceptions measured with scales.

These various methodologies may be a function of two distinct definitions of semantic networks. For example, Rice and Danowski (1993) described the essence of the semantic network as the analysis of text to measure the relationship among words. On the other hand, Monge and Eisenberg's (1987) conceptualization of semantic networks is described as associations based on shared interpretations. Essentially, these two definitions are at the heart of the division between types of semantic network research.

The following sections consider the history of semantic network analysis, scholars' contrasting methods, how the methods complement definitions of semantic networks, and argue that because of research methods and history, the label, 'semantic networks,' should be reserved for studies which consider explicit texts rather than indirectly measured attributes of texts or perceptions of individuals. After all, different methods yield different results (Carley, 1993).

THE HISTORY OF SEMANTIC NETWORKS

Rice and Danowski (1993) framed the history of network analysis as related to assumptions about cognitive processes. They compared semantic network analysis to Collins and Quillian's (1969) conceptualization of memory as a hierarchical ordering of words (network) in people's memories. Similarly, spatial models like the GALILEO system defined meaning as relations among words with multiple dimensional scaling (spatial manifolds) as opposed to graph theoretical (link-node) manifolds (Woelfel & Fink, 1980). Woelfel and Fink explained that the meaning of concepts are determined by separation relations with all other concepts. In other words, the meaning of a concept relative to other concepts. Barnett, Palmer, and Noor Al-Deen (1984) as well as Palmer and Barnett (1984) found evidence that such spatial models accurately determined meaning (see Barnett & Woelfel, 1988 for additional readings).

Based on the cognitive association of words, Rice and Danowski argued that words are nodes linked in relationships of facilitated and inhibited association. Similarly, map analysts (Carley, 1993) consider the content of texts by identifying concepts and the relationships between them. Carley (1993) argued that the mapping of concepts in relation to one another enables a picture of the web of meaning contained within a text. She argued that there is a strong theoretical grounding for extracting meaning from text based on theories such as the construction of meaning, mental models, and knowledge representation.

The meaning extracted from texts is not merely based on the presence of certain words or concepts. As Carley (1993) illuminated, two texts may contain the same concepts, yet represent different meanings. This is how semantic network analysis differs from word-count content analysis, because meaning is revealed by the relationships (networks) among the concepts. Carley argued, "differences in the distribution of concepts and the relationships among them

across texts provides insight into the similarities and differences in the content and structure of the texts (p. 92). She differentiated map analysis from the text analyses of Danowski and others because her analyses considered the direction of word association, whereas Danowski (and others) determined the relationship between words as they occurred within a window of n words wide that moves sequentially through the text, one word at a time. Rice and Danowski (1993) defended the ability of their methods to represent meaning because of the hierarchical association of words in people's minds (Collins & Quillian, 1969).

Nearly 20 years later, Chang (1986) supported Collins and Quillian's experiments on semantic memory and argued that a database of semantic memory based on the hierarchical ordering of words is both rich and consistent with reality. Therefore, I concur with Rice and Danowski's conclusion that analyses of texts based on word association analyses (semantic networks) represent the meaning inherent in such texts. The following section cites research that analyzed meaning with network analysis with three different types of methods: (1) that which represents analyses of word associations within bodies of texts; (2) that which utilizes traditional content analysis of bodies of text; and (3) that which utilizes respondents' answers to close-ended scaled questions.

Table 1. *Typology of Meaning-centered Network Analyses*

Operationalization	Conceptualization		
	Analyses of Text		Shared Interpretations
Word associations (quantitative)	Carley (1993); Danowski (1982; 1993); Doerfel & Barnett (1997); Jang & Barnett (1994); Rice & Danowski (1992)	→	Word associations = meaning
Traditional content analysis (interpreted by coders)	Coders interpret respondents' meaning	←	Contractor & Grant (1996); Contractor, Eisenberg & Monge (1994); Stohl (1993)
Perceptions scales (self-report closed-ended questions)	∅	≠	Krackhardt & Kilduff (1990)

WORD ASSOCIATIONS AND ANALYSES OF TEXTS

As Table 1 illustrates, the group of papers that analyzed word associations in texts adopted 'analysis of text' as the definition for semantic network analysis. Their methods were similar in that they analyzed frequencies, co-occurrences, and relationships among words in text, and therefore, classified their research as analysis of shared interpretations. Thus, their classification in Table 1 is at the cross section of 'Word associations' and 'analysis of text.' The right-arrow shows the underlying assumption of this research in that their operationalization of semantic networks enabled them to elicit meaning. This group of research includes (1) analyses of meaning networks, in which the nodes are words, and (2) analyses of social networks in which a link between two actors in the network is a function of their communicated meaning networks.

Meaning networks (nodes = words). In regard to communication research, Danowski predated Monge and Eisenberg's (1987) call to include meaning in network studies, with his analysis of the communication that took place in a computer-mediated conference (Danowski, 1982). He used a concept co-occurrence method in which he mapped the relationships among words by indexing the pairs of concepts. Specifically, he analyzed pairs of messages and their computer-mediated responses. He argued that this method represented two aspects of communication. First, it revealed the manifest conversational structure among participants as it appeared to an external observer, and second, it indirectly represented the collective cognitive structure among participants (Danowski, 1982, p. 911).

Rice and Danowski (1991) used similar methods to analyze comments about users of voice mail. They employed the NEGOPY network analysis program and found that the semantic network (words relations) discriminated between categories of voice mail users. They argued that "traditional content analysis would not have revealed much of these distinctions in respondents' perceptions" (emphasis retained, p. 137). This is because unlike traditional content analysis which requires a priori categories based on theory, their research was exploratory in that they did not have theoretical expectations about the use of voice mail on which to base coding categories. They concluded that their research supported the notion that "cognitive theories about communication provide a useful theoretical basis for integrating open-ended interpretations of a new medium, and distinctions in the type of use of such a communication system" (Rice & Danowski, 1991, p. 137).

Freeman and Barnett's (1994) research on organizational culture included a dual analysis of content. First, they developed a words-by-words matrix of co-occurrences upon which they conducted hierarchical cluster analysis. The results included the most prevalent words and how they clustered in relation to each other. Second, they developed a cooccurrence matrix in which a link was represented by the co-presence of words in the same 'sliding window' which could range from 3-10 words wide. The entire text was read as the window moved through it and then the data were analyzed with the NEGOPY network analysis program. The NEGOPY program enabled them to identify groups of words, words which linked groups of words, and others which were structurally isolated. Both sets of procedures provided a representation of language patterns used by the organization. The word clusters represented the cultural categories communicated in the organization's written messages which allowed for "a more objective, precise description of its culture" (Freeman and Barnett, 1994, p. 65).

In a similar vein, Lievrouw, Rogers, Lowe, and Nadel (1987) conducted a co-word analysis among terms used to index grants for the National Institute of Health (NIH) database. Specifically, the frequency of co-occurrence of pairs of indexing terms within individual research grants was computed, employing the assumption that indexing terms that co-occur frequently generally have an intellectual relationship. Grants indexed by a relatively large number of terms which cluster together should be strongly intellectually related (Lievrouw et al., 1987, p. 224).

The authors argued that their identification of an invisible college in the biomedical field would have otherwise been undiscovered had they depended on only traditional networks measured via co-citation analyses. In other words, the content of the database is what enabled their discoveries.

Meaning networks (nodes are actors linked by their meaning networks). The above analyses were network descriptions of the texts. With similar methods, Jang and Barnett (1994) created a companies-by-companies relations matrix based on word cooccurrence in the organizations' public communication. They explained their semantic network as a configuration of relationships among nodes who used the same symbols. The strength of links was the degree to which the organizations shared meanings. Thus, organizations' relative positions could be classified in a meaning network. They argued, "in this respect, semantic network analysis has an advantage over traditional network analysis in that it provides a precise description of the content of messages while at the same time allowing researchers to differentiate characteristics of actors based on what they communicate" (Jang & Barnett, pp. 34-35). Their network analysis of 35 Fortune-500 companies' letters from chief operating officers differentiated the Japanese versus American corporations. In addition, they found that Japanese organizations clustered tightly, and their content was mostly focused on organizational operations, while the American organizations were loosely clustered and their content was primarily about financial information and the organizational structure.

Doerfel and Barnett (1997) conducted an analysis of the International Communication Association (ICA) in which the nodes were the association's divisions and the links were based on overlapping research themes in the titles of papers presented to ICA's divisions and interest groups (1992-1996). In addition to describing the semantic network of the association, Doerfel and Barnett found a significant correlation between their semantic network and the structure of the membership network measured by Barnett and Danowski (1992).

Central to all of the aforementioned studies was the analysis of text based on relationships among the content's words. A strength of these articles is that they captured the relationship among words in texts, and the authors did not force content elements into a relatively small set of categories (Danowski, 1993). Furthermore, it "represents the semantic content of message in the actual, natural language in which they were originally expressed, resulting in greater external validity and [it] reduces translation error in moving from what is said to the representation, resulting in greater internal validity" (Danowski, 1993, p. 219). A weakness of this methodology, however, is that the valence of attitudes was not necessarily captured. These studies represent the majority of published semantic network analyses, however, there are a few network studies in which different methodologies were employed. These alternate methods enabled the analyst to capture the valence of attitudes. The next two sections address the alternate methods.

TRADITIONAL CONTENT ANALYSIS AND SHARED INTERPRETATIONS

Monge and Contractor (in press) reviewed the semantic network research that has occurred since Monge and Eisenberg's (1987) argument that more network analyses should also focus on meaning. Among the research they referenced were papers which are categorized in Table 1 as having defined a link in semantic networks as the situation when two nodes share interpretations, and their operationalization for constructing their networks was based on traditional content analysis methods. Table 1 illustrates the difference of these analyses from the word-associations studies in that they are first, interpretive (as they are in the conceptualization column, 'shared interpretations'). The left arrow denotes that these projects

are 'once removed' from the texts because first categories of shared interpretation were created then coders were used to interpret the meaning in the texts.

Contractor et al. (1994) analyzed the interpretive diversity of organizations with multiple methods, including a network analysis of traditional content analysis data. They conceptualized a semantic network as a representation of multiple meanings present at any given time in an organization. They argued that it is possible to "consider all organizational members as belonging to a semantic network where the web of linkages depicts the degree to which members converge (or diverge) in their interpretation of the organization's mission" (p. 4). They coded answers to various open-ended questions with coding schemes which were based on the authors' readings of the responses. One scheme included three substantive categories plus a fourth 'don't know' option, and the other two schemes included six substantive categories with a seventh 'don't know' option. The content analyses resulted in three networks whose measures were used to compute members' agreement with others in their group and the organization.

Similarly, Stohl (1993) conducted a cultural analysis of European managers' responses to open-ended questions. She conducted a traditional, categorical content analysis, in which categories for coding were based on Hofstede's (1984; 1991) dimensions of cultural variability. She operationalized two nodes as linked if they had overlapping interpretations based on categories of culture. Four categories of culture included pairs of opposites, which resulted in a coding scheme of eight possible categories. Stohl argued that her coding enabled a representation of the data's richness because if two managers overlapped on one category, the corresponding cell, ij, was assigned a "1." If they were coded as having overlapping perceptions on two categories, the corresponding cell, ij, was assigned a "2." Therefore, while limited by the categories she developed out of Hofstede's work, she argued that the network retained the richness and complexity of her data because it took into account multiple meanings.

Similar to the word associations research, these traditional content analysis projects considered the actual communication (text) of respondents' communication about their organization. The strength of traditional content analysis is that the coders are able to capture the valence of responses. However, their shortcoming is that the "richness of the data" and "multiplicity of meanings" are reduced to a few categories. This shortcoming was reemphasized in Barnett, Danowski, and Richards' (1993) introduction in Progress in Communication Sciences when they argued that Lewin's (1931) criticism of social sciences still stands:

It is excessively Aristotelian in its focus on categories and on nominal variables... In prevalent categorical thinking the focus is on elements and their classification, not on their relationships to one another, except indirectly, by way of common membership in categories. In network terms, it has been common to think of two nodes as simply being linked or not linked (p. 5).

The Aristotelian concern Barnett et al. described is even more prevalent in the last section of this article, in that the "semantic" networks were not constructed based on nodes' communication.

PERCEPTION SCALES AND SHARED INTERPRETATIONS

The research categorized on Table 1 as perception scales and shared interpretations is depicted as such because the networks of shared meaning were constructed with ordinal scales of

perceptions rather than with some form of content analysis of communication. Monge and Eisenberg (1987) emphasized that unlike Danowski (1982) they were less concerned with frequency of word usage. As such, the following articles' approaches were certainly consistent with Monge and Eisenberg's "concern with the interpretations and meanings as seen by communicators" (1987, p. 333).

Contractor and Grant's (1996) simulation of communication processes included network measures of shared interpretations of organizational members. Their goal was to use self organizing systems theory to explain and model the emergence of shared interpretations. They constructed the semantic network based on nodes' overlapping agreement measured with a 12-point scale. In other words, cell ij and ji , "indicated individuals i 's and j 's agreement (on a scale from 0 to 12) with a particular interpretation at time t " (Contractor & Grant, 1996, p. 221). Interpretation scores ranged from 0 (no agreement) to 12 (high agreement). Likewise, the Contractor et al. (1994) study on organizational interpretive diversity also measured members' perceived interpretive diversity with a 7-point scale. A shared interpretations network was constructed with answers to questions regarding how similar respondents perceived others to have similar interpretations. Finally, although Krackhardt and Kilduff (1990) did not refer to their research as a semantic network analysis, Monge and Contractor (in press) included this in their review. Like Contractor et al. (1994), Krackhardt and Kilduff operationalized a dyadic connection with a coefficient of similarity. They did this by calculating the correlation between person i 's vector of ratings with the corresponding vector for person j .

Clearly, these studies utilized substantively different methods from those which conducted content analyses. As Table 1 illustrates, the method is related to the other research because it is concerned with shared interpretations, however, the method does not involve the analysis of comprehensive texts or responses to open ended questions. In other words, this method is completely subject to preconceived categories imposed by the researchers and is not an analysis of meanings in texts (i.e., semantic).

CONCLUSION

Monge and Eisenberg (1987) clearly differentiated the methods for constructing these shared interpretations networks in that the "semantic network" is one that is constructed based on the content analysis of organizational members' open-ended responses to or organizational texts about the organization's culture. On the other hand, they explained, "individuals could complete attitudinal scales regarding important issues, and linkages in the resultant attitudinal network could be identified based upon degree of similarity across a core set of attitudes" (emphasis retained, p. 333). Thus, as Table 1 depicts, the attitudinal scale methods do not result in a semantic network. The methods are clearly distinguishable between semantic networks versus attitudinal networks.

This difference is simple and straightforward. On the other hand, the other two types of research reviewed in this article represent a controversy among methods. Word analyses versus traditional content analyses each have their own differences as well as strengths and weaknesses. For example, they differ in that the former extracts concepts from texts and considers the relationship among concepts, while the latter focuses on the extraction of contexts from texts (Carley, 1993). A significant shortcoming of content analysis, though extensively used, is that

it "has met with only limited success for a variety of reasons, including lack of simple routines, time consuming data preparation, difficulties in relating textual analysis to other data, and lack of a strong theoretical base" (Carley, 1993, p. 77). To its credit, however, traditional content analysis does not face the problem with the word associations method of constructing networks in that homographs, words that have the same written form but a different origin and meaning (Carley, 1993), can be recognized and managed.

Rice and Danowski (1993) argued that semantic network analysis was more advantageous than traditional content analysis because their methods did not employ a priori categories based on theory, which might have suppressed unexpected emergent meanings. Thus, the network analyses that employed traditional content coding still embody the same shortcomings of traditional content analysis, because they use traditional content analysis to construct their matrices. Furthermore, as Barnett et al. (1993) noted, this type of research suffers the same problems as much other social scientific research, as criticized by Lewin (1931), in being overly dependent on categorical data. The word associations method enable texts to be handled as continuous variables without loss of richness and multiplicity of the information. As Danowski (1993) noted, it retained the richness of the data and enabled comparisons of qualitative information across respondent groups.

This brings the focus back to the original question posed at the beginning of this article. What constitutes a semantic network analysis? By going back to Monge and Eisenberg's (1987) call to consider meaning in network research, we can see that the three types of studies cited in this article are all studies of interpretation that utilize network techniques to analyze the data. However, they are not all semantic analyses. The operations differentiate three categories of network research: (1) semantic networks; (2) interpretations networks; and (3) attitudinal networks. Semantic network analyses are those which are classified in the first row of Table 1. They are those studies in which word associations in texts were analyzed, and those word associations represented the meaning inherent to the data. Therefore, a link in a semantic network represents the extent to which two nodes, i and j , share meaning as measured by their overlapping use of language as representation of meaning. Interpretations network analyses are those classified in the second row in Table 1. The analysts employed traditional content analysis of texts to summarize meaning in texts. Therefore, a link in the interpretations network represents the extent to which two nodes, i and j , share meaning as inferred by coders' interpretation of nodes i and j 's language. Attitudinal networks are those which are classified in the third row of Table 1. They were constructed with answers to close-ended, ordinal-scaled questions created by the researcher. Therefore, a link in the attitudinal network represents the extent to which two nodes, i and j , answered an attitudinal scale similarly.

An interesting issue to which scholars should attend is that all three of these network approaches have been categorized as semantic networks, however, a more appropriate description would be to refer to their general nature as meaning networks. Meaning networks differ from traditional network analysis because the focus is on perceptions of relationships or organizational culture rather than who communicates with whom. However, the various meaning networks differ in their construction and therefore, the role of the researcher in data collection also varies. Put another way, they differ in the amount of researcher bias that is imposed on responses.

Table 2 summarizes the three different types of meaning networks, semantic, interpretation, and attitudinal, and the operations and relative level of imposition of researcher on respondent. Note

that the least researcher bias is with semantic networks because no *a priori* categories are used. The imposition is only minimal, to the extent that the investigator might formulate open-ended questions to probe respondents' attitudes. In regards to interpretations networks, the researcher might use the same techniques for data collection as semantic network analysts, however, they will depend on coders and a priori categories for content analysis. Finally, attitudinal network analysts construct close ended questions which force respondents into perceived categories.

Table 2. Three Categories of Meaning Networks

Network Type	Operationalization of Meaning	Analyst Imposition on Data
Semantic	Word frequencies and associations	Minimal: Does not use <i>a priori</i> categories in content analysis
Interpretation	Traditional content analysis	Moderate: Uses <i>a priori</i> categories (either based on theory or researchers' reading of data)
Attitudinal	Questionnaires	Maximum: Uses closed-ended perceptual scales

In conclusion, the purpose of this article was to elaborate on and make distinctions between the types of approaches that have been used in dealing with meaning in social networks. Specifically, this article clarified the definition of semantic network analysis, identified it as different from other types of meaning networks, and provided a typology for three different methods used in constructing meaning networks.

REFERENCES

- Barnett, G. A., & Danowski, J. A. (1992). The structure of communication: A network analysis of the International Communication Association. Human Communication Research, 19, 264-285.
- Barnett, G. A., Danowski, J. A., & Richards Jr., W. D. (1993). Communication networks and network analysis: A current assessment. In W. D. Richards, Jr. G. A. Barnett (Eds.), Progress in communication sciences (vol. 12, pp. 1-19). Norwood, NJ: Ablex.
- Barnett, G. A., Palmer, M. T., & Noor Al-Deen, H. (1984). An examination of the use of multidimensional scaling to determine the accuracy of translation. In R. Bostrom (Ed.), Communication Yearbook (vol. 8, pp. 659-679).
- Barnett, G. A., & Woelfel, J. (1988). Readings in the GALILEO system: Theory, methods and applications. Dubuque, IA: Kendall/Hunt.
- Carley, K. (1993). Coding choices for textual analysis: A comparison of content analysis and map analysis. Sociological Methodology, 23, 75-126.
- Chang, T. M. (1986). Semantic memory: Facts and models. Psychological Bulletin, 99, 199-220.
- Collins, A. M., & Quillian, M. R. (1969). Retrieval time from semantic memory. Journal of Verbal Learning and Verbal Behavior, 8, 240-247.

- Contractor, N. S., Eisenberg, E. M., & Monge, P. R. (1994, May). Antecedents and outcomes of interpretive diversity in organizations. Paper presented at the meeting of the International Communication Association, Sydney, Australia.
- Contractor, N. S., & Grant, S. J. (1996). The emergence of shared interpretations in organizations. In J. H. Watt & C. A. VanLear (Eds.), Dynamic patterns in communication processes, (pp. 215-230). Thousand Oaks, CA: Sage.
- Danowski, J. A. (1982). Computer mediated communication: A network-based content analysis using a CBBS conference. In M. Burgoon, (Ed.), Communication yearbook (vol. 6, pp. 905-924). Beverly Hills, CA: Sage.
- Danowski, J. A. (1988). Organizational infographics and automated auditing: Using computers to unobtrusively gather as well as analyze communication. In G. M. Goldhaber & G. A. Barnett (Eds.), Handbook of organizational communication (pp. 385-433). Norwood, NJ: Ablex.
- Danowski, J. A. (1993). Network analysis of message content. In W. D. Richards, Jr. G. A. Barnett (Eds.), Progress in communication sciences (vol. 12, pp. 197-221). Norwood, NJ: Ablex.
- Doerfel, M. L., & Barnett, G. A. (1997, May). A semantic network analysis of the International Communication Association. Paper presented at the meeting of the International Communication Association, Montreal, Quebec.
- Freeman, C. A., & Barnett, G. A. (1994). An alternative approach to using interpretive theory to examine corporate messages and organizational culture. In L. Thayer & G. A. Barnett (Eds.), Organization ↔ Communication: Emerging perspectives (vol. 4, pp. 60-73). Norwood, NJ: Ablex.
- Hofstede, G. (1984). Culture's consequences: International differences in work-related values. Beverly Hills, CA: Sage.
- Hofstede, G. (1991). Cultures and organizations: Software of the mind. London: McGraw-Hill.
- Jang, H., & Barnett, G. A. (1994). Cultural differences in organizational communication: A semantic network analysis. Bulletin de Methodologie Sociologique, 44, 31-59.
- Krackhardt, D., & Kilduff, M. (1990). Friendship patterns and culture: The control of organizational diversity. American Anthropologist, 92, 142-154.
- Lewin, K. (1931). The conflict between Aristotelian and Galilean modes of thought in contemporary psychology. Journal of General Psychology, 5, 141-177.
- Lievrouw, L. A., Rogers, E. M., Lowe, C. U., & Nadel, E. (1987). Triangulation as a research strategy for identifying invisible colleges among biomedical students. Social Networks, 9, 217-248.
- Monge, P. R., & Contractor, N. S. (in press). The emergence of communication networks. In F. Jablin & L. L. Putnam, (Eds.), Handbook of organizational communication (2nd ed.). Thousand Oaks, CA: Sage.

Monge, P. R., & Eisenberg, E. M. (1987). Emergent communication networks. In F. Jablin, L. L. Putnam, K. Roberts, & L. Porter (Eds.), Handbook of organizational communication (pp. 304-342). Newbury Park, CA: Sage.

Palmer, M. T., & Barnett, G. A. (1984). Using spatial models to determine the accuracy of language translation. In W. B. Gudykunst & Y. Y. Kim (Eds.), International and intercultural communication annual (vol. 8, pp. 129-147).

Rice, R. E., & Danowski, J. A. (1991, October). Comparing comments and semantic networks about voicemail. Proceedings of the American Society for Information Science, 28, 134-138.

Rice, R. E., & Danowski, J. A. (1993). Is it really just a like a fancy answering machine? Comparing semantic networks of different types of voicemail users. Journal of Business Communication, 30, 369-397.

Stohl, C. (1993). European managers' interpretations of participation: A semantic network analysis. Human Communication Research, 20, 97-117.

Woelfel, J., & Fink, E. L. (1980). The measurement of communication processes: GALILEO theory and method. New York: Academic Press.

Network Measures of Social Capital¹

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INTRODUCTION

As Burt (1998) notes, "social capital is fast becoming a core concept in sociology and political science". But it has mostly been used in a theoretical context; only a few researchers have had to confront the issue of measurement. Those that have (e.g., Burt 1992; Gulati 1999) have almost universally chosen or constructed a single measure of social capital. The focus has been substantive rather than methodological, so none have systematically considered the range of possible measures. In this short paper, we would like to consider which existing network measures might be used to formalize the notion of social capital.

DIFFERENT CONCEPTIONS OF SOCIAL CAPITAL

Barry Wellman and Sherry Bartram (email message to SOcNET listserv, 10 January 1997; reprinted in Borgatti, 1998) have suggested that there seem to be at least two fundamentally different usages of the term social capital. One usage – exemplified by Putnam (1995) – conceives of social capital as a quality of groups (usually whole societies). It is partly cultural, partly socio-structural. It includes such things as rule of law, social integration, and trust. Other writers in this vein include Fukuyama (1995) and Loury (1987), as well as the apparent originators² of the term, Hanifan (1920) and Jacobs (1961).

Another usage – exemplified by Burt (1992) – conceives of social capital as the value of an individual's social relationships. It has been axiomatic in the social support literature since the 1970s (e.g., Cassel, 1974) that one's relationships with others are a source of material, information and emotional aid. A more formal statement of this view – renamed social resource theory – is provided by Lin (1986). Similarly, in the organizational literature, one's relationships have been seen as a source of power (Brass, 1992). In a somewhat different vein, Burt (1992) suggests that certain configurations of relationships with others confer significant information

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²See the SOcNET discussion reprinted in Borgatti (1998), elsewhere in this issue.

and control benefits. This view is rooted in a long sociological tradition of viewing an actor's position in a social network as determinant of its opportunities and constraints (Wellman, 1988).

Wellman and Bartram argue that these two usages primarily reflect two different levels of analysis: the individual and the group (or social system). But Putnam (email message to SOcNET, 12 January 1997; reprinted in Borgatti, 1998) suggests a different distinction. He notes his own usage of social capital might be thought of as emphasizing "the collective-good facet of social capital -- I can benefit from broader social networks and the associated norms of reciprocity and trust, even when I did not help produce and do not own those assets", while Burt's usage could be seen as emphasizing "the private-good facet -- how my connections can help me".³

Our own view is that both distinctions need to be made, although we shall prefer somewhat different language. Wellman and Bartram are right: some writers focus on the individual, while others focus on the group. But let us consider the group level for a moment. In general, the group has been implicitly conceived of as a universe: relationships, norms and systems within the group are discussed, but nothing outside the group is considered. For example, Putnam (1995) takes the United States as his object of analysis, and he documents the decline of participation in volunteer groups within the US. He does not examine the structure of American relationships with individuals in other countries. Yet, most groups we study are not universes: they are embedded in their own social environments. Let us consider the case of teams or departments within an organization. Specifically, let us examine the social capital of an academic department within a university. With the department as our unit of analysis, we can take either of the approaches to social capital described above. Taking Putnam's approach⁴, we would look at such things as the working relationships among the members of the department (e.g. are there many pairs that like each other?), the structure of ties (e.g., are there mutually exclusive factions?) the working procedures of the team (e.g., Do they utilize secret ballot voting? Run meetings according to Roberts' Rules of Order?), the department norms (e.g., is it ok to criticize someone's work?), and so on.

Or we can take Burt's approach, but applied to the department, not the individuals within it. For example, we look at the relationships that the department (or its members) have with the individuals and groups outside of it. Are some of the faculty well-connected with the dean and with chairs of other departments? Does the department itself have relations, as a department, with other departments through joint degrees, research centers, etc.? What is the reputation of the department in the eyes of the other departments?

In other words, we consider the substance of Putnam's and Burt's approaches to be separable from the unit of analysis. When applied to collective actors within a larger system, the essence

³As an aside, it is interesting to note that Burt (1992) explicitly rejects Putnam's implication that an actor owns his or her social capital, since it requires both parties to maintain a binary tie. Yet, from a methodological point of view, any measurement process that results in assigning a single value to each actor is a property or attribute of the actor.

⁴The concept of "social capital" has a long and multi-threaded history. We use Putnam and Burt as exemplars of two distinctive points of view, but do not claim that either of these were the first to articulate these positions.

of Putnam’s approach is to look within the collectivity, while the essence of Burt’s approach is to look to look outside the collectivity. Thinking in purely network terms, Putnam would look at the structure of relationships within the group, while Burt would look at the structure of the group’s relationships to outsiders. Combining the individual vs. group dimension with the inside vs outside dimension generates a two 4-fold classification, as shown in Table 1.

Table 1. Different Conceptions/Forms of Social Capital

	Type of Focus:	
Type of Actor:	Internal	External
Individual	A)	B) Burt (1992); Lin (1986); Brass (1992);
Group	C) Putnam (1995); Fukuyama (1995);	D) Ancona (1990); Cohen & Levinthal (1990); Everett & Borgatti (1999);

The top left cell ("Box A") is presumably empty since the individual is normally seen as the indivisible atom of the sociological world. On the other hand, since physicists have now split the atom and connectionist theories of mind currently dominate cognitive science, one is tempted to write "human capital" in that cell and rename the table "different forms of non-financial capital". Nevertheless, we choose not to pursue that line of thinking any further in this paper.

The top right cell ("Box B") corresponds to the conception of social capital that Wellman and Bartram regard as ‘individualist’ and Putnam describes as the private-good facet of social capital. This basic approach is found in Burt (1992), DiMaggio (1992), Gulati (1999), and in all of classical social resource theory (e.g., Lin, 1986) and structuralist position theory (Wellman, 1988).

The bottom left cell ("Box C") corresponds to what Wellman and Bartram regard as ‘groupist’ and Putnam describes as the collective-good facet. This is the underlying conception found in Putnam (1995), Bourdieu (1986), and most of Coleman (1988, 1990). It is rooted in a tradition that includes such classical writers such as Adam Smith and de Tocqueville, who did not use the term *social capital* but probably would today.

The bottom right box ("Box D") is just beginning to receive attention. In the context of teams within business organizations, Ancona (1990) has suggested that teams whose members have strong ties with the rest of the organization are more successful in getting things done. However, she does not apply the term social capital. Similarly, Jones, Hesterly, Lichtenstein and Borgatti (1996) suggest that film production teams with strong social capital make more successful films. Cohen and Levinthal (1990) suggest that ties to outsiders help organizations to innovate. Everett and Borgatti (1999) do present measures of centrality defined for cohesive subsets and explicitly identify this centrality as measuring the social capital of groups, but this paper is not yet in print.

Now we consider specific measures for each of the three non-empty boxes in Table 1. We shall confine ourselves to purely network measures: that is, we ignore norms, procedures and other cultural aspects of social capital. We shall also want to ignore relational contents (e.g., friendship versus acquaintance), but will not be completely successful in this. In all cases we must be careful about the underlying social relation on which the measures are computed — which relation is appropriate will vary according to the setting. In general, however, it is assumed that we want to measure "neutral" or "positive" relations, such as *knows* or *likes* rather than "negative" relations such as *hates* or *is not speaking to*.

BOX B: EXTERNAL MEASURES FOR INDIVIDUAL ACTORS

The first set of measures, closest to the verbal description of social capital, consists of the standard ego-network measures that are well known in the network literature (see Table 2). Note that in the table uses "ego" to mean the person whose social capital we are measuring, and "alter" to mean the persons that the ego is directly connected to. The column labeled "relation to social capital" gives the conventional wisdom on how the network variable is related to social capital. The last two rows present measures that require additional data on the alters beyond who is connected to whom.

Table 2. Standard Ego-Network Measures for "Box B Social Capital"

Name:	Description:	Relation to Social Capital:
Size / degree (Burt, 1983)	The number of alters that an ego is directly connected to, possibly weighted by strength of tie.	Positive. The more people you have relationships with, the greater the chance that one of them has the resource you need.
Density (Burt, 1983)	The proportion of pairs of alters that are connected.	Negative. If all your alters are tied to each other, they are redundant. Given limits on relational energy, need to put eggs in more than one basket.
Heterogeneity* (Burt, 1983)	The variety of alters with respect to relevant dimensions (e.g., sex, age, race, occupation, talents).	Positive (except when it conflicts with compositional quality)
Compositional Quality*	The number of alters with high levels of needed characteristics (e.g., total wealth or power or expertise or generosity of alters)	Positive. The more connected to useful others, the more social capital.

*Requires attribute data on all nodes in addition to relational data.

The next set of measures are the structural hole measures proposed by Burt (1992). He proposes two basic measures – *effective size* and *constraint* – along with variants of each. Table 3 shows only the basic categories.

Table 3. Structural Hole Measures for "Box B Social Capital"

Name:	Description:	Relation to Social Capital:
Effective Size (Burt 1992)	The number of alters, weighted by strength of tie, that an ego is directly connected to, minus a "redundancy" factor.	Positive. The more different regions of the network an actor has ties with, the greater the potential information and control benefits.
Constraint (Burt 1992)	The extent to which all of ego's relational investments directly or indirectly involve a single alter	Negative. The more constrained the actor, the fewer opportunities for action.

The third set of obvious measures includes all the standard centrality measures. These differ from the ego-network measures in that they require that the entire network be measured in order to be computed. Thus, they are richer measures of a node's position in the network, but require much more complicated data as input. Table 4 presents just a few of the more well-known measures (new ones are developed every year).

Table 4. Standard Centrality Measures for "Box B" Social Capital

Name:	Description:	Relation to Social Capital:
Closeness [un-normalized] (Freeman 1979)	The total graph theoretic distance from ego to all others in network. An inverse measure of centrality: large values indicate less centrality.	Negative. The greater the distance to other nodes, the less the chance of receiving information in a timely way.
Betweenness (Freeman 1979)	The number of times that ego falls along the shortest path between two other actors.	Positive. Actors with high betweenness link together actors who are otherwise unconnected, creating opportunities for exploitation of information & control benefits.
Eigenvector (Bonacich 1972)	The extent to which ego is connected to nodes who are themselves high in eigenvector centrality.	Positive. An actor has high eigenvector scores when they are connected to well-connected others.

Note that closeness is described as negatively related to social capital. This is only because — absent normalization — closeness is an inverse measure of centrality: larger values indicate greater social distance and therefore lower centrality.

BOX C: INTERNAL MEASURES FOR COLLECTIVE ACTORS

This is the version of social capital implicit in the writings of Putnam, Bourdieu and others. Ignoring cultural and cognitive aspects of this conception, we have the measures shown in Table 5. They are all standard measures of network cohesion.

Table 5. Standard Cohesion Measures for "Box C" Social Capital

Name:	Description:	Relation to Social Capital:
Density (Harary 1969)	The proportion of group members who are tied (with a "positive" relation, such as friendship, respect, acquaintance, past collaboration, etc.).	Positive; Curvilinear for intellectual conflict relations; Negative for personal conflict relations
Average or maximum Distance (Harary 1969)	The average (or maximum) graph-theoretic distance between all pairs of members	Negative. Smaller distances mean faster communication among members, which is an asset ⁵
Centralization/Core-Periphery Structure (Freeman 1979; Borgatti & Everett 1996)	The extent to which the network is NOT divided into cliques that have few connections <u>between</u> groups	Positive. Controlling for density, core-periphery structures are easier to coordinate than fractionated networks
Homophily* (Marsden 1988)	The extent to which members of the group have their closest ties to members who are similar to themselves	Negative. Less homophily should mean greater exposure to a wider range of ideas. But homophily may also improve communication, possibly resulting in a curvilinear relationship.

*Requires attribute data on all nodes in addition to relational data.

Note that the measures in Table 5 duplicate many of the measures in Table 2, although they are applied differently. One measure that is missing is *size*. Although crude, this would not be a bad measure to include. One reason the United States does well in the Olympics is probably that in such a large country, there are bound to be a few individuals who are exceptionally gifted in ways that can be molded into champions of some Olympic sports. In many team settings, however, the relationship of size to performance is probably curvilinear, as greater numbers create coordination problems.

Another measure that is missing is *compositional quality*. Translated to the within-group context, this would refer to measures like the number of group members with certain qualities, such as high intelligence. But most researchers would probably prefer to think of such measures as an aggregate form of human capital, hence we leave it off the list.

BOX D: EXTERNAL MEASURES FOR COLLECTIVE ACTORS

There are really two kinds of external measures for collective actors. One type is about the relationships that the group -- as an entity separate from its constituent members -- has with other entities. For example organizations are legal entities that have relationships with other

⁵Of course, shorter distances in a *has sex with* network implies more rapid transmission of sexually transmitted diseases, which is not, generally speaking, an asset.

organizations (e.g., sells to, has joint venture with, etc.). In this case, the group is seen as a single entity, and the relations this entity has with others are its own, not some aggregating of the relationships of its members. The fact that the group is made up of separable individuals is immaterial, and so this situation is identical to that of "Box B" social capital: no further development is needed.

The other type of external group social capital occurs when all the relations being studied belong to individuals, but we are interested in the position of a group of individuals in this network of individuals. For example, in the case of teams within an organization, we might look at the assets that a given team has with respect to the friendship network of the organization. In other words, by virtue of the relationships of its members, who can the team call on for help?

Table 6. Group Centrality Measures for "Box D" Social Capital

Name:	Description:	Relation to Social Capital:
Group Degree (Everett & Borgatti, 1999)	Number of outsiders tied to at least one group member.	Positive. As noted by Ancona (1990), members' positive relationships with the rest of the network are an asset to the team.
Group Closeness [unnormalized] (Everett & Borgatti, 1999)	Total distance of the group to all non-members. Distance from group to outsider usually defined as minimum distance from outsider to any insider.	Negative. The greater the distance to outsiders, the less timely information available to the team.
Group Betweenness (Everett & Borgatti, 1999)	The number of times that the shortest path between any two outsiders passes through a group member.	Positive. Teams scoring high on group betweenness have few redundant ties with outsiders, generating exploitable structural holes.

Measures appropriate for capturing this kind of social capital have appeared in the social network literature as measures of *group centrality*. Table 6 summarizes some of these measures.

Table 7. 2-Mode Centrality Measures for "Box D" Social Capital

Name:	Description:	Relation to Social Capital:
2-mode Closeness [un-normalized] (Faust 1997; Borgatti & Everett 1997)	Total distance of the group to all other groups and non-member individuals.	Negative. The greater the distance to outside entities, the less timely information available to the team.
2-mode Betweenness (Faust 1997; Borgatti & Everett 1997)	The number of times that the shortest path between any two entities (groups or individuals) passes through the group.	Positive. Teams scoring high on 2-mode betweenness have members who belong to groups that share few members. This lack of redundancy generates exploitable structural holes.

Name:	Description:	Relation to Social Capital:
2-mode Eigenvector (Bonacich 1991; Faust 1997; Borgatti & Everett 1997)	A group is central to the extent it is has many members who belong to groups who have many members who ... (recursive definition)	Positive. Groups high on this measure are well-connected in terms of working together in multiple settings.

Another set of measures that can serve, in some cases, as measures of "Box D" social capital are the measures proposed for 2-mode networks (Bonacich 1991; Faust 1997; Borgatti and Everett 1997). In these measures, neither relations among groups nor among individuals are directly available: there is only the relation of membership of individuals in groups. If individuals may be members of several groups simultaneously, and if the ties that a group's members have with other groups are useful, then these measures can also act as measures of social capital. These are summarized in Table 7.

CONCLUSION

In order to find measures of the structural aspects of social capital, we have had to grapple with the apparent diversity of usages of the term. One important source of variation, as Wellman and Bartram have pointed out, is the unit of analysis — individual or group. Differences in level of analysis have masked another difference: an outward focus versus an inward focus. This second dimension has remained hidden because researchers focusing on individuals have (naturally) looked to ties outside the individual, while researchers focusing on groups have (by coincidence) been concerned only with all-encompassing groups and therefore looked only at ties within the group. But when we try to measure the social capital of groups embedded within larger structures, such as teams in organizations, we immediately recognize the possibility of looking at either ties within the group, or ties to outsiders.

Cross-classifying interest in social capital by these two dimensions yields a four-fold table in which one cell (internal measures for individual actors) is ignored. This leaves a need for three basic kinds of social capital measures: external measures for individuals ("Box B"), internal measures for groups ("Box C"), and external measures for groups ("Box D"). Looking in the standard network analytic toolkit, we find several measures available "off-the-shelf" for each kind of social capital.

REFERENCES

- Ancona, D. 1990. "Outward bound: Strategies for team survival in the organization." *Academy of Management Journal* 33: 334-365.
- Bonacich, P. 1972. "Factoring and weighting approaches to status scores and clique identification." *Journal of Mathematical Sociology* 2: 113-120.
- Bonacich, P. 1991. "Simultaneous group and individual centralities." *Social Networks* 13: 155-168.
- Borgatti, S.P. 1998. "SOCNET discussion of the origins of social capital." *Connections* 21(2)

- Borgatti, S.P. and M.G. Everett. 1996. "Models of core/periphery structures." Paper presented at the *Sunbelt International Social Networks Conference* in Charleston, SC. February, 1996.
- Borgatti, S.P. and M.G. Everett. 1997. "Network analysis of 2-mode data." *Social Networks* 19(3): 243-270.
- Bourdieu, P. 1986. "The forms of social capital." Pp. 241-258 in J.G. Richardson (ed.) *Handbook of theory and research for the sociology of education*. New York: Greenwood Press.
- Brass, D. 1992. "Power in organizations: A social network perspective." In G. Moore and J.A. White (Eds.) *Research in politics and society*. Pp. 295-323. Greenwich: JAI Press.
- Burt, R.S. 1983. "Range." Pp. 176-194 in R.S. Burt and M.J. Minor (Eds.) *Applied Network Analysis*. Beverly Hills: Sage Publications.
- Burt, R.S. 1992. *Structural holes*. Cambridge: Cambridge University Press.
- Burt, R.S. 1998. "The network structure of social capital." Paper given at *Social Networks and Social Capital* conference at Duke University. Manuscript available on the internet at <http://gsbwww.uchicago.edu/fac/ronald.burt/research>.
- Cassel, J. 1974. "Psychosocial processes and stress: Theoretical formulations." *International Journal of Health Services* 4: 471-482.
- Cohen, W.M. and Levinthal, D.A. 1990. "Absorbptive capacity: A new perspective on learning and innovation." *Administrative Science Quarterly* 35: 128-152.
- Coleman, J.S. 1988. "Social capital in the creation of human capital." *American Journal of Sociology* 94: 95-121.
- Coleman, J.S. 1990. *Foundations of Social Theory*. Cambridge: Harvard University Press.
- DiMaggio, P. 1992. "Nadel's paradox revisited: Relational and cultural aspects of organizational structure." Pp. 118-142 in N. Nohria and R. Eccles (Eds.) *Networks and organizations: Structure, form and action*. Boston: Harvard Business School Press.
- Everett, M.G. and S.P. Borgatti. 1999. "The centrality of cliques and classes." *Mathematical Sociology*. Forthcoming.
- Faust, K. 1997. "Centrality in affiliation networks." *Social Networks* 19:157-191.
- Freeman, L.C. 1979. "Centrality in social networks: I. Conceptual clarification." *Social Networks* 1: 215-239.
- Fukuyama, F. 1995. *Trust: The social virtues and the creation of prosperity*. New York: Free Press.
- Gulati, R. 1999. "Network location and learning: The influence of network resources and firm capabilities on alliance formation." *Strategic Management Journal*. Forthcoming.
- Hanifan, L.J. 1920. *The community center*. Boston: Silver, Burdette & Co.
- Harary, F. 1969. *Graph theory*. New York: Addison-Wesley.
- Jacobs, J. 1961. *The death and life of great American cities*.

- Jones, C., W.S. Hesterly, B. Lichtenstein, and S.P. Borgatti. 1996. "Intangible assets of teams: How human, social and team capital influence project performance." Paper presented at the *Sunbelt International Social Networks Conference, San Diego 2/96*.
- Loury, G. 1987. "Why should we care about group inequality?" *Social Philosophy and Policy*. 5: 249-271.
- Lin, N. 1986. "Conceptualizing social support." In N. Lin, A. Dean, and W. Ensel (Eds.) *Social support, life events and depression*. New York: Academic Press.
- Marsden, P.V. 1988. "Homogeneity in confiding relations." *Social Networks* 10: 57-76.
- Putnam, R. 1995. "Bowling alone: America's declining social capital." *Journal of Democracy* 6(1):65-78.
- Wellman, B. 1988. "Structural analysis: From metaphor to theory and substance." Pp. 19-61 in B. Wellman and S.D. Berkowitz (Eds.) *Social structures: A network approach*. New York: Cambridge University Press.

A SOCNET Discussion on the Origins of the Term *Social Capital*¹

Edited by **Stephen P. Borgatti**
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INTRODUCTION

On January 7th, 1997, Michael Lichter posted a message to the SOCNET listserv asking about the origins of the term *social capital*. This was not the first time social capital had been discussed in that forum, but this particular topic sparked special interest. Although social capital in general continues to be discussed on SOCNET, the discussion about the origins of the term ended on June 11th, 1997. People interested in discussing the topic further should note that a listserv has been set up for that purpose: contact Karl van Meter (bms@ext.jussieu.fr) for information.

I have edited the series of messages for spelling, punctuation and grammar, and have printed them here in chronological order of reception. To conserve space, I have removed signatures and personal comments.

From: Social Network Researchers on behalf of Michael I. Lichter
Sent: Tuesday, January 07, 1997 10:10 PM
To: Multiple recipients of list SOCNET
Subject: Genesis of Social Capital

Would anybody venture to guess when the term "social capital" was first used, where, and by whom? Bourdieu was the first person I know of to use it, but the earliest reference I have is *DISTINCTION*, in 1984, and I would guess he had been using the term for at least a decade by then.

How do people on this list feel about "social capital"? I've noticed that most of the scholars using the term are not, per se, social network researchers.

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From: Social Network Researchers on behalf of David M Krackhardt
Sent: Wednesday, January 08, 1997 12:31 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

Michael, I anticipate it will become standard terminology in the social network community. It has had some heavy hitters behind it, most notably Jim Coleman and Ron Burt. And, it is such a catchy phrase -- it might even replace "weak ties" as the favorite term in the field.

From: Social Network Researchers on behalf of Bill Stevenson
Sent: Wednesday, January 08, 1997 1:16 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

David, I agree completely that social capital is a new buzzword in social networks as well as other fields such as Organizational Behavior. But why is it so catchy? On the one hand, I think it is because we non-economists can sound like economists and can be serious bottom-line type researchers. Thus, we no longer have neighbors, friends, or sympathetic colleagues, we have social capital. On the other hand, social capital contains an implicit critique of the type of economic thinking which does not move beyond the assumption that the social world works solely on the principle that "greed is good" and the accumulation of capital as monetary wealth. This critique falters however when theorists start talking about investments in social capital and strategies for individuals to follow to manipulate their social networks to increase social capital.

From: Social Network Researchers on behalf of Scott L. Engle
Sent: Wednesday, January 08, 1997 5:51 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

Michael, in Chapter 12, entitled "Social Capital," of Foundations of Social Theory, James Coleman credited G. Loury with originating the term. The cite is:

Loury, G. 1977. A dynamic theory of racial income differences. Chapter 8 of Women, minorities, and employment discrimination, ed. P.A. Wallace and A. le Mund. Lexington, Mass: Lexington Books

Coleman also cited Bourdieu (1980) and Flap and de Graff (1986) as early users of the term. Based on Coleman's description, Loury's construct is very similar to the way "social capital" has been used by Burt and others; i.e., a set of useful resources that are vested in relations and in social organization.

I weigh in with those who find it a useful term in describing the value of specific relations and the value in the structure of those relations. I've found that it helps my students and others grasp much of what we network-types are about, esp. when set against financial and human capital, a la Burt. I suspect our challenge

will be in keeping the term useful and at least reasonably specific -- so most of us can agree on wwhat we mean when we use it. I'm reminded of what Nitin Nohria had to say about the loss of the term "culture."

From: Social Network Researchers on behalf of Lewis A. Friedland
Sent: Wednesday, January 08, 1997 11:23 PM
To: Multiple recipients of list SOCNET
Subject: social capital

The term social capital was first used by Jane Jacobs in *The Death and Life of Great American Cities* in 1961 in reference to networks in urban neighborhoods: "These networks are a city's irreplaceable social capital. Whenever the capital is lost, from whatever cause, the income from it disappears, never to return until and unless new capital is slowly and chancily accumulated" (p. 138).

It was picked up by Glenn Loury in 1977 and James Coleman in 1986. I have written several papers that include reviews of the concept with discussions of social capital in relation to Laumann and Fischer if anyone is interested.

From: Social Network Researchers on behalf of Barry Wellman
Sent: Wednesday, January 08, 1997 1:52 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

Michael, in one of his many essays pertaining to social capital, Robert Putnam (Harvard, Kennedy School) gives his account of origins. I forget the specifics -- and which article -- but I am pretty sure it was unBourdieu. I'm sorry, you'll have to search for it yourself.

I agree that many social capital folks don't talk network, and vice-versa The 'cepts are complimentary. Two network folks who did use the term are (a) James Coleman & (b) myself & Scot Wortley in our "Different Folks from Different Folks" (AJS, 1990). We cite the Coleman usage there.

When you've finished your research on this, I'd appreciate a final summary. I think Bob Putnam would also.

From: Social Network Researchers on behalf of JD Eveland
Sent: Wednesday, January 08, 1997 10:00 AM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

As someone noted earlier, a lot of the dialogue in this area originated in economics, particularly the "human capital theory" of Gary Becker. It's worth looking back at his work to see how memes change as they migrate from field to field...

From: Social Network Researchers on behalf of Holly Arrow
Sent: Wednesday, January 08, 1997 3:23 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

On Wed, 8 Jan 1997, Bill Stevenson wrote: "This critique falters however when theorists start talking about investments in social capital and strategies for individuals to follow to manipulate their social networks to increase social capital. "

Well, any metaphor highlights some things and obscures other. Machiavellian behavior is very nicely analyzed by just this notion -- people treating social ties in a self-interested, "maximizing" sort of way. But we can apply other notions that have emerged from the critique of rational actor, optimization models. Some people take a satisficing approach to social capital.

Extending the model to classic economic paradigms like prisoner's dilemma and resource depletion: People are faced with social capital dilemmas in which short-term losses (costs of developing relationships) translate into long-term gains. The emergence of cooperation can be explained by a richer model if we include both economic goods and social "goods" as outcomes. And so on.

From: Social Network Researchers on behalf of Ronald L. Breiger
Sent: Friday, January 10, 1997 2:10 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

A 1972 source for "social capital" is: Pierre Bourdieu, "Esquisse d'une the'orie de la pratique. Pre'ce'de'e de trois e'tudes d'ethnologie kabyle." Geneve: Droz, pp. 227-243.

As Loic Wacquant notes on p. 119 (n. 73) of Bourdieu and Wacquant, "An Invitation to Reflexive Sociology" (Univ. of Chicago Press, 1992), Bourdieu's whole work may be read as a hunt for the varied forms and effects of capital. As to a definition, Bourdieu (ibid., 1992, p. 119) states that "social capital is the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition."

From: Social Network Researchers on behalf of Xavier de Souza Briggs
Sent: Friday, January 10, 1997 4:32 PM
To: Multiple recipients of list SOCNET
Subject: Re: Genesis of Social Capital

Ulf Hannerz, the Swedish anthropologist who studied poor urban neighborhoods, also used the term. By social capital, he referred to the resources reflected in favors that friends and acquaintances did for one another as part of coping with poverty.

Hannerz, Ulf. 1969. *Soulside: Inquiries into ghetto, culture and community*. New York: Columbia.

So, so far I trace:

jacobs (1961) > hannerz (1969) > loury (1977) > coleman (1986) > bourdieu (1992?) > putnam (1993)

As someone who thinks mainly about urban inequality, I propose that we care about 2 types of social capital when discussing individuals and opportunity in particular:

- (a) *Support Capital* - a la Carol Stack's (1974) "all our kin," which helps people cope with problems posed by their circumstances ("get by"). this type is very often provided by socially similar others; and
- (b) *leverage Capital* - a la Granovetter's (1974) "getting a job" or Burt (various), which helps people change their life chances or create and take advantage of opportunities ("get ahead"). This type calls for having diverse ties, whether weak or strong.

Jeremy Boissevain, social anthropologist, didn't use the term, but his "friends of friends" book (1974) is the most engaging and detailed account of how people think about, secure, and make use of the leverage type of social capital. Irony is that he used Sicily, which came up short on social capital by Putnam's use of the term, to show how important social capital is for individual, as opposed to societal problems, and how one acquires it. this, I would suggest, underlines the importance of clarifying what one takes "social capital" to mean, and what one considers an indicator of some particular type of social capital, in a given context.

From: Social Network Researchers on behalf of Sam Leven
 Sent: Friday, January 10, 1997 4:50 PM
 To: Multiple recipients of list SOcNET
 Subject: Re: Social Capital

See the new book by Athol Fitzgibbon, "Adam Smith's System". The old SOB understood that community, interaction, and trust underlie effective economic action.

From: Social Network Researchers on behalf of John Boyd
 Sent: Friday, January 10, 1997 9:28 PM
 To: Multiple recipients of list SOcNET
 Subject: Genesis of Social Capital

When this fad passes, it is at least clear what the next one will be: the "Exodus of Social Capital"--this has at least One of the same "heavy hitters" behind it.

From: Social Network Researchers on behalf of Barry Wellman
 Sent: Friday, January 10, 1997 5:52 PM
 To: Multiple recipients of list SOcNET
 Subject: Re: Genesis of Social Capital

Thanks Xav for your info & time line. [However, my research shows that it goes back to Jane Austen's Miss Dashwood in *Sense and Sensibility* who when asked about her trip to London, said "Well, it was quite a social capital." ;-) In fact, all of Jane's books are about getting and spending social capital.

Two somewhat more serious comments:

1. Your use of the symbol ">" in the timeline suggests actual linkage. While I am comfortable that Hannerz read Jane Jacobs, I wonder if some of the others cited actually read/used their immediate predecessor.
2. You cad, you left me & Scot Wortley out. I refer you to "Different Strokes from Different Folks," *American Journal of Sociology*, March 1990, p. 561:

"Community ties with friends and relatives provide social support that transcends narrow reciprocity. They make up much of the SOCIAL CAPITAL people use to deal with daily life, seize opportunities, and reduce uncertainties (Kadushin 1981). They underpin the informal arrangements crucial for a household's survival, expansion, and reproduction (Pahl 1984). Hence, they are both a product and a cause of role relationships."

The cites are to:

- Charles Kadushin. 1981. "Notes on expectations of Reward in N-Person Networks." pp. 235-54 in Blau & Merton, *Continuities in Structural Inquiry*;
- Ray Pahl, *Divisions of Labour*.

I regret that I don't have these worthy tomes handy to check what they actually said.

As a player in this, I know I read Jane Jacobs (my current Toronto neighbor) within a year of her book coming out, but I had sure forgotten her use of the "sc" term. Same for Hannerz (not my neighbor.) I think I discovered Coleman after I wrote my piece, because I don't cite him here but I do cite him on "sc" in a later piece (I recall). I confess to having never heard of Loury, to having heard of but not having read much of Bourdieu (especially in the original Provencal), and to reading Putnam (but as his 1993 date tells you, only after I wrote my stuff). On the other hand, it is extremely possible I lifted the term from somewhere besides Charles K, while reading or talking with someone.

All this, Xav et al, is to be careful of ">" implications if they mean "lead to" or "took from".

And to start a somewhat different thread, in talking yesterday with grad student Sherry Bartram here, we worked out two different uses of "social capital." One, as I, Jim Coleman & some others have used it is to talk about the resources that individuals have. "He is amassing lots of sc." But Bob Putnam is interested in whether social systems have lots of sc floating around in them (so they'll be more civically active in a de Tocquevillian sense, etc.) It's a different level of analysis.

From: Social Network Researchers on behalf of Robert D. Putnam
 Sent: Sunday, January 12, 1997 10:46 PM
 To: Multiple recipients of list SOCNET
 Subject: Re: Genesis of Social Capital

As an interested lurker on SocNet, I've much enjoyed the series of posts about the origins of the term "social capital." In the spirit of bibliographic completeness, I add another early use of the term, brought to my attention by the author himself in discussion after a talk last spring in which I had offered the usual attributions to Jacobs, Loury, Bourdieu, and Coleman that have been cited in earlier contributions to this thread. (My own guess is that the term was probably independently invented by a number of different scholars in different fields, each quite unaware of the others; given that, it is striking that there is a family resemblance among all the individual coinages.)

In an essay entitled "Cognitive Dissonance in Economics," published in *Normengeleitetes Verhalten in den Sozialwissenschaften* (Berlin: Duncker und Humblot, 1984), 61-81 (citation at p. 62), Ekkehart Schlicht [a professor of economics at Ludwig Maximilians Universitaet in Munich] wrote:

"It is obviously very important for the efficiency of any economic system that people obey the rules even if unobserved since this saves control costs, and their desire to appear to themselves as law-abiding citizens is a very important economic asset and can be considered as a kind of *social capital*--one might speak of 'moral capital' just in the same sense as v. Weizsacker speaks of the "organizational capital" of a society as embodying the value of the organizational structures present within an economy."

In a personal communication to me (intended to clarify his own claim to have coined the term), Schlicht attributes his inspiration to the German economist von Weizsacker and earlier to Alfred Marshall's idea of "organization as an agent of production." Schlicht was apparently ignorant of the Jacobs and Bourdieu usages and believes that Loury and Coleman got their inspiration from him, via a seminar at the Institute for Advanced Study at Princeton. In intellectual pursuits, as in warfare, success (or purported success) has many fathers and mothers.

To follow up the related thread that Barry Wellman started, it is worth noting that Schlicht's use of the term, like those of Coleman and Jacobs (and derivatively, me), emphasizes the collective-good facet of social capital--I can benefit from broader social networks and the associated norms of reciprocity and trust, even when I did not help produce and do not own those assets. By contrast, Loury, Burt, Briggs, and Portes (among many others) emphasize the private-good facet--how *my* connections can help me. I think that Bourdieu belongs more in this second category, but I'm not certain. Barry Wellman puts Jim Coleman in the second, private-good category, but Jim's discussion of "The Public Good Aspect of Social Capital" at pp. 315-318 of *Foundations*, as well as his canonical example of child safety in Jerusalem, suggests the opposite. My own view is that those two usages are complementary, not competitive, but others on this list, more expert than I in sociology and network analysis, may have a different view.

On the other hand, I agree with Scott Engle about the dangers of too sloppy a delimitation of the term, especially since it is now increasing used by practitioners in several different social sciences. Since this concept is useful (if it is) primarily as a framework for discussing adjacencies among different

disciplines--broadly speaking, the implications of social networks for economics, politics, public health, and so on--it will be interesting to see whether the term and the incipient subfield it signals can survive the tensions inevitably associated with interdisciplinary discourse, or whether sociologists will feel that non-sociologists have misappropriated the term. In my view, much theoretical rigor would be gained if some more systematic network analysis could be integrated into the current discussions of social capital, but that will depend in large part on the work of subscribers to this list.

Thanks for letting an outsider borrow your soapbox (and your concept) for a moment.

From: Social Network Researchers on behalf of Robert D. Putnam
Sent: Friday, May 30, 1997 12:56 PM
To: Multiple recipients of list SOCNET
Subject: Re: social capital

I've been replying separately to these individual requests, since I happened to keep a set of the earlier correspondence. To save myself further time, I'm reposting all the messages to socnet, along with a related, but shorter exchange between myself and my colleague Xavier de Souza Briggs.

I should add that out of idle curiosity I've been collecting a file of claimed origins, some apparently true, others apparently false. (Under the latter heading, for example, it seems that John Bates Clark, noted 19th century American economist, borrowed the term from the Austrian economist von Bohn-Bawerk, but used it not at all in the current sense, but in the sense of collectively employed physical capital.) Quite aside from such false "origins," however, I'd guess from my cursory investigations that this term in approximately its current sense has been "invented" independently at least several times over the last three decades.

If anyone has any further insights, I'd be glad to hear from you.

From: Social Network Researchers on behalf of Michael I. Lichter
Sent: Thursday, June 05, 1997 12:15 AM
To: Multiple recipients of list SOCNET
Subject: Origins of "social capital"

If I'm not mistaken, Bob Putnam said last week that he was going to send the list a compendium of responses to the question posed a while back about the origins of the term "social capital". Since I haven't seen anything since, I figured I'd post the version I sent to a colleague a while back. By the way, a couple of people asked me at the time to send them a summary of what I found, but since I didn't do any research outside of the list there wasn't anything new to report.

Below is the query I sent to the list and a selection of the messages that were sent in reply. [Omitted -- ed.] My summary is that Jane Jacobs' 1961 reference to "social capital" is the earliest anybody remembers seeing. Ulf Hannerz in 1969 used the term in a way more consistent with contemporary usage, and Bourdieu apparently first used it in 1972. A few others also used it in the early 1970s, well before Coleman came on the scene.

It was commented that Jane Austen, Adam Smith, and Niccolo Machiavelli all well understood that social ties are important in generating other kinds of "capital". I think the mention of Austen is particularly interesting; the creation, maintenance and use of "social capital" is clearest (and possibly the most clearly instrumental) among the nobility (at least Bourdieu thinks so). On the other hand, it seems to me that the nobility also illustrate some of the problems of the concept, in that their uses of social capital are often more political than economic, per se. Another aside: while most Americans seem to think of social capital as being bound up in ties between people who know each other, Bourdieu sees titles of nobility as being forms of concentrated social capital. In this view, it is to some extent true that the larger number of people who know you while you do not know them, the larger your stock of social capital. (In the U.S., it would be celebrity rather than nobility.)

See especially the Briggs, Wellman (second), and Putnam messages.

From: Social Network Researchers on behalf of Xavier_Briggs/FS/KSG@ksg.harvard.edu
 Sent: Thursday, June 05, 1997 7:09 PM
 To: Multiple recipients of list SOCNET
 Subject: Your note - Origins of "social capital"

Michael – Many thanks for posting your compendium of our social capital exchange (sic) from a few months back. my own feeble attempt created something colorful but untidy.

Your thoughts on "nobility" and "celebrity" fit well, it seems to me, with Coleman's (1990) broadest treatment of "social capital" in foundations ... "those features of social structure..." If we take things like status and even group membership itself to be facets of social structure, then it makes sense that your celebrity as, say, a moonlighting rock star - when you're not sociologizing? - would be a resource because of what people you don't even know might do for you, also that my wife continually finds that other African-Americans riding the subway here in boston go out of their way to nod or acknowledge her - a fellow group member (black), though a stranger, and someone whom the "nodder" in question would be just a little more likely to trust or aid if approached. (The ridership on her particular commute is overwhelmingly white Anglo-American.)

This can lead to some awfully broad usages of "social capital," surely, but many facets of day-to-day social exchange would remain obscured if we were only interested in concrete personal ties. One need not know someone to be "tied" to them.

I must make another pitch for Boissevain's "friends of friends," a book now out-of-print, which Charles Kadushin made me read in his course on social networks at CUNY some time back. The discussion on "being a broker" is absolutely enchanting sociology. Speaks to your points...and I need to look at Austen and the other ancestors of the term, I suppose...does anyone know if the classic (i.e., Greco-Roman) treatises on governance and politics included references to what we now term "social capital"? Or Hebrew or other ancient books?

(I've been inclined toward the ancient ever since exciting my students with the thought that "suburbs," places that people go precisely to get away from the noise and such of the city, are, even by a purists definition, at least 2,500 years old. Ancient Babylonian texts refer to such places.)

From: Social Network Researchers on behalf of Robert D. Putnam
Sent: Wednesday, June 11, 1997 2:25 PM
To: Multiple recipients of list SOCNET
Subject: "Social Capital"--another "origin"

I hope that this message makes it through to the net, since the concatenation of previous postings on this topic that I tried to post last week did not. (Thanks to Michael Lichter for picking up the ball.)

By chance, a sharp-eyed research assistant of mine, Brad Clarke, has just discovered an unexpectedly early usage of "social capital" in very much our contemporary sense. Indeed, the passage is startling prescient, including the now-familiar distinction between the public-good and private-good effects of social capital, as well as a discussion of the civic consequences of entertainment gatherings [bowling leagues?]. The following quotation appears in a book by L. J. Hanifan, *The Community Center* (Boston: Silver, Burdette and Co, 1920), pp. 78-9. [The "community center movement," within which Hanifan was writing, was a prominent part of the Progressive Era.]

"Social capital defined. In the use of the phrase 'social capital' no reference here is made to the usual acceptation of the term 'capital,' except in a figurative sense. We not refer to real estate or to personal property or to cash, but rather to that in life which tends to make those tangible substances count for most in the daily lives of people: namely good will, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit, -the rural community, whose logical center is in most cases the school. In community building, as in business organization, there must be an accumulation of capital before the constructive work can be done....

Now we may easily pass from the business corporation over to the social corporation, the community, and find many points of singularity. The individual is helpless socially, if left by himself. Even the association of the members of one's own family fails to satisfied that desire which every normal individual has of being with his fellows, of being a part of a larger group than the family. If he comes into contact with his neighbors, there will be an accumulation of social capital, which may immediately satisfy his social needs and which may bear a social potentiality sufficient for the substantial improvement of life in the whole community. The community as a whole will benefit by the cooperation of all its parts, while the individual will find in his associations the advantages of the help, the sympathy, and the fellowship of his neighbors. First, then, there must be an accumulation of community social capital. Such accumulation may be effected by means of public entertainments, picnics, and a variety of other community gatherings. When the people of a given community have become acquainted with one another and have formed a habit of coming together occasionally for entertainment, social intercourse, and personal enjoyment, then by skillful leadership this social capital may easily be directed towards the general improvement of the community well-being."

I propose that as far as credit for inventing the term, Hanifan's is the claim to beat. At the very least, this citation illustrates that we have here a classic case of multiple inventions of the same concept.

Pajek: A Program for Large Network Analysis

Vladimir Batagelj and Andrej Mrvar¹
University of Ljubljana

Large networks, having thousands of vertices and lines, can be found in many different areas, e.g: genealogies, flow graphs of programs, molecule, computer networks, transportation networks, social networks, intra/inter organisational networks ... Many standard network algorithms are very time and space consuming and therefore unsuitable for analysis of such networks. In the article we present some approaches to analysis and visualisation of large networks implemented in program Pajek. Some typical examples are also given.

INTRODUCTION

Pajek (Slovene word for Spider; the “j” is pronounced like an English “y”) is a program, for Windows (32 bit), for analysis of *large networks*. It is freely available, for noncommercial use, at its homepage:

<http://vlado.fmf.uni-lj.si/pub/networks/pajek/>

Large networks can be found in many different areas. Usually they are produced automatically, using computers, from different data sources that are already available in computer readable form. For example:

- large genealogies (genealogies having some 10.000 people [21]), e.g., Theoretical Computer Science Genealogy (1.882 persons [30]);
- networks derived from dictionaries and other texts (character mutation/insertion/deletion network on 52.652 English words [24]);
- transportation networks (American airlines with 332 airports [31]);
- large molecule (molecule having thousands of atoms, e.g. DNA [28]);
- communication networks: links among pages or servers on Internet, usage of Usenet [29], phone calls [20];
- flow graphs of programs [15];
- bibliographies, citation networks [9, 7], Erdős graph (network with 5.822 co-authors [18]),...

¹Contact the authors at vladimir.batagelj@uni-lj.si and andrej.mrvar@uni-lj.si.

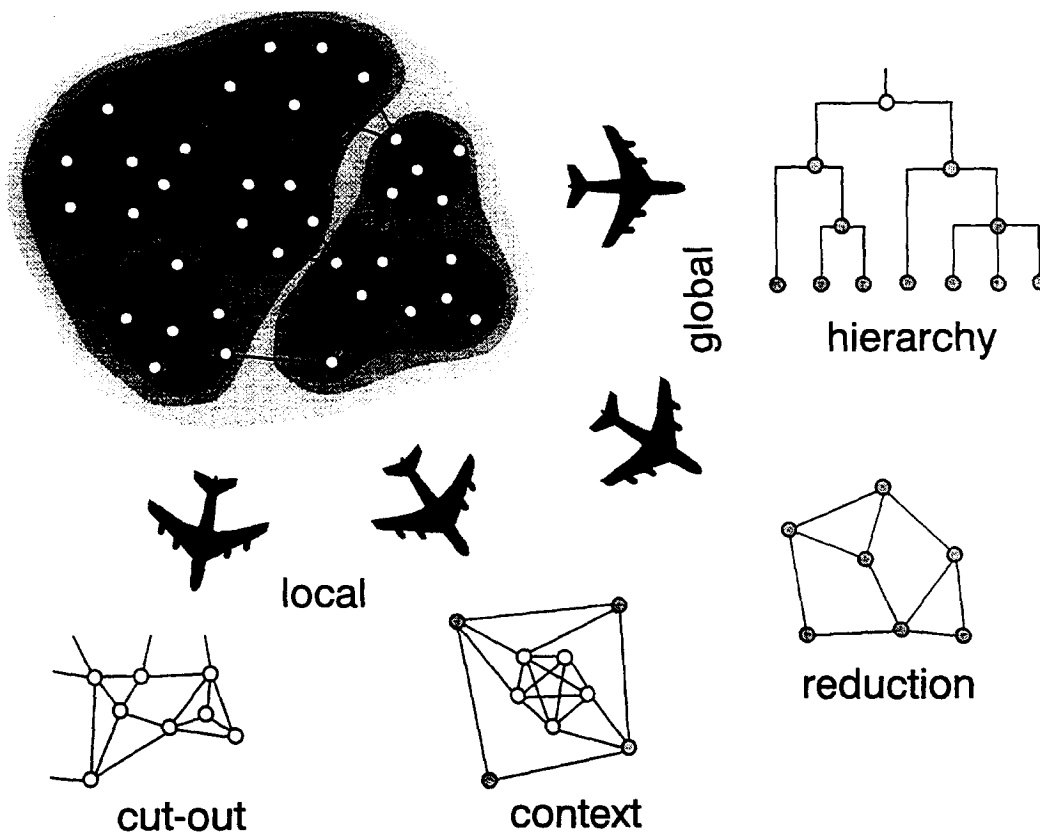


Figure 1. Goals.

Such networks cannot be treated efficiently using standard network analysis tools which are mostly based on matrix representation and are therefore limited to networks of moderate size.

The main goals in the design of **Pajek** are (see Figure 1):

- to support *abstraction* by (recursive) factorization of a large network into several smaller networks that can be treated further using more sophisticated methods;
- to provide the user with some powerful *visualisation* tools;
- to implement a selection of *efficient* algorithms for analysis of large networks.

One of the approaches to support abstraction is: *find* clusters (components, neighbourhoods of 'central' vertices, cores,...) in a network, *extract* and *show* vertices that belong to the same clusters separately, possibly with the parts of the context (detailed local view), *shrink* vertices in clusters and show relations among clusters (global view).

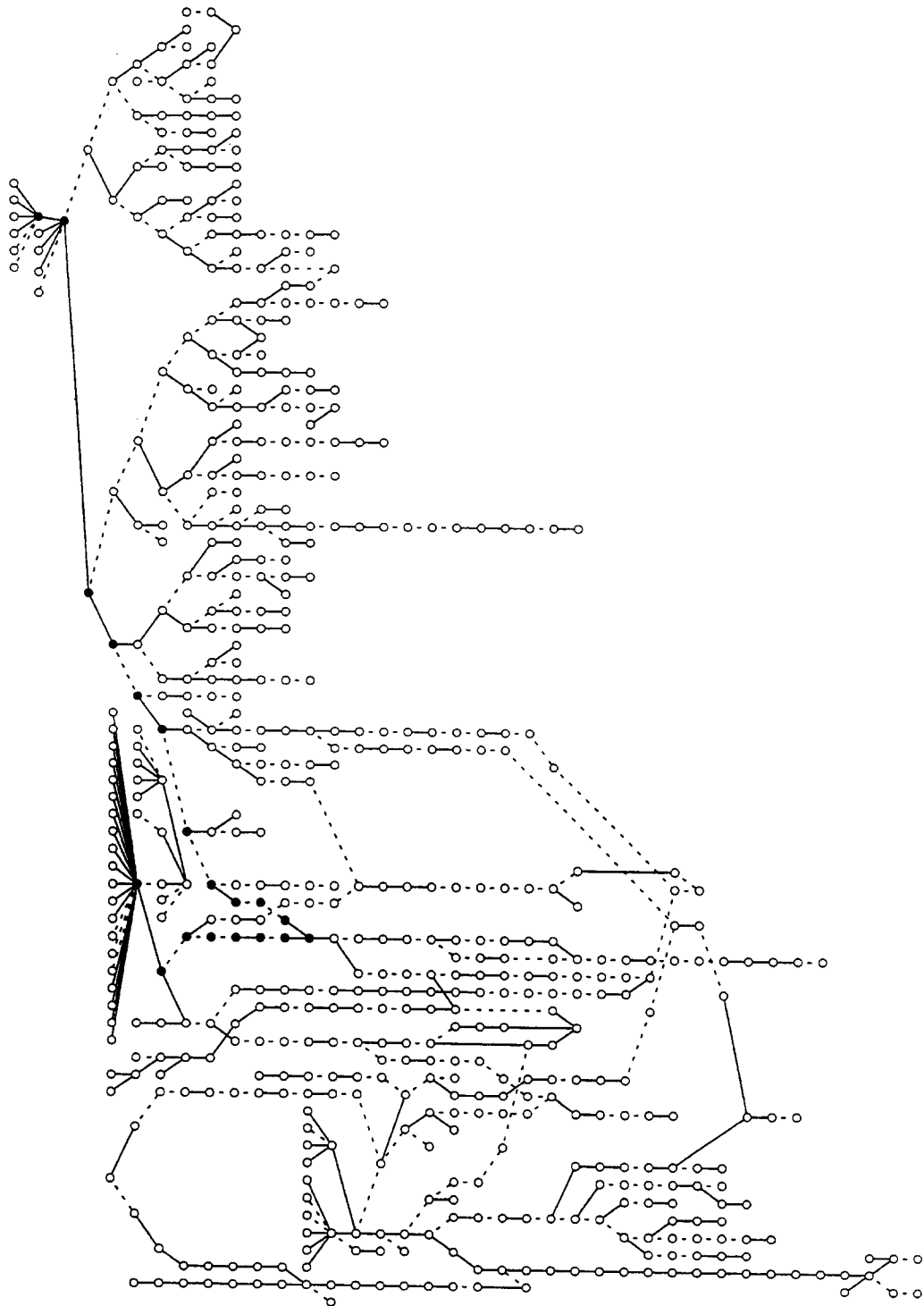


Figure 2. Genealogy of US presidents.

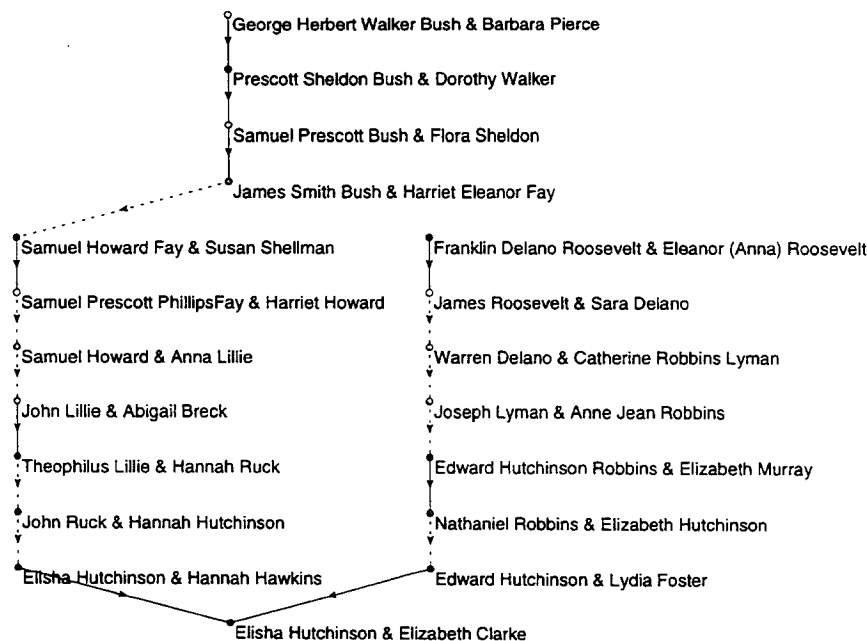


Figure 3: Shortest path between Franklin Delano Roosevelt and George Herbert Walker Bush in USA presidents genealogy.

EFFICIENT ALGORITHMS FOR LARGE NETWORKS

Time $T(n)$ and space $S(n)$ complexities of an algorithm are estimates of the time and memory space needed to run it on instances of size n (in our case - number of vertices or lines). In most large networks the number of lines m is of the same order as the number of vertices — $O(n)$ or at most $O(n \log n)$ (such networks are considered *sparse networks*). In the following we assume that we have to analyse large but sparse networks.

According to capabilities of nowadays computers, space complexity for storing sparse networks is not crucial any more. The problem can be solved using appropriate data structures for internal representation of data (doubly linked lists representation of networks is used in Pajek).

Table 1: Time complexities of algorithms (Pentium 64MB RAM 90mHz).

	$T(n)$	1.000	10.000	100.000	1.000.000
Shuffle	$O(n)$	0,00 s	0.015 s	0,17 s	2,22 s
Quick Sort	$O(n \log n)$	0,00 s	0,00 s	0,40 s	5,14 s
Heap Sort	$O(n \log n)$	0,00 s	0,06 s	0,98 s	14,35 s
Insertion Sort	$O(n^2)$	0,07 s	7,50 s	12,50 m	20,83 h
XY	$O(n^3)$	0,10 s	1,67 m	1,16 d	3,17 y

Key: s = seconds; m = minutes; h = hours; d = days; y = years.

Having much faster computers does not help a lot in the case of high order time complexities. In the theory problems solvable with algorithms of polynomial complexity are considered easy. But, in the case of large n , in practice already algorithms of time complexity of order $O(n^2)$ can be too slow (for the interactive use), what can be seen in Table 1.

Therefore, most of the algorithms implemented in Pajek have *subquadratic* time complexities: $O(n)$, $O(n \log n)$, $O(n\sqrt{n})$, or are restricted to small sets of selected vertices.

Pajek - shadow [0.00,1.00]
World Trade (Snyder and Kick, 1979) - cores

Sep- 5-1998

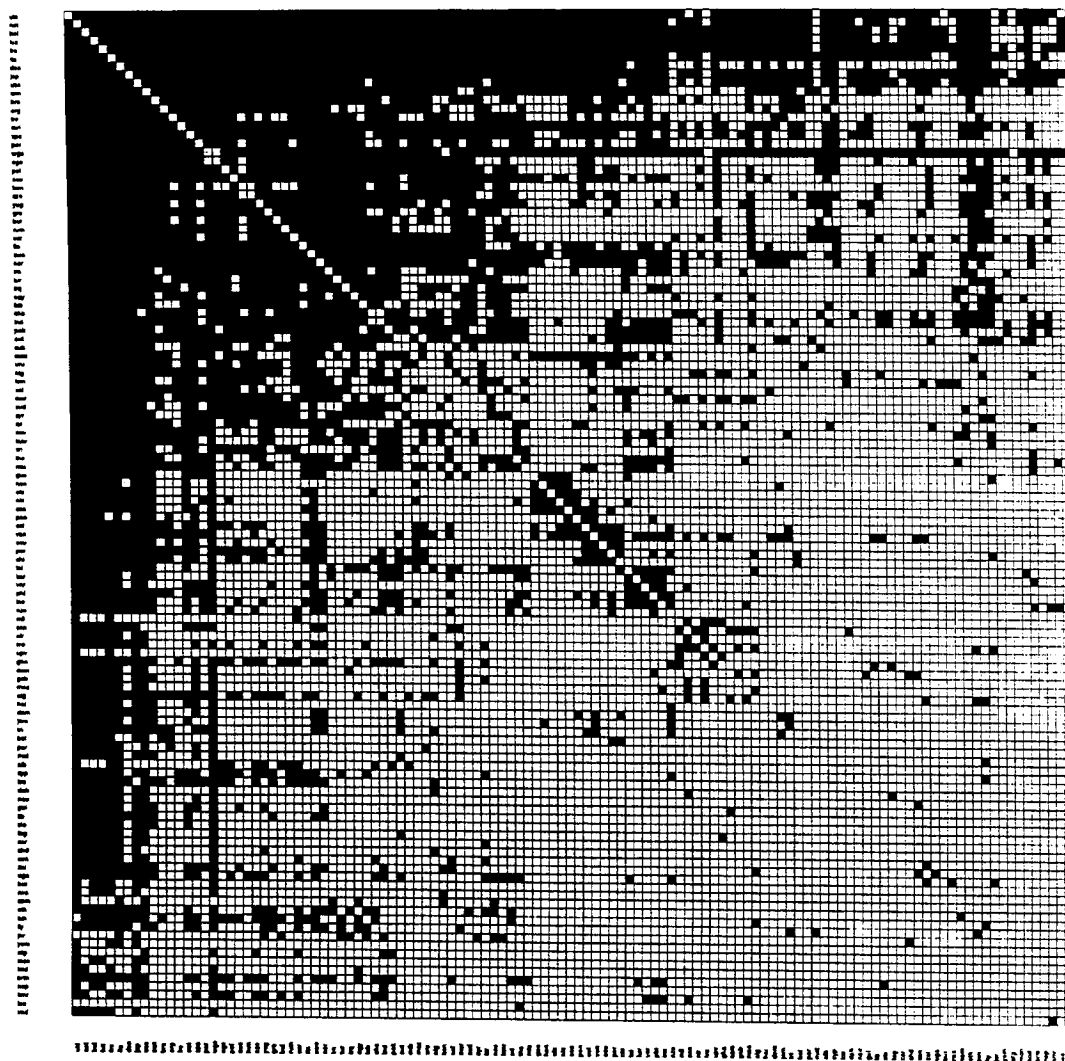


Figure 4. Reordered Snyder and Kick world trade matrix.

DATA STRUCTURES

Currently Pajek uses six data structures to implement the algorithms:

- network - main object (vertices and lines);
- permutation - reordering of vertices;
- vector - values of vertices;
- cluster - subset of vertices (e. g. one class from partition);
- partition - tells for each vertex to which cluster the vertex belongs;
- hierarchy - hierarchically ordered clusters and vertices.

The power of Pajek is based on several transformations which support different transitions among these data structures.

Besides its own input formats, Pajek supports several other formats: UCINET DL [33]; GED [19], genealogies can be read either as Ore-graph or p-graph [21, 16, 17]; and some molecular formats: BS (Ball and Stick), MAC (Mac Molecule) and MOL (MDL MOLfile).

ALGORITHMS

Using the above data structures the basic set of efficient algorithms was implemented [1, 24, 13, 14], for example:

- *partitions*: degree, depth, core, p-cliques, centers;
- *binary operations*: union, intersection, difference;
- *components*: strong, weak, biconnected, symmetric [1];
- *decompositions*: symmetric-acyclic;
- *paths*: shortest path(s), all paths between two vertices [11];
- *flows*: maximum flow between two vertices [14];
- *citation weights*: Paths Count Method and SPLC Method [2];
- *neighbourhood*: k-neighbours;
- *CPM* (Critical Path Method);
- *extracting subnetwork*;

- *shrinking* clusters in network (generalized blockmodeling) [4];
- *reordering*: topological ordering, Richards's numbering, depth/breadth first search;
- *reduction*: hierarchy, subdivision, degree;
- *simplifications and transformations*: deleting loops, multiple lines, transforming arcs to edges ...

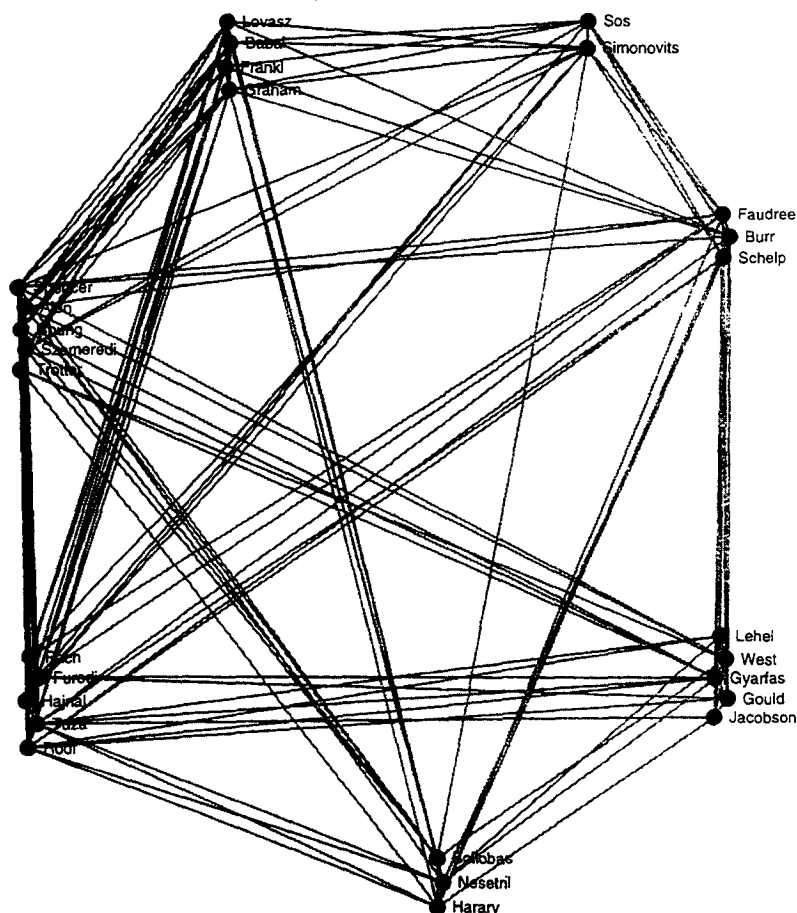


Figure 5. Clique decomposition of 9-core of Erdős graph.

We can define an often used sequence of elementary operations as a *macro* and run it as a single command. Using systems of macros we can adapt Pajek to special groups of users (analysis of genealogies, chemical applications,...).

Some *special algorithms* for solving problems from different areas of network analysis were also included in Pajek: e.g., algorithms for checking whether a program is written structurally [15]; simulation of Petri nets [12]; searching for given fragments/patterns in molecule or genealogies.

Special emphasis was given to automatic generation of network *layouts*. Several standard algorithms for automatic graph drawing were implemented: spring embedders based on minimi-

sation of the total energy of the system (Kamada-Kawai [10] and Fruchterman-Reingold [6]), layouts determined by eigenvectors (Lanczos algorithm [3, 5]), drawing in layers (genealogies and other acyclic structures). These algorithms were modified and extended to enable additional options: drawing with constraints (optimisation of the selected part of the network, fixing some vertices to predefined positions, using values of lines as similarities or dissimilarities), drawing in space. Pajek also provides tools for *manual graph editing*.

Pajek supports several output graphic formats which can be examined by special 2D and 3D viewers (Encapsulated PostScript - GSVIEW [25]; VRML - CosmoPlayer [23]; MDLMOL - Rasmol [28], Chime [22]; Kinemages - Mage [26]).

EXAMPLES

In Figure 2 the largest connected p-graph component of the genealogy of the USA presidents [32] is presented. The shortest kinship path between Franklin Delano Roosevelt and George Herbert Walker Bush, determined using macro Path, is displayed in Figure 3.

Figure 4 represents a reordered matrix of Snyder and Kick's world trade relation (iterative core decomposition with additional analysis of internal structure of cores).

The cliques decomposition (obtained by MODEL2 [27]) of the main core of Erdős graph [18] is displayed in Figure 5.

The last picture (Figure 6) presents a snapshot of the 3D display by Mage [26] of the Prison network (from the UCINET [33] dataset).

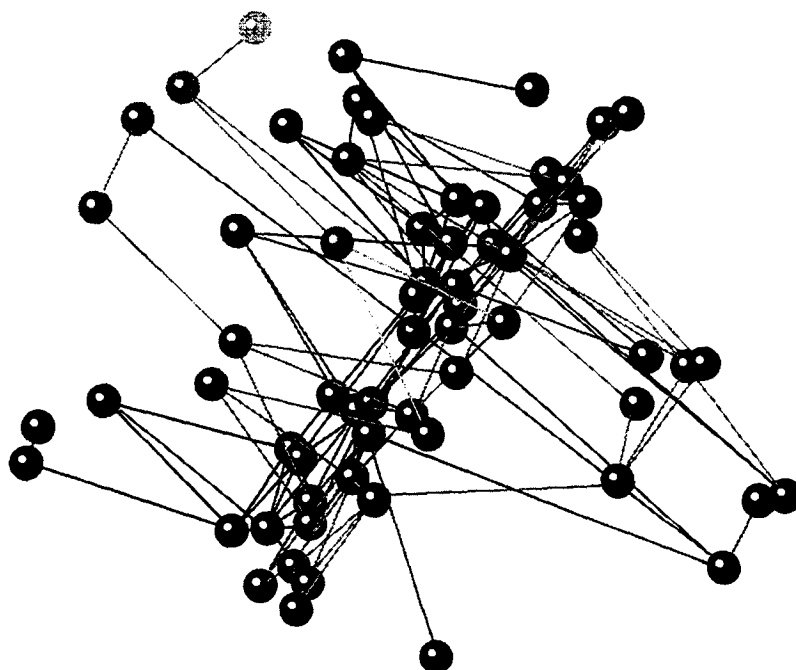


Figure 6. Gagnon and MacRae Prison Data.

FUTURE PLANS

Pajek is in a constant development. The latest version is available from its homepage. In the near future we are planning to implement the following additional options: different clustering and decomposition procedures, some statistics (triad counts), animation and presentation of the sequence of networks, output formatting, control structures in macros, planarity testing and layout...

REFERENCES

- [1] AHO, A. V., HOPCROFT, I.E., ULLMAN, I. D. (1976): *The Design and Analysis of Computer Algorithms*. Addison-Wesley, Reading, MA.
- [2] BATAGELI, V. (1994): *An Efficient Algorithm for Citation Networks Analysis*. Presented at EASST'94, Budapest, Hungary, August 28-31, 1994.
- [3] DATTA, B. N. (1995): *Numerical Linear Algebra and Applications*. Brooks&Cole Publishing Company, Pacific Grove.
- [4] DOREIAN, P., BATAGELI, V., FERLIGOT, A. (1994): Partitioning Networks Based on Generalized Concepts of Equivalence. *Journal of Mathematical Sociology*, 19, 1, 1-27.
- [5] GOLUB, G. H., van LOAN, C. E (1996): *Matrix Computations*. The John Hopkins University Press, Baltimore.
- [6] FRUCHTERMAN, T. M. I., REINGOLD, E. M. (1991): Graph Drawing by Force-Directed Placement. *Software, Practice and Experience*, 21, 1129-1164.
- [7] HUMMON, N. P., DOREIAN, P. (1989): Connectivity in a Citation Network: The Development of DNA Theory. *Social Networks*, 11, 39-63.
- [8] HUMMON, N. P., DOREIAN, P. (1990): Computational Methods for Social Network Analysis. *Social Networks*, 12, 273-288.
- [9] HUMMON, N. P., DOREIAN, R, FREEMAN, L. C. (1990): Analyzing the Structure of the Centrality-Productivity Literature Created Between 1948 and 1979. *Knowledge: Creation, Diffusion, Utilization*, Vol.11, June, No.4, 459-480.
- [10] KAMADA, T., KAWAI, S. (1989): An Algorithm for Drawing General Undirected Graphs. *Information Processing Letters*, 31, 7-15.
- [11] KNUTH, D. E. (1993): *The Stanford GraphBase*. Stanford University, ACM Press, New York.
- [12] PETERSON, I. L., (1981): *Petri Net Theory and Modeling of Systems*. Prentice-Hall, Inc., Englewood Cliffs, N.J.

- [13] ROGERS, E. M., KINCAID, D. L. (1981): *Communication Networks, Toward a New Paradigm for Research*. The Free Press, New York.
- [14] TARIAN, R. E. (1983): *Data Structures and Network Algorithms*. Society for Industrial and Applied Mathematics Philadelphia, Pennsylvania.
- [15] WATSON, A. H., MCCABE, T. I. (1996): *Structured Testing: A Testing Methodology Using the Cyclomatic Complexity Metric*. Computer Systems Laboratory, National Institute of Standards and Technology Special Publication 500-235, Gaithersburg, MD 20899-0001.
- [16] WHITE, D. R., JORION, P. (1992): Representing and Analyzing Kinship: A New Approach. *Current Anthropology* 33, 454-462.
- [17] WHITE, D. R., JORION, P. (1996): Kinship Networks and Discrete Structure Theory: Applications and Implications. *Social Networks* 18, 267-314.
- [18] Erdős Number Project: <http://www.oakland.edu/grossman/erdoshp.html>
- [19] GEDCOM Standard: <http://www.gendex.com/gedcom55/55gcint.htm>
- [20] Graph Drawing Competition 1996, Graph B:
<http://portal.research.bell-labs.com/orgs/ssr/people/north/contest.htm>
- [21] p-graphs: <http://eclectic.ss.uci.edu/~drwhite/pgraph/p-graphs.html>
- [22] Plug-in Chime: <http://www.md1i.com/download/chimedown.html>
- [23] Plug-in Cosmo Player: <http://cosmosoftware.com/>
- [24] KNUTH, D. E.: *Dictionary*. Stanford University, Computer Science Department:
<ftp://llabrea.stanford.edu/pub/dict/>
- [25] Program GSView: <ftp://ftp.cs.wisc.edu/pub/ghost/rjl/>
- [26] Program Mage: <http://www.prosci.org/Kinemage/Magesoftware.html>
- [27] Program MODEL2: <http://vlado.fmf.uni-lj.si/pub/networks/stran/default.htm>
- [28] Program RasMol (RAster MOlecules):
<http://klaatu.oit.umass.edu/microbio/rasmol/getras.htm>
- [29] SMITH, M. A. (1996): NetScan, Department of Sociology, UCLA:
<http://www.sscnet.ucla.edu/soc/csoc/netscan/netscan.htm>
- [30] Theoretical Computer Science Genealogy: <http://sigact.acm.org/genealogy/>
- [31] Transportation Networks, National Transportation Atlas Database, Bureau of Transportation Statistics: <http://www.bts.gov/gis/ntatlas/networks.html>

[32] American Presidents GEDCOM file: <ftp://www.dcs.hull.ac.uk/public/genealogy/>

[33] BORGATTI, S.P., M.G. EVERETT, AND L.C. FREEMAN. (1992): *UCINET 4*. Columbia, SC: Analytic Technologies. <http://www.analytictech.com/>

Articles and Chapters

Note: Normally, we do not include abstracts from past years. However, it has come to my attention that in the past we have seriously neglected articles from the field of communication, so this issue includes a few abstracts from past years that should have appeared earlier. – Ed.

Baker, Wayne E.; Faulkner, Robert R.; Fisher, Gene A. 1998. Hazards of the market: The continuity and dissolution of interorganizational market relationships. *American Sociological Review*. 63: 147-177. We propose a theory of the market as an "intertemporal" process that integrates multiple theoretical perspectives. Using event-history methods, we analyze the dissolution of interorganizational market ties between advertising agencies and their clients as a function of three forces—competition, power, and institutional forces. The informal "rules of exchange" institutionalized in the "emergence phase of the advertising services market include *exclusivity* (sole-source) and *loyalty* (infrequent switching). We find that most exchange relationships between advertising agencies and their clients are indeed exclusive, and most last for several years; but competition, power, and institutional forces support or undermine these rules. Most institutional forces reduce the risk of dissolution of agency-client ties. Powerful advertising agencies mobilize resources to increase tie stability, but powerful clients mobilize resources to increase or decrease stability. Competition is the weakest market force, but it has a consistent and substantial effect on tie dissolution: Competition always increases the risk of dissolution. We conclude that the market is institutionalized as imperfectly repeated patterns of exchange, because competition and changing norms about the dura-

tion of market ties destabilize market relationships.

Baku, Esmail; Smith, Marc. 1998. Loan delinquency in community lending organizations: Case studies of NeighborWorks organizations. *Housing Policy Debate*. 9(1): 151-175. A study reports on qualitative data gathered through interviews conducted in 1996 with key leadership and staff from 13 community lending organizations. Loan servicing and collection procedures within the organizations were examined. Findings suggest that several organizational factors of nonprofit lenders are related to their loan delinquency rates: social networks, business culture, funding sources, composition of the board and loan committees, staff structure, loan intake, and collection tools. The study also finds that the nonprofit sector's institutional environment and its partnership with the private sector in a mutually beneficial process influence the loan delinquency rate. More specifically, active participation of local bankers in NeighborWorks loan committees, diverse funding sources, and a diffusion of business practices through dense social networks are related to NeighborWorks' loan servicing and collection policy and procedures. These factors in turn influence NeighborWorks' rehabilitation loan delinquency rates.

Barnett, G. A. & Joseph G.T. Salisbury. 1996. *Communication and Globalization: A Longitudinal Analysis of*

the International Telecommunication Network. *Journal of World System Research* 2(16): 1-17. This paper extends the theoretical arguments of the world-systems perspective to the emerging post-industrial society. Using survey data gathered by AT&T and published in the *World's Telephones* (1978-1990) and data gathered by the International Institute of Communication and published in *Tele-Geography* (1991-1992), this paper describes the process of globalization by examining the changes in the international telecommunications network from 1978 to 1992. Based on network analysis, the results indicate that the system was relatively stable over this time period. In the late 1970s, the system was composed of a number of sub-groups. By 1980, it had coalesced into a single group with the United States and the other western economic powers at the center and the Eastern block and less developed countries in the periphery. Over time, the network slowly became denser, more centralized and more highly integrated. During the 1980s, the newly industrialized countries (NICs) of East Asia and the wealthier Latin American countries moved from the periphery of the network toward the center. Beginning in 1989, the former members of the Soviet block also moved from the periphery toward the center of the system, supplanting the wealthier countries from Latin America. The Asian NICs, however, retained their semi-peripheral position.

Barnett, G.A., Jacobson, T., Choi, Y. & Sun-Miller, S. 1998. An Examination of the International Telecommunication Network. *The Journal of International Communication* 3(2): 19-43. Using Dependency and World Systems Theory this article examines the structure of the international telecommunication network based upon patterns of use among the nations of the world. The results indicate

that the network is consistently organized along a center-periphery dimension with the western industrial nations at the core and the lesser developed countries at the periphery. There are significant correlations between network indicators and GNP per capita, quality of life and level of political participation. Network position was also found to have an incremental effect on economic development.

Bonacich, Phillip. 1998. A behavioral foundation for a structural theory of power in exchange networks. *Social Psychology Quarterly*. 61(3): 185-198. In this paper I propose structural criteria for power based only on simple and valid assumptions about how individuals in exchange networks make decisions. The implication of the model is that exchange networks contain 4 types of components, identified by the solution to a set of equations. In coreless components, the equations are inconsistent and trading behavior is unstable. In strong power components, the equations have a unique solution and some positions have complete power. In equal power components, the equations have a unique solution, and all positions are equal in power. In indeterminate components, the equations have an infinity of solutions and power is not determined strongly by structure. Formal criteria are developed for these four types of components.

Bourgois, Philippe. 1998. The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. *Substance Use and Misuse*. 33(11): 2323-2351. Documents, from over 3 yrs of participant observation, the shooting galleries and homeless encampments of a network of heroin addicts living in the bushes of a public park in downtown San Francisco. It is contended that ethnographic immer-

sion among these homeless heroin addicts documents far more risky practices than the public health literature routinely reports. The logics of street-based income-generating strategies and the moral economy of social networking among self-identified "dope fiends" results in almost daily shares of drug preparation paraphernalia. It is suggested that public health researchers need to reconceptualize their psychological behaviorist paradigm of "individual health risk behavior" because the pragmatics of income-generating strategies and the social symbolic hierarchies of respect, identity, and mutual dependence shape risky behavior. Further, it is argued that the explanatory potentials and the applied interventions that participant-observation anthropological approaches could bring to epidemiological public health research have not been utilized effectively in the field of HIV prevention and substance use.

Burt, Ronald S. 1998. The gender of social capital. *Rationality and Society*. 10(1): 5-46. The dynamics of gender, social capital, and legitimacy are examined through analysis of network, background, and performance data on a probability sample of 3,000+ senior managers employed by a large US firm in electronic components and computing equipment. Drawing on structural hole theory and research on the relationship between social capital and brokerage opportunities of a network, analysis reveals that structural holes in a network offer entrepreneurial opportunities to add value, and they enhance the likelihood of promotion among the male respondents. They did not have the same impact on the women's careers. Promotions came earlier to those women who borrowed social capital. Generic differences between insiders and outsiders rather than gender differences are discussed as the mechanism underlying

ing differences in the social capital dynamics of men and women. It is shown how people not accepted as legitimate members of a population (in this case, managers not qualified for promotion) gain social capital by "borrowing" the network of a strategic partner.

Davies Netzley, Sally Ann. 1998. Women above the glass ceiling: Perceptions on corporate mobility and strategies for success. *Gender and Society*. 12(3): 339-355. Focuses on women in corporate positions above the "glass ceiling," exploring their perceptions on corporate mobility and strategies for success in elite positions. Interviews conducted 1995/96 with 16 male and female corporate presidents and chief executive officers in southern CA indicate that, while white men promote the dominant ideology of individualism and patriarchal gender ideology as explanations of corporate mobility and success, white women emphasize alternative perspectives by confirming the importance of social networks and peer similarities for succeeding in elite positions. These women strategically attempt to increase their cultural capital to negotiate male dominated networks and maintain their high status positions through such measures as obtaining advanced educational degrees or modifying speech and behavior.

Delgado, Melvin. 1998. Puerto Rican elementary school-age children: Assistance with homework as an indicator of natural support strengths. *Social Work in Education*. 20(1): 49-54. Considers the role of natural support systems in helping Puerto Rican children succeed in US schools, drawing on a 30-month, four-wave interview study of 24 Puerto Rican families with children in two kindergarten & first-grade bilingual classes in a Boston, MA, elementary school.

Findings show that these families (1) have unexpectedly few adults in their support systems; (2) are more likely to have a more extensive support system if they are actively religious; (3) have high expectations for school achievement; (4) have in their support systems members who are not involved in helping children succeed in school; & (5) consider the school part of their support system. These findings can inform other efforts to provide early assistance to young students. Also the concept of family should be broadened to make assistance more effective.

Dimmick, J.W. S. Patterson & J. Sikand. 1996. Personal Telephone Networks: A Typology and Two Empirical Studies. *Journal of Broadcasting & Electronic Media* 40:45-59. This article reports an effort to map the personal telephone networks of samples of respondents and to use characteristics of networks to partially explain phone usage patterns. A typology which consisted of four network types was formulated by dichotomizing and cross-tabulating respondents according to their position of two variables which were termed affective relations and proximate relations. Expectations based on the typology were assessed in both a city-wide sample of Columbus, Ohio, and in a state-wide survey. Many of the expectations associated with the typology were supported.

Foley, Lara; Fraser, James. 1998. A research note on post dating relationships: The social embeddedness of redefining romantic couplings. *Sociological Perspectives*. 41(1): 209-219. In an exploratory, descriptive study of relationship redefinition, symbolic interaction theory is used to examine the contours of postdating relationships, asking the following questions: (1) How do people orient themselves to one another after a

dating relationship ends? (2) What is the power dynamic between one's social network and a postdating relationship? Using a snowball sample (N = 30), interview data are analyzed as narratives about the respondents' construction of postdating relationships. This analysis joins recent research suggesting that relationships between former spouses or lovers may satisfy legitimate needs, eg, friendship, shared history, and extended social networks.

Foley, Ruth M.; Pollard, Christina M. 1998. Food Cent\$--implementing and evaluating a nutrition education project focusing on value for money. *Australian & New Zealand Journal of Public Health*. 22(4): 494-501. The Food Cent\$ Project aimed to show low income earners a new way to allocate their food budget to obtain value for money and balance their diet. It also created an infrastructure for program delivery. Strategies included a recommended spending model, resources that addressed barriers to healthy eating, together with group activities to enhance knowledge and skills. Community volunteers, known as Food Cent\$ Advisers, were trained to deliver the project by conducting budget and cooking sessions for people in their social networks. In 1992, the Food Cent\$ Project was piloted in the Great Southern Health Region of Western Australia. It successfully reached its target group of low income earners who were identified as those holding Health Care Cards. Evaluation results demonstrated positive changes in self-reported dietary, cooking and shopping behaviors.

Hagan, Jacqueline Maria. 1998. Social networks, gender, and immigrant incorporation: Resources and constraints. *American Sociological Review*. 63(1): 55-67. Draws on 1986-1990 ethnographic data from 74 Guatemalan

Maya in the US to present a dynamic and variable portrayal of immigrant social networks and demonstrate how they gradually assume different forms and functions for women and men that differentially affect settlement outcomes, particularly opportunities to become legal; gendered social relations of neighborhood, work, and voluntary associations interact to produce this outcome. It is concluded that social networks can strengthen and weaken over time, change differentially for different segments of the immigrant community, and, therefore, have disparate effects on incorporation.

Hajnal, Istvan; Loosveldt, Geert. 1998. **An evaluation of some clustering methods for mixed mode variable data sets.** *Bulletin de Méthodologie Sociologique*. 58: 16-30. Clustering, when objects are measured on a mix of nominal, ordinal or numerical variables, has always been a problem in classification research. This article briefly reviews some clustering methods for dealing with mixed mode variable data sets. These methods include the coefficient of Gower, the coefficient of Kaufman and Rousseeuw, the combined resemblance matrix approach of Romesburg, the method of Everitt and Merette, and finally Groupals. Some of the methods were compared in a simulation study. We used a conditional Gaussian mixture approach to generate artificial mixed mode variable data sets with a known clustering structure. We conclude that in our simulation set up that Gower's coefficient performed less well than Groupals and the use of binary variables.

Kiong, Tong Chee; Kee, Yong Pit. **Guanxi bases, xinyong and Chinese business networks. 1998.** *British Journal of Sociology*. 49(1): 75-96. Attempts to account for the importance of personal relationships in decision making in Chinese business firms, drawing on field-

work conducted in Singapore and Malaysia. It is argued that understanding the importance of personal relationships requires study of both the organization and the institutional bases of its organizational principles. Three key elements of personalism personal control, personal guanxi (interpersonal) relations, and xinyong (interpersonal trust) are analyzed, and a model of personalism in Chinese firms is presented, clarifying how relationships among distrust of legal and political systems, paternalistic hierarchies of control, the system of patronage of wealthy merchants through Chinese associations, and uncertainty and insecurity (eg, about society and government) have worked to perpetuate personalism. It is concluded that persistent insecurities and uncertainties maintain personalism despite increases in stability and trustworthiness of political and legal systems.

Knoke, David. 1998. **The organizational state: Origins and prospects.** *Research in Political Sociology*. 8: 147-163. Reviews research since the 1970s to describe the origin, development, & aim of the organizational state model of political sociology. The theoretical & methodological history behind organizational state research is presented as a reaction to the stagnant 1970s elite pluralist debate over community power structure & as a new approach based on the structural explanation of collective struggles over public policy making. Laumann and Pappi's (1973) study of community elites in West Germany is analyzed as the breakthrough and founding case for the model. Suggestions are made for new research directions, aiming toward other nations, historic eras, institutions, and cultural dimensions.

Kretzschmar, Mirjam; Wiessing, Lucas G. 1998. **Modelling the spread of HIV in social networks of injecting**

drug users. *AIDS*. 12(7): 801-811. Used a stochastic simulation model to study the spread of HIV in a hypothetical population of injecting drug users (IDU) and applied the model to 886 drug users in the Netherlands, 434 of whom were current IDU. In modeling the contact patterns amongst IDU the authors sought to investigate the influence of the apparently stable social network of partners/friends, which restricted borrowing of syringes to a relatively small number of different persons. The model describes a dynamic network of long-lasting relationships between individuals that are referred to as "buddy relationships." Despite the simplification of model assumptions, results agreed well with epidemiological observations. Findings indicate that the importance of the social ties and networks in IDU communities cannot be underestimated. In populations where IDU are part of a relatively stable social network, sustain steady partnerships and friendships, and confine their sharing of equipment to those persons they know well, HIV is given less of an opportunity to reach devastating levels of prevalence. It is suggested that prevention strategies that strengthen this network and make use of it for educating IDU, especially new IDU, will be more successful than strategies that do not take this environment into account.

Labianca, Giuseppe. Brass, Daniel J. Gray, Barbara. 1998. Social networks and perceptions of intergroup conflict: The role of negative relationships and third parties. *Academy of Management Journal*. 41(1): 55-67. A study investigated the relationship between interpersonal relationships among members of different departments and individuals' perceptions of intergroup conflict within an organization. Although friendships across groups were not significantly related to perceptions of intergroup con-

flict, negative relationships were associated with higher perceived intergroup conflict. Perceptions of intergroup conflict were also significantly related to indirect relationships through friends, and an amplification effect was uncovered. Low intragroup cohesiveness was significantly related to higher perceptions of intergroup conflict.

Latkin, Carl A. 1998. The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. *Substance Use and Misuse*. 33(11): 2375-2382. Comments on the article by P. Bourgeois regarding the moral economies of homeless heroin addicts in San Francisco shooting encampments. It is contended that by documenting the lives of homeless heroin addicts, Bourgeois effectively provides insights into the social and economic organization of risk-taking behaviors within this highly marginalized group. His attention to both the material and emotional motivations to engage in drug use and microsocial interactions of drug users makes his ethnographic work implicitly multidisciplinary and distinct in the drug field, and especially valuable for informing public health research.

Litwin, Howard. 1998. Social network type and health status in a national sample of elderly Israelis. *Social Science and Medicine*. 46(4-5): 599-609. A typology of social support networks was examined in relation to five health measures in a national probability sample of Jewish Israelis (N = 4,214, ages 60+) using multiple classification analysis of survey data. The procedure revealed that the more resourceful diversified & friend & neighbor network types were consistently associated with better scores on measures of basic & instrumental activities of daily living, incontinence, vision,

& self-rated health, even when controlling for respondents' age, sex, & education. The religious family network type, also endowed with considerable support potential, tended to correlate with lower health scores. The narrow family-focused network had average health ratings or less & a moderate support capability. The least resourceful network type, the attenuated network, was most frequently associated with poor health.

Mehra, Ajay; Kilduff, Martin; and Brass, Daniel J. 1998. At the margins: A distinctiveness approach to the social identity and social networks of under-represented groups. *Academy of Management Journal*. 41(4): 441-452. Using distinctiveness theory, research shows that the relative rarity of a group in a social context tended to promote members' use of that group as a basis for shared identity and social interaction. Relative majority group members, racial minorities and women in a master of business administration cohort were more likely to make identity and friendship choices within-group. The marginalization of racial minorities individuals' own preferences for same-race friends. By contrast, the marginalization of women resulted more for exclusionary pressures than from their preferences for woman friends.

Meyer, Katherine; Rizzo, Helen; Ali, Yousef. 1998. Islam and the extension of citizenship rights to women in Kuwait. *Journal for the Scientific Study of Religion*. 37(1): 131-144. Examines the compatibility of Islam & the extension of women's rights as an element of democratization, with attention to social complexities within Muslim societies & to religious distinctions within Islam. Analysis is based on a 1994 survey of a random sample of 1,500 Kuwaiti citizens, which provided data on individuals' status dif-

ferences, religious beliefs & practices, & embeddedness into social networks. Ordinary least squares regression analysis demonstrated that Islamic orthodoxy was compatible with extending women's rights while Islamic religiosity was not, regardless of the respondents' sects. Respondents occupying positions of social status were more inclusive. However, Respondents' ties to the social system around them predicted differently for members of Sunni & Shia sects. Also, intrasect differences probably reflected Respondents' connections to different schools of Islamic thought in different geographical locations that hold differing ideas & opinions regarding the place of women.

Montoya, Isaac D. 1998. Social network ties, self efficacy, and condom use among women who use crack cocaine: A pilot study. *Substance Use and Misuse*. 33(10): 2049-2073. So far, attempts to change the sexual risk behavior of women who use crack cocaine have been less successful than efforts to change the needle risk behavior of injection drug users. Two theoretical areas that have shown some success in predicting behavior change among of out-of-treatment drug users are A. Bandura's (1994) social cognitive theory (self-efficacy theory) and social network theory. According to Bandura, social networks are important sources of social support, and social support is vital to self-efficacy. Social network research also indicates that close bonds with network members may be a protective factor independently of self-efficacy. In order to test the feasibility of collecting such data, a pilot study was conducted with 60 women who used crack cocaine and who were not in treatment. Results of Pearson product-moment correlations indicated that self-efficacy and number of very strong ties were positively correlated with condom use for

women in the sample. In addition, the number of very strong ties was significantly, if modestly, correlated with self-efficacy. Self-efficacy was also associated with behavioral performance in multivariate regression analysis, whose number of very strong ties had a moderate, though not significant, effect on self-efficacy.

Neher, Linda.; Short, Jerome. 1998. Risk and protective factors for children's substance use and antisocial behavior following parental divorce. *American Journal of Orthopsychiatry*. 68(1): 154-161. Questionnaire data are used to explore the role of social networks & personal resources as risk or protective factors for substance use & antisocial behavior in 66 middle school students, ages 11-14, whose parents had been divorced an average of 65.6 months, as compared to 70 children of married parents. Analysis reveals that children of divorced parents reported significantly more substance-using friends & less use of coping & social skills than children whose parents were married. Findings suggest the importance of focusing on substance use as well as mental health outcomes in preventive interventions for children of divorce.

O'Brien, David J.; Raedeke, Andrew; Hassinger, Edward W. 1998. The social networks of leaders in more or less viable communities six years later: A research note. *Rural Sociology*. 63(1): 109 -127. A reexamination of the social networks of leaders in five more & less viable rural communities in MO, originally studied in 1989 (O'Brien et al, 1991). An index of community social indicators & survey of community leaders re administered in 1995 reveal that four of the five communities had been impacted by major events, including the introduction of corporate hog production

in two places & flooding in two others. Nevertheless, there was a high degree of continuity in their relative viability scores. Leaders in more viable places continued to work with a larger number of organizations than their counterparts in less viable places, showing the importance of social capital for rural community viability.

Pattillo, Mary. 1998. Sweet mothers and gangbangers: Managing crime in a black middle-class neighborhood. *Social Forces*. 76(3): 747-774. Early 1990s ethnographic data from a black middle-class neighborhood in Chicago, IL, are drawn on to explore how residents manage their proximity to high-crime & high-poverty areas as well as their own internal high poverty rates. It is found that dense social networks, fostered by residential stability, facilitate the informal supervision of neighborhood youth & enhance the activities of formal organizations & institutions. Nevertheless, the incorporation of gang members & drug dealers into the networks of law-abiding kin & neighbors thwarts efforts to rid the neighborhood of its criminal element. The conflicting effects of dense networks challenge traditional social organization theory.

Pescosolido, Bernice; Gardner, Carol; Lubell, Keri. 1998. How people get into mental health services: Stories of choice, coercion and "muddling through" from "first-timers". *Social Science and Medicine*. 46(2): 275-286. The routes by which individuals make initial contact with mental health services were examined through analysis of 109 client self-reports of first major mental health agency contact collected by the Indianapolis Network Mental Health Study. Analysis categorized client stories into three major routes of contact with mental health services: (1) individual or

supported choice (46%); (2) coercion or social control (23%); & (3) muddling through or stories without a clear agent (31%). Type of mental health problem & social networks impacted the route of initial contact with mental health services. Those with bipolar disorders were most likely to give accounts of coercion. Those with larger social networks were most likely to give accounts of coercion or muddling through.

Sahlstroem, Fritjof; Lindblad, Sverker. 1998. Subtexts in the science classroom—an exploration of the social construction of science lessons and school careers. *Learning and Instruction*. 8(3): 195-214. Examined student work constructed in the science classroom and how students' science lessons relate to the construction(s) of their school careers. Using a sociocultural approach to learning, this case study focused on the activities of 2 female students in Grades 8 and 9 in a Swedish secondary comprehensive school, and their interactions with peers, the teacher, and artifacts of science. The data consist of video and audio recordings of verbal interaction. Using a lesson on magnetic fields as a case analysis, large differences are reported between the lessons of the 2 focused students in terms of opportunities for learning both about science and about their social identities. The differences found between the Ss in terms of the development of their grades and their social networks in the class seem to be closely mirrored in the classroom interaction. The results show that an understanding of science learning in education benefits from considering the different situations and strategies of different students.

Shah, Priti Pradhan. 1998. Who are employees' social referents? Using a network perspective to determine referent others. *Academy of Management*

Journal. 41(3): 249-268. A social network perspective was used to determine whom brokerage firm employees selected as social referents. In particular, a study focused on cohesive actors and structurally equivalent actors as sources of social information. Results on the social networks of brokers, sales assistants and operations employees indicate distinct differences in interaction patterns, information seeking and social comparison processes across the 3 job categories. Overall, the results suggest that employees rely on structurally equivalent referents for job-related information and on cohesive referents for general organizational information and as social comparison referents.

Szmatka, Jacek; Skvoretz, John; Sozanski, Tad; Mazur, Joanna. 1998. Conflict in networks. *Sociological Perspectives*. 41(1): 49-66. Most contemporary examinations of actor relations in networks have concentrated on coercion and exchange relations; here, a framework for assessing conflict relations in networks is presented. Differences between conflict and confrontation are discussed in relation to David Willer's (1981) conceptualization of conflict relations in networks. It is argued that conflict relations are characterized by an absence of agreement and both parties' ability to impose negative sanctions on the other, thus, the initial holdings of both parties deteriorate; automatic and manual sanctioning paradigms are utilized to demonstrate how conflict relations are played out. Although the alternative paradigms produce similar results concerning the relation of earning differentials to structural position, it is noted that the automatic sanctioning paradigm yielded a similar outcome to that produced in exchange relations. However, since sanctions are applied at the conclusion of each round of negotiation, one

party cannot extricate additional holdings from the other; therefore, future research should emphasize testing of the manual sanctioning protocol.

Tigges, Leann M.; Browne, Irene; Green, Gary P. 1998. Social isolation of the urban poor: Race, class, and neighborhood effects on social resources. *Sociological Quarterly*. 39(1): 53-77. Investigates the effects of race, class, and neighborhood on social isolation, drawing on interview data from 1,485 adults in Atlanta, GA, taken from the 1993 Multicity Study of Urban Inequality. Comparisons of poor and nonpoor African Americans to nonpoor whites on two types of social ties and the social resources inherent in those ties indicate that poverty has an important influence on the social resources available to African Americans. Poor blacks are less likely than other blacks and nonpoor whites to live with another adult, to have a person outside the household with whom they discuss important matters, or to have a college educated person in their discussion network. Higher neighborhood poverty reduces the size of the discussion network for whites and blacks and affects the probabilities of having any kind of social contacts. Important for the social isolation thesis is the finding that, among African Americans, living in a very poor neighborhood increases social isolation, and reduces access to social resources via one's network of close ties.

Valente, T. W., & Saba, W. 1998. Mass media and interpersonal influence in a reproductive health communication campaign in Bolivia. *Communication Research* 25: 96-124. This study compared mass media and interpersonal influence during a reproductive health communication campaign in Bolivia using the following six behavior change steps: awareness, detailed knowledge, attitudes,

intention, interpersonal communication, and family planning method use. The authors found that the main terms of mass media campaign and personal network exposure were associated with behavior change while the multiplicative interaction term was not. Further analysis showed that the mass media campaign was associated with contraceptive adoption for individuals with personal networks composed of few contraceptive users (as perceived by the respondent) and not for individuals with personal networks containing a majority of users. These findings indicate that the mass media may substitute for personal network influences and speed social change by accelerating the behavior change process.

Valente, T. W., Watkins, S., Jato, M. N., Van der Straten, A., & Tsitsol, L. M. 1997. Social network associations with contraceptive use among Cameroonian women in voluntary associations. *Social Science and Medicine* 45: 677-687. This paper examines the association between social networks and contraceptive use. Using data from a survey of women belonging to voluntary associations in Yaounde, Cameroon, we find that the behavior and characteristics of the members of a respondent's personal networks are associated with her contraceptive use, over and above a set of her own individual characteristics that are usually found to be important. Respondents who report that their network partners approve of contraception, use it, and encourage the respondent to use are more likely to use contraception themselves; the association with encouragement is particularly strong. Moreover, there is a strong association between the specific methods of contraception used by a respondent and those used by her network partners, suggesting that members of personal networks exchange and evaluate specific methods. Because most of the respon-

dent's network partners were interviewed, we are able to compare the respondent's perceptions of contraceptive use by her network partners with the network partner's actual use. We find that it is perceptions of use that matter, even if those perception are incorrect.

Van Tilburg, Theo. 1998. Interviewer effects in the measurement of personal network size: A non-experimental study. *Sociological Methods and Research*. 26(3): 300-328. Methods for delineating personal networks in surveys contain complex instructions for the interviewers, assuming that the interviewers' experience and education influence their ability to follow these instructions. Here, the magnitude of interviewer effects on personal network size is investigated, and differences among interviewers are explained on the basis of their experience and education, drawing on data from a 1992 interview of 4,059 older adults in the Netherlands (N = 87 interviewers). A strong interviewer effect is observed, and multilevel regression analysis shows that, controlling for respondent characteristics, well educated interviewers with minor experience prior to the project and major experience within the project (ie, the high sequence number of the interview) generate relatively large networks.

Books

Arbib, Michael A. 1998. *The handbook of brain theory and neural networks.* Cambridge, MA: MIT Press. In hundreds of articles by experts from around the world, and in overviews and "road maps" prepared by the editor, *The Handbook of Brain Theory and Neural Networks* charts the immense progress made in recent years in many specific areas related to great questions: How does the brain work? and How can we build intelligent machines? While many books discuss limited aspects of one subfield or another of brain theory and neural networks, the *Handbook* covers the entire sweep of topics—from detailed models of single neurons, analyses of a wide variety of biological neural networks, and connectionist studies of psychology and language, to mathematical analyses of a variety of abstract neural networks, and technological applications of adaptive, artificial neural networks. Expository material makes the book accessible to readers with varied backgrounds while still offering a clear view of recent, specialized research on specific topics. (By publisher)

Broadbent, Jeffrey. 1998. *Environmental politics in Japan: Networks of power and protest.* Cambridge: Cambridge University Press. Japan's rapid industrial development and economic growth in the decades after World War II brought dramatic environmental damage. Japan diverges from the typical story of industrial democracies, however, in the scale and speed with which it was able to reduce air and water pollution, despite the absence of national environmental lobbying groups. As local protest movements grew more vocal in the early 1970s (though they failed

to coalesce into effective national lobbying organizations), the Japanese government moved, after some resistance, to regulate industrial pollution. In *Environmental Politics in Japan*, Jeffrey Broadbent shows, through a detailed examination of the Japanese political process and its environmental policy outcomes, how social, cultural, and political-economic factors interacted to bring about environmental degradation and eventual partial restoration. Broadbent's case study of heavy-industry growth and environmental protest in rural Japan illustrates how pro-growth and pro-environment coalitions mobilized and struggled to affect government policy at all levels in Japan. His analysis explains why, in the face of that pressure, the Japanese government succeeded in reducing pollution, but failed at solving other important environmental problems, such as dense urbanization and industrial concentration. Drawing on his study, Broadbent presents the first integrated, empirical critique and reconstruction of leading theories on the state, protest movements, the political process, and environmental problems. In so doing, he reforms our understanding of Japanese society and the general relationship between society and the natural environment. (By publisher)

Dicken, Peter. 1998. *Global shift: Transforming the world economy.* New York: Guilford Press. (Third edition). Reflecting the many ways our understanding of globalization has changed and become more sophisticated in recent years, the third edition of *Global Shift*, like its predecessors, is an invaluable text for both large undergraduate classes and advanced gradu-

ate seminars.... No other book on the market contains as much information and clear-headed thinking about the global economy. (Review by Gary Gereffi, Duke University). Moving beyond globalization hype, Dicken carefully introduces students to the economic, political, and technological processes that are creating global shifts in economic activity and affecting local communities in highly uneven ways. Like the previous editions, the book focuses on the interrelated actions of transnational corporations (within business networks) and states (as containers, regulators, and competitors) within a volatile technological environment. Several new chapters are included, and all chapters are revised to reflect the latest available data and theoretical debates. Of special utility are detailed case studies of key global industries. (By publisher)

Lesourne, Jacques; Orlean, Andre. Editors. 1998. *Advances in self-organization and evolutionary economics*. Washington: Brookings Institution Press. The field of microeconomic theory is about to be shaken by a revolutionary new movement. Focusing on the dynamics of economic systems, this breakthrough approach is built on the complementary concepts of self-organization and evolution. In this book, leading economic theorists consider the movement and its different aspects from varying points of view. To provide a comprehensive overview of these developments, the book looks at five key factors. The authors begin with the evolutionary aspects of firm and consumer behavior, then explore some of the systems that enable markets to self-organize, and review the dynamics of technological systems. Next, evolutionary approaches to economic growth, with explicit microfoundations, are presented, and the book concludes by analyzing different learning processes in the context of evolutionary game theory. With its general focus on the dynamic processes of a knowledge-based economy,

this book will be an invaluable resource for gaining greater understanding of the complexity of real economic systems. (By publisher)

Mulgan, Geoff. 1998. *Connexity: How to live in a connected world*. Boston: Harvard Business School Press. Many books have been written about the implications of a globalized and interconnected civilization. But few have the range and depth of Geoff Mulgan's *Connexity*. The central issue *Connexity* addresses is the fundamental conflict that exists between the freedoms enjoyed by many, mainly in the Western world, and the growing economic interdependence of so many more worldwide. Mulgan, who is the founder of Demos, a liberal think tank based in London, and a member of Tony Blair's Policy Unit, writes, "Our problem is that freedom to behave as we would wish, without regard for our effects on others, runs directly counter to the other striking fact of the contemporary world: our growing dependence on other people. The world may never have been freer, but it has also never been so interdependent and interconnected. Only a small proportion of the world's population could now be self-sufficient. The rest of us depend on complex systems to deliver us water, food, justice, energy and health." Mulgan probes the nature of the conflict between freedom and interdependence by examining everything from the nature of markets in a free society to the role of governments in a shrinking world and problems posed by economies which tend to ignore national boundaries. The author argues that reciprocity, or the golden rule, "is the most important idea for a developed democratic society." Whether you agree with Mulgan politics or not, you will find this book to be thought-provoking and timely. Highly recommended. (Review by Harry C. Edwards)

Reitz, Jeffrey G. 1998. *Warmth of the welcome: The social causes of economic*

success for immigrants in different nations and cities. Boulder, CO: Westview Press. This book examines how the economic performance of immigrants is shaped by national and urban social institutions. In the United States, particularly in the high-immigration cities, most immigrant-origin groups have significantly lower earnings than do their counterparts in Canadian or Australian cities. Immigration policy is not a factor, however; in fact U.S. immigrants in particular origin groups are not less skilled. American institutions, including education, labor market structures, and social welfare, all reflect greater individualism and all contribute to the potential for inequality. Resulting higher poverty rates for America's immigrants explains their more extensive use of its weaker welfare system. Jeffrey Reitz's social institutional approach projects the impact of institutional restructuring—past and future—on the economic performance of immigrants in these countries. (By publisher)

Schweizer, Thomas; White, Douglas R. Editors. 1998. *Kinship, networks, and exchange.* Cambridge: Cambridge University Press. Structural analysis as practiced today in the study of human societies is characterized by combining the richness of ethnographic case studies with the formal rigor of social network analysis, the theory of games and of social exchange and social cognition, algebraic and graph-theoretical analysis of social structure, and more dynamic (and computer-driven) analyses of social processes. These approaches focus on linkages and relations as well as groups and individuals. The concept of the social embedding of economic and political organization makes it imperative that ethnological concerns with kinship, marriage, and social exchange be reconceptualized and reanalyzed as foundational in all parts of the contemporary world, to the way that societies, economies, and politics are organized. Social network analysis focuses on social rela-

tions and the flow of resources within networks of actors and investigates the emerging social order or pattern generated over time by networked activities. In integrating anthropological studies of kinship and exchange with the social network perspective, anthropology profits from the precise and flexible framework of social network analysis while the interdisciplinary study of social structure deepens its understanding of social pattern and process in taking into account holistic ethnographic cases and the comparative agenda of anthropology. Studies of marriage, descent, and exchange can pay due respect to the social, material, and symbolic aspects of human societies and can assess change without sacrificing rigor and systematic understanding of social and economic patterns in a broader structuralist and dynamic perspective. This collection of original articles, restudies of classic ethnographic cases, and fieldwork studies of kinship and exchange in contemporary tribal and peasant societies of Africa, Asia, the Pacific, and Europe aims at revitalizing the study of kinship and exchange in a social network perspective. This volume brings together studies of empirical systems of marriage and descent with investigations of the flow of material resources in human societies to demonstrate how the social and material aspects of society are related. It addresses issues of concern to anthropology and the neighboring disciplines of history, sociology, and economics. This book marks the emergence of a new era in the study of kinship and exchange using a productive combination of ethnographic substance with formal methods, one that leaves behind older structural-functionalist and culturalist assumptions.

Spitzer, Manfred. 1998. *The mind within the net: Modes of learning, thinking, and acting.* Cambridge, MA: MIT Press. How does the brain work? How do billions of neurons bring about ideas, sensations, emotions, and actions? Why do children learn faster than elderly people? What can go wrong in perception, thinking, learning, and acting? Scientists now use computer

models to help us to understand the most private and human experiences. In *The Mind Within the Net*, Manfred Spitzer shows how these models can fundamentally change how we think about learning, creativity, thinking, and acting, as well as such matters as schools, retirement homes, politics, and mental disorders. Neurophysiology has told us a lot about how neurons work; neural network theory is about how neurons work *together* to process information. In this highly readable book, Spitzer provides a basic, non-mathematical introduction to neural networks and their clinical applications. Part I explains the fundamental theory of neural

networks and how neural network models work. Part II covers the principles of network functioning and how computer simulations of neural networks have profound consequences for our understanding of how the brain works. Part III covers applications of network models (e.g., to knowledge representation, language, and mental disorders such as schizophrenia and Alzheimer's disease) that shed new light on normal and abnormal states of mind. Finally, Spitzer concludes with his thoughts on the ramifications of neural networks for the understanding of neuropsychology and human nature. (By publisher)

Conference Presentations

Association Internationale de Sociologie 14th World Congress of Sociology. 26 July - 1 August 1998. Montréal, Québec, Canada

Behrens, Dean M. Department of Sociology, University of Toronto, 203 College St., Toronto, Ontario M5S 1A1. "Self-isolation and social support." In a study of men and women who have been tested for HIV, and their social support and information networks, the theory of action called Maximal Network Stability Theory (MNST) was tested, and expanded. Seventy-nine participants were interviewed. Five participants were interviewed again, 7 months later. MNST predicts that people under stress will actively restructure their support networks in such a manner that they become smaller, denser, and more stress related. Analyses of self reported sources of support showed that respondents under stress had significantly smaller and denser networks. Analysis of responses to a hypothetical situation (preference analysis) provided additional support for MNST hypotheses. These analyses also suggested additional factors that affect interaction choice. These factors are: 1) family membership; 2) the perceived type of support provided by each network member; 3) the perceived amount of social support provided by each network member; 4) the perceived degree of similarity between each network member and the ego; and 5) the perceived frequency of current interaction between each network member and the ego. Qualitative analysis supported the quantitative findings and corroborated many of the hypotheses suggested by MNST.

De Rond, Mark. Christ Church, University of Oxford, Oxford OX1 1DP, United

Kingdom. "The role and rhetoric of social ties in R&D collaborations." Since the mid-80s, research into the strategic alliance phenomenon has proliferated, a development to which the biotechnology community has not been immune. The majority of alliance research papers appears grounded in resource dependence theory or transaction cost economics, and focuses largely on antecedent conditions or outcomes of collaboration. Relatively few academics have taken a process-oriented approach and addressed the evolution of cooperation. Fewer still have explored inter-organizational collaboration from a social network perspective. Yet in an effort to understand cooperation, the network 'perspective' appears to have been put on a par with transaction cost economics, resource dependence, resource based, and game theoretic views. Is this justifiable? Can a social network perspective help explain the evolution of collaboration, or is it mere rhetoric? Based upon a circular model of alliance process and incorporating a research perspective by Hakansson & Snehota, this paper presents an in-depth, longitudinal case study covering nearly four years of successful collaboration between a large pharmaceutical and a smaller biotechnology firm. What appear to emerge are three specific roles for social ties.

Fu, Yang-chih. Institute of Sociology, Academia Sinica, Nankang 115, Taiwan. "Mobilizing personal networks into the concert audience: A case study of dyadic ties." The concert audience can be composed of members in the performer's personal networks as well as the general public. Before concerts, some performers invited their acquaintances to attend the upcoming events, and ask some of their alters to do the same, thus extending the basis for recruiting potential audience

members. This study examines such a mobilization process in a piano recital held in 1994 at the National Recital Hall of Taipei, Taiwan. The data are derived from the contact record between the performer (the ego) and her acquaintances, and between 11 alters and THEIR acquaintances. Of the 283 contacts, 112 (or 40%) turn out successful because the persons contacted actually attended the recital. Using these dyadic ties as the analytic unit, I examine the following three sets of factors in determining whether a contact leads to the successful outcome: (1) individual characteristics of those who initiate the contacts and those whom they contact with, (2) the similarity (homophily) or difference (heterophily) in individual characteristics between the dyadic actors, and (3) types of relationships and the strength of ties between these dyads. Preliminary logistic analyses suggest that a recruiting effort becomes most successful when mobilizing one's strong ties. Such a study may illustrate a novel way to incorporate the social network perspective and techniques into the understanding of collective social actions.

Koku, Emmanuel; Wellman, Barry. University of Toronto, 455 Spadina Ave., Toronto, Ontario, Canada M5S 2G8. "The emergence of a scholarly network." This paper attempts to explain the emergence, persistence and dissolution of a scholarly network. It argues that the emergence of the network is in response to the marginalization of members research interests in their individual departments, faculties, and institutes. In a bid to develop their research interests, members find it expedient to join and form collaborative ties with others sharing mutual interests. The extent of returns and benefits in the network is partly a function of member's location within the network as well as their amount of investment of time and resources in the network. In other words, centrality within the network, as well as their investment of time and resources varies with benefits from membership. The scholarly network is composed of heterogenous scholars and professionals,

with varying interests, departmental and institutional affiliations. Membership is largely voluntary, with no direct financial benefits. Members in ScolNet are united by their research interests in human computer interaction as well as human-centered design of knowledge artifacts and tools, and their effects on human interaction. Members meet in several fora, including seminars, retreats, and conferences to exchange ideas. Data for this paper are based on preliminary interviews conducted with the members of ScolNet, perceived benefits and costs of joining ScolNet, and extent and frequency of each member's interaction and communication with others in the network. These interviews are supplemented by observations of interactions among members of ScolNet.

Nazer, Nancy; Wellman, Barry. University of Toronto, 455 Spadina Ave., Toronto, Ontario, Canada M5S 2G8. "Scholarly networks in a loosely coupled organization." This paper analyzes the structure and operation of a multi-disciplinary group of dispersed scholars by focusing on the interplay between computer networks and social networks which operate over them in whole or in part. This multi-disciplinary group consists of sixteen scholars collaborating on important and complex problems in the physical and human sciences. We explore how this network of internationally dispersed scholars collaborates using different types of Computer Mediated Communication technologies, as well as more traditional means of communication such as face-to-face meetings, phone, mail and fax. We trace the development of relationships among the participants and examine the extent to which new ties are formed and whether these tend to be strong ties of collaboration or weaker ties of mutual awareness. In addition, the association between different types of ties and the content and flow of information and resources is examined. We explore how involvement in these computer-supported scholarly network groups affect: (a) The composition, structure, and content of working and sociable relationships among scholars; (b) Knowl-

edge transfer, information flows, mutual awareness, and scholarly productivity.

Thomese, Fleur. *Vrije Universiteit, De Boelelaan 1081c, 1081 HV Amsterdam, The Netherlands.* "Neighborhood networks of older adults and social support: Does urbanization matter?" Differences between urban and rural elderly in size and supportiveness of their neighboring-networks are often supposed but rarely tested. Data from a survey among 2900 independently living people between 55-89 in the Netherlands are used to test a hypothesis that: (1) Neighborhood networks (=percentage of core network members within 10 minutes) in rural (=sparsely populated) neighborhoods are larger than in urban neighborhoods, (2) Exchanges of instrumental support in larger neighborhood networks are more supportive and less balanced than in smaller ones, and (3) The effect of larger neighborhood networks is strongest in rural areas, compared to urban areas, where more alternative sources of support exchange are available. Controlling for background characteristics, results of hierarchical linear regression analyses support the first hypothesis, with the addition that older city-dwellers have relatively more network members living within an hour's distance. The second hypothesis is rejected. Results of multi-level analyses indicate that network members tend to give less instrumental support when the network is larger, probably in accordance with the older person's need for support. The third hypothesis gets some support in the finding that for older people living in rural areas, exchanges are less balanced in larger neighborhood networks. This effect is not found in urban areas. The availability of professional resources might partly account for this. Even in a rather uniformly dense, populated, high-standard welfare state like the Netherlands, differences between city and countryside thus appear to remain a source of differentiation or even stratification, through the distribution of [missing words].

Su, Tieting. *Department of Sociology, State University of New York, 101*

Broad St., Plattsburgh, NY 12901. "Cycles of global trade networks?" This paper is designed to explore global trade structure from a historical perspective. Specifically, it uses global trade networks as indicators of the structure. It is contended in the paper that such complex network structures as trade structures are largely based on the combination of four basic network elements: the star set, the clique set, the dyadic set, and the null set. It is further argued that a major cyclical trend tends to characterize global networks in this century.

National Communication Association, Chicago, November, 1997.

Pollock, Tim, Robert C. Whitbred, & Noshir S. Contractor. "Social Information Processing and Job Characteristics: A Simultaneous Test of Two Theories with Implications for Job Satisfaction." This study simultaneously tested two theories which attempt to explain differences in job satisfaction; Job Characteristics theory (Hackman & Oldham, 1976) and Social Information Processing theory (Salancik & Pfeffer, 1978). The theories were tested using data collected from the civilian employees of the public works division at a US military base. The results indicated that individuals' social environments had significant effects upon their attitudes. Multiple social networks were used to operationalize individuals' social environments. The results also suggested that job characteristics had an independent main effect upon job satisfaction, in addition to the effects of the social environment. Based on prior research, employees' past experience and self-monitoring were tested as moderators of the effects of the social environment, and growth need strength was tested as a moderator of the effects of job characteristics upon job satisfaction. Self-monitoring was found to have a significant moderating effect on the relationship between information from the social environment and job satisfaction.

Arab Culture and Globalization in the 21st Century conference, Philadelphia University, Amman, Jordan, May 4-6, 1998.

Danowski, James A. "Arab Countries' Global Telephone Traffic Networks." This study addressed the question as to whether there is evidence from international telephone traffic networks for an "Arab Nation," a regional political entity often discussed among Arab intellectuals and political actors. NEGOPY network analysis of inter-country telephone traffic among the world's nations using data compiled by Telegeography from 1995-1996 shows that there is not one large global network as Sun & Barnett (1994) previously found. Rather, there emerged a distinctively Arab-centered group, in addition to a larger group comprised of most of the remaining world nations. This differentiation of global communication networks is consistent with theoretical reasoning (Danowski, 1993). In contrast to broadcast media, the network-based media carrying messages over telephone circuits may increasingly promote less unified global networks with regional subgroups of increasing variation. Future research can determine to what extent there is evidence for further development of a trend of this kind by using international telephone traffic data and network analysis as the years unfold.

International Communication Association, Jerusalem, Israel, July, 1998.

Barnett, George A., Joseph G. T. Salisbury, Chul Woo Kim & Anna Langhorne. "Globalization and International Communication Networks: an Examination of Monetary, Telecommunications, and Trade Networks." As an empirical assessment of globalization, this paper

examines international monetary flows among the world's nations and compares it with international telecommunications and trade networks. Overall, the structures of the three networks are very similar. The results are consistent with World Systems Theory. "Center to periphery" structures were identified in all three international networks. The findings indicate a strong relationship between economic conditions and a country's location in the networks. Consistent regional patterns of organization in the three networks suggest an anomaly in World Systems Theory. Factors other than economics, such as culture and geographic location, determine the structure of the world system. There are distinctive clusters of the Arab/Islamic nations as well as separate groupings of East Asian and European countries.

Kim, Chul Woo. "The Changing Structures of Global Arms Trade 1987 - 1994: a Network Analysis of Major Conventional Weapons Trade." Using Major Conventional Arms Trade Data gathered by Stockholm International Peace Research Institute (SIPRI), this paper examines the changing structures in the international arms trade network from 1987 to 1994. Unlike the previous arms trade research, this paper applies the network analysis method to investigate the structural changes of international arms trade during the period. The results indicate that the network has been highly centralized by the Western industrialized countries, Russia and China. The network structures of global arms trade during this period show a trend toward uni-polarity rather than bi-polarity. The position of Russia in the arms trade network shifted distinctively during 1991-1992, reflecting the structural adjustment of Russia as a dominant supplier. The USA maintained the position of the dominant supplier and became a more centralized nation in the arms trade network.

How to use...

SOCNET

Electronic Discussion Forum

SOCNET is a *listserv* list. A *listserv* list is essentially an automated mail forwarding system in which subscribers send e-mail to a central address and it is automatically rebroadcast to all other subscribers. The purpose of SOCNET is to allow network researchers worldwide to discuss research and professional issues, make announcements, and request help from each other. Subscription to SOCNET costs nothing and is available to all members of INSNA.

Joining SOCNET

To join SOCNET, send an email message to listserv@lists.ufl.edu that says the following in the first line of the body of the message: SUBSCRIBE SOCNET <your name>. For example:

SUBSCRIBE SOCNET Steve Borgatti

(Substitute your own name for "Steve Borgatti", don't join the 3.3% of the membership that has subscribed with my name.) The *listserv* software at Florida will then add your name and email address to the list, and send you back a message confirming your membership. If you do not receive a confirmation message back, contact Steve Borgatti (borgatts@bc.edu).

Using SOCNET

Once you are a subscriber, to send a message to all SOCNET subscribers, just send email to the internet address

socnet@lists.ufl.edu

Your message will automatically be broadcast to all SOCNET subscribers.

Note: You must not try to send messages to the listserv from a different e-mail address than the one you subscribed with. If you do, the system will flag you as "spammer" and will send the message to me, the list manager, instead.

Options

To permanently remove yourself from SOCNET, send a message to listserv@nervm.nerdc.ufl.edu with the following command in the body of the message:

SIGNOFF SOCNET

Important note: this message, like all listserv commands, should be sent to the listserv (address listserv@lists.ufl.edu) and not to SOCNET. If you send it to SOCNET, it will not sign you off, and everyone on SOCNET will get a message from you that says "SIGNOFF SOCNET".

To see who else is subscribed to SOCNET, send the REVIEW SOCNET command to the listserv. You can have the list sorted by country, last name, node id and user id, if you like, by sending a command of the form REVIEW SOCNET (BY <fieldname> as follows:

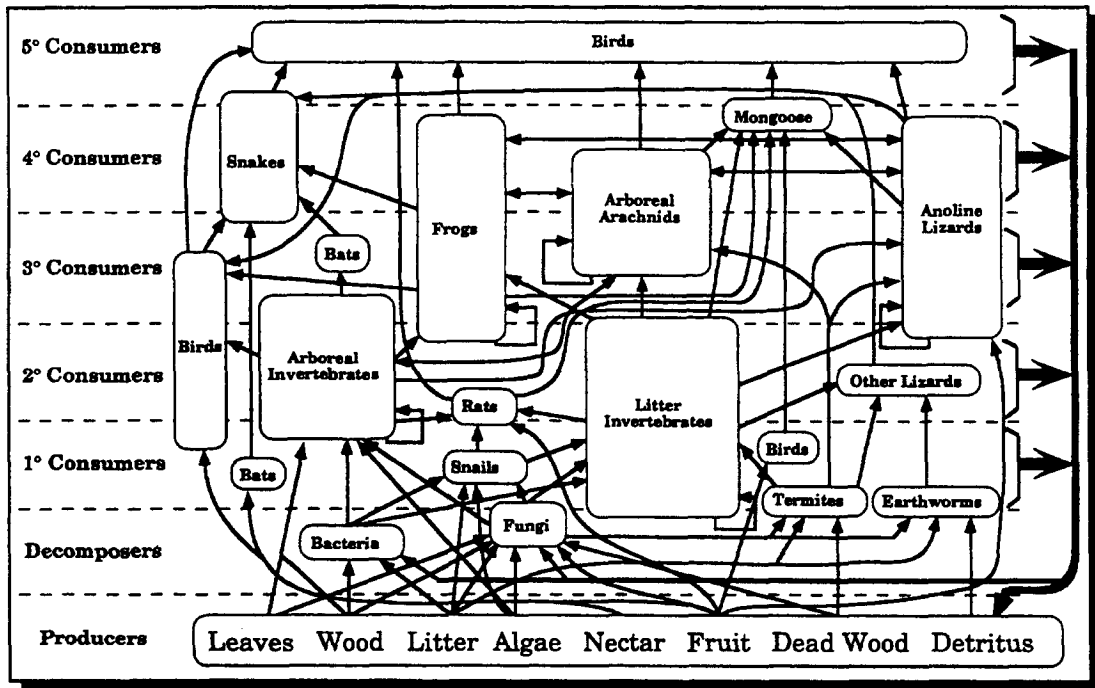
**REVIEW SOCNET (BY COUNTRY
REVIEW SOCNET (BY NAME
REVIEW SOCNET (BY NODE**

For information about additional commands, such as using the DIGEST option, send the command

HELP

to listserv@lists.ufl.edu. Again, don't send it to socnet or else everybody will get that message!

The Food Web of a Tropical Rain Forest



Reagan, D.P. and R.B. Waide. 1996. *The food web of a tropical rain forest*. Chicago: University of Chicago Press.

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