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Author(s):

Bernard, Russ; Bienenstock, Elisa; Borgatti, Steve; Brandes, Ulrik; Burt, Ron; Butts, Carter; Doreian, Pat; Fararo, Tom; Faust, Katie; Johnson, Jeff; Kanfer, Alaina M.; Krackhardt, David; Skvoretz, John; Wellman, Barry

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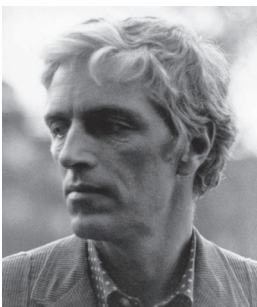
This collection of tributes to Linton C. Freeman is meant to remind us that the field of social network analysis is marked by shared connections, intellectual and social, and the role that Lin and Sue, his wife and partner, played in creating them.

Lin's friends, students and colleagues tell us their stories of Lin and through them we learn about Lin the man, the professor, the scientist, the dean, the mentor, the editor, the teacher, the friend, and the networker.

The contributors to this collection of tributes are Russ Bernard, Elisa Bienenstock, Steve Borgatti, Ulrik Brandes, Ron Burt, Carter Butts, Pat Doreian, Tom Fararo, Katie Faust, Jeff Johnson, Alaina Michaelson Kanfer, David Krackhardt, John Skvoretz, and Barry Wellman.

In Memoriam: Linton C. Freeman

Katie Faust and Carter Butts



Linton "Lin" Freeman, sociology research professor at the University of California, Irvine, passed away on August 17, 2018. He was 91.

Freeman served as dean of the UCI School of Social Sciences from 1979 to 1982. He retired from UCI in

1994 and continued on as a research professor in sociology, teaching courses in social network analysis. Prior to his UCI service, Freeman held professorships at Syracuse University (1956-67), University of Pittsburgh (1967-69), University of Hawaii (1969-73), and Lehigh University (1973-79) where he was the Lucy G. Moses Distinguished Professor of Sociology.

Freeman was a mathematical sociologist whose research focused on social network analysis. He used formal models and network analyses of empirical data to answer questions about how and why groups form. He was author or coauthor of 17 books and more than 100 scholarly articles that appeared in a diverse array of journals including the *American Anthropologist*, *Animal Behavior*, *Social Cognition*, *Social Networks*, and *Social Forces*, to name a few.

Lin was born in Chicago in 1927 and grew up near the University of Chicago. He was named after the anthropologist Ralph Linton, one of his father's closest friends. As Lin told the story, Ralph was doing field work in Madagascar at the time of Lin's birth, and his father "somehow managed to embrace a very quaint Victorian notion that it was perfectly all right to take a person's last name without asking, but you could not take their first name." So, instead of Ralph Freeman, we had Lin Freeman.

Lin was a towering figure in social network analysis, one of the pioneers of the field, and a major contributor to a wide range of topics in the discipline. It is difficult to find an area of social network analysis that has not been influenced by his work.

Lin received his bachelor's in psychology and sociology from Roosevelt University, his master's in sociology and anthropology from the University of Hawaii, and his doctorate in sociology from Northwestern University. His early career is marked by major contributions to the study of community decision making and leadership, research done at Syracuse University in collaboration with Morry Sunshine, Sue Freeman, Tom Fararo, and Warner Bloomberg.

Late in his long career, Lin outlined his own view of the history of the field in an influential book, *The Development of Social Network Analysis: A Study in the Sociology of Science* (2004). Written in response

to the then-fashionable notion that the study of social networks was a “new science,” he mapped out the development of social network analysis starting in the 1930s, noting the many threads that came together to form the field as we know it today. He also described his own early structural research and his epiphany about the common network perspective that unified otherwise seemingly disparate lines of work. In a recent interview, he described the “mental flip” that he had immediately upon reading Anatol Rapoport’s 1961 paper, “A Study of a Large Sociogram.” In Lin’s words: “[...] mathematical biology [being done by Rapoport] at Chicago was really sociology [...]. He gave us a mathematical foundation for thinking about social linkages in structural terms.” Lin’s research on social networks brought that insight to full realization.

His contributions on centrality are Lin’s first publications to explicitly embrace all aspects of a social network perspective, and have had a profound and lasting influence on the field.

His 1979 article “Centrality in Social Networks: I. Conceptual Clarification” mapped out key distinctions between different approaches for quantifying centrality and centralization, and established a quorum of formally defined metrics for these concepts that are still the gold standard in the field. Likewise, his work on human social intelligence and perception of social groups contributed both to the systematic collection of network data and to our understanding of how people see social relations and social groups, feeding fruitful lines of research that continue to this day. He made sustained contributions to network visualization, formalizing the sociological concept of “group,” measurement of dominance hierarchies, and the development of the field of social networks as a scientific institution. He was one of the early authors of the widely used network analysis software UCINET and published widely on the use of computers in social science in an era when this was a largely untapped frontier. Throughout his career, he helped define research directions that would become central concerns within the field.

Beyond his research contributions, Lin was also a pivotal player in the institutionalization of the field. He founded the flagship journal *Social Networks* and edited it from 1977 to 2006. This journal was one of the important institutional advances of mid-1970s that helped to consolidate the interdisciplinary field of social networks. The journal continues to be the central outlet for social network research and provides a focal point for contributions from a wide range of disciplines. A careful student of publication practices across disciplines, Lin consciously mod-

eled his editorial approach at *Social Networks* after successful examples in the broader scientific community. His contributions to building social networks as a scientific discipline were also supported by the National Science Foundation-funded Electronic Information Exchange System (EIES) experiment, work done in collaboration with Sue Freeman. At the dawn of the internet in 1977-78, this project provided then state-of-the-art computer communications capabilities (phone modems and computer terminals) to link several dozen scientists working in the emerging field of social networks. The goal of the experiment was to facilitate exchange of information about the rapidly developing discipline, but it also highlights Lin’s continued fascination with the social context of scientific enterprises. He was also an active supporter of the International Network for Social Network Analysis (INSNA), the professional organization of the network analysis community, and its flagship meeting, the Sunbelt conference. Some of Lin’s personal predilections (including his passionate advocacy for conference logistics that would allow him to windsurf, as well as his determination that the meeting always be welcoming to newcomers) left a lasting mark on the culture of the conference. Always an evangelist for social network analysis, Lin worked tirelessly to bring new researchers into the field – whatever their home discipline might have been. It is a testimony both to his tenacity and to his charisma that one can to this day find many social network researchers whose entree into the field was an encounter with Lin.

Lin’s own exposure to structural and network perspectives started early and ran deep. His father was a genealogist who emphasized the importance of family relations. As an undergraduate at Roosevelt University, Lin’s mentor was St. Claire Drake, by all accounts a genuine intellectual and captivating lecturer. Drake had been a student of Allison Davis at the University of Chicago and had worked on the now classic Deep South study (Allison Davis, Burleigh B. Gardner, and Mary R. Gardner, 1941). Drake introduced Lin to the Deep South research in the late 1940s, so at that point Lin would have encountered the quintessential two-mode network of Southern women attending social events (As an aside, decades later Lin published “Finding Social Groups: A Meta-analysis of the Southern Women Data”, a review of more than 20 studies that had analyzed the Davis, Gardner, and Gardner data.). At the University of Hawaii, the geographer Forrest Pitts introduced him to Hägerstrand’s diffusion models and Harry Ball pointed him toward Bavelas and Leavitt’s experimental work on communication

structures. As a PhD student at Northwestern, Lin was deeply influenced by Don Campbell, who was at the height of his work on reliability, validity, and measurement, themes that continued throughout Lin's own research. Lin also met Morry Sunshine at Northwestern and they embarked on a very fruitful series of studies of community leadership. Lin identified Morry as someone who was most influential on his thinking and the two remained close friends.

Lin moved to UC Irvine in 1979 as Dean of the School of Social Sciences. At UCI he joined an active group of social network faculty and graduate students, including John Boyd, Doug White, and Lee Sailer. Lin quickly converted others to social networks, notably Kim Romney and Bill Batchelder, and influenced a steady stream of graduate students (Jeff Johnson, David Krackhardt, Katie Faust, Steve Borgatti, Sue Freeman, and Alaina Michaelson Kanfer, to name a few from Lin's early years at UCI). At the time of his arrival, there were no departments in the School of Social Sciences. Lin's presence was the catalyst for the formation and steep ascent of the UCI Social Network Research Group, a focal point for research and training at Irvine that continues to be extremely active. He also helped establish one of the first systematic graduate curricula in social networks within the Department of Sociology, which has gone on to become the training ground for a large number of doctoral students (both from sociology and from other fields). A member of the Institute for Mathematical Behavioral Sciences, he also boosted the visibility of network-related research within the institute, and was central in recruiting social network researchers to UCI.

Lin received a number of awards for his contributions during his career. Among his more notable honors, he held the unique distinction of being a two-time recipient of the Georg Simmel award from the International Network for Social Network Analysis, and received the James S. Coleman Distinguished Career Award in Mathematical Sociology from the Mathematical Sociology Section of the American Sociological Association. In 2002, INSNA named the early career award for contributions to the study of social networks after him, recognizing not only his own remarkable intellectual accomplishments but also his long record of mentoring and supporting young people. For many junior colleagues who survive him, this is perhaps the most fitting honor for a man who gave so much of his time to encouraging others in their own research.

For those who had the good fortune to work closely with him, Lin is remembered as a person of infectious enthusiasm, great intellectual energy,

and strong convictions. Never shy about expressing his opinions – often in forceful language – Lin was always willing to engage in intellectual debate. But he also took criticism graciously, and encouraged a spirit of no-holds-barred inquiry among his peers that was at once fun, rigorous, and irreverent. He brought out the best in his students and his colleagues alike, challenging them to be better scientists, to pursue the truth wherever it led, and to enjoy life along the way. He left his mark on the social network field, on UC Irvine, and on all of us who benefited from his presence. Those who travel in the wake of the “Big Kahuna” (so dubbed by a number of his colleagues) have a lot to live up to. But we are richer for his many gifts to us, and, were he here, he would be urging us to sail on to shores he had not yet seen. We hope that our collective voyages do honor to his memory.

An open door

Jeff Johnson



There are many reasons to celebrate the life and career of Lin Freeman. As Carter and Katie point out, he has been one of the most influential intellects in social network analysis. But what I most celebrate about Lin was his kindness, openness, and, most of all, his mentorship. I believe a story about my time at UC Irvine as a graduate student

vividly illustrates this. I was a graduate student from 1975 to 1981. During the latter three years of this Lin was the Dean of the School of Social Sciences. The school of social sciences at UCI was itself a unique place. There were no departments and faculty from across the social sciences had offices among the seven floors that were assigned in no particular disciplinary pattern. So, a geographer could be next to a political scientist who was next to an economist and so on. This led to a very different academic environment. Although I was an anthropologist, I interacted extensively with psychologists, economists, sociologists, etc. The Dean before Lin, and eventually Lin, had his office on the 6th floor of the Social Science Tower. Although the Dean's office had a door that directly accessed the hallway, the door was always shut and any access to the Dean's office was through an adjoining sec-

retary's office, with the secretary as gatekeeper. So as a graduate student before Lin's time, I had very little interaction, if any, with the Dean (I can't even remember seeing him). I remember the buzz about the arrival of the new Dean, an athletic looking man with a full head of white hair. However, as a graduate student I thought little of it since, as the Who sang, "meet the new boss, same as the old boss." But these expectations were quickly dashed. Soon after Lin took over as Dean, I would notice the door to the Dean's office that opened to the hallway was occasionally open, wide open, with Lin often at his desk, at times with his feet on it. I don't exactly remember how it all transpired, but I eventually found myself in his office talking about something networks or something windsurfing or something Hawaii, since both of us had spent time at the University of Hawaii. Here I was, a graduate student having conversations with the Dean across a whole range of topics, and not just once, but regularly. I could not have fathomed at the time how unique this really was for a broad range of reasons. A particularly memorable discussion in his office centered on the validity and reliability of respondent's self-reports of social network interactions. Russ Bernard, Peter Killworth, and Lee Sailer (an Irvine graduate) had just come out with the first of a series of papers on the problem of informant accuracy in the collection of social network data. I remember a number of lively discussions about the topic with Lin and they were incredibly stimulating. Lin would talk about things with conviction and passion and with a style that I would, over the course of my academic life, try to emulate. These discussions about informant accuracy, not just with me but with many others, led to, in my mind, an exciting intellectual period examining many aspects of informant accuracy that contributed to not only breakthrough's in social network analysis, but also in the study of culture. Over time the open door was not just limited to Lin's office. Eventually the door to Lin and Sue Freeman's house was also open to me. Often when I was in Laguna, where they lived, I would stop by and talk with both Lin and Sue. Their hospitality and mentorship extended well into my academic career. In retrospect both Lin's and Sue's kindness and mentorship was a gift.

I am now a full professor at a research one university. I often walk by the office for the Dean of The College of Arts and Sciences at my university. Despite my advanced status, the Dean's door is not open. Lin's open doors are a testament to his character and uniqueness, and a vivid reminder of the human being he was and will always remain in my memory.

Forever connected: Linton C. Freeman

Alaina Michaelson Kanfer



I first met Lin in the summer of 1984, at a new graduate student picnic when Sue Freeman, his wife, ran up to me, grabbed my arm, asserted "you belong with us," and pulled me over to meet Lin. They were partners; in networks, in science, and in life. That is how I experienced Lin and Sue. And that is how they mentored me, at UC-Irvine and beyond.

When Lin was getting impatient for me to finalize my dissertation topic, I simply could not choose. Should I contribute a methodology for role analysis following Lorrain and White, or should I investigate the how social relationships impact the diffusion of innovations in the spirit of Ev Rogers? Sue listened patiently and proposed the perfect solution: why not do both? Aha! The role of social relationships in the diffusion of a scientific specialty, specifically, role analysis. Thank you, Lin and Sue, for helping me crystalize my lifelong interest in the sociology of science.

While he was simply "Lin" with his doors open, and feet on the desk in his Social Science Tower office at UCI, I saw him transform into Linton Freeman the elegant speaker at the Sunbelt conferences. In his dress beach clothes (long pants and shoes – sandals) he would saunter into a large packed meeting room. With a booming voice, and piercing eyes that softened into an impish grin he would take the spellbound audience along with him on his intellectual journey to construct a definition, devise a method or discover an answer. Lin was a consummate story-teller.

Lin was a great teacher. He could take any task or idea, break it down step by step and communicate it. He was such a good teacher, in fact, that he could take a city-girl from the Midwest, with no athletic ability, and teach her how to race in windsurfing regattas! He would explain how to prepare a meal – kung pao chicken, Korean kalbi, Osso Bucco – with the same precision and enthusiasm as explaining betweenness

centrality. To this day I cannot peel a tomato in boiling water without thinking of Lin.

I think Lin's skill at teaching stems from his love of the subject, a genuine desire to share, and his focus on simplicity. A simple answer. A simple explanation. Any complex idea could be broken down into simpler steps. Lin asserted that the only reason math appears confusing is because the teacher is making it confusing. His explanation for that: Either the teacher doesn't understand it, or even more nefarious, they make math sound confusing so they can appear smarter! I had the privilege of witnessing clear math communication when I was Sue's teaching assistant. This was a required course – statistics – and students voluntarily filled the social science lecture hall. They listened, they learned and they enjoyed.

Learning to windsurf was so much more important to me than I imagined. By including me in their beach culture, Lin and Sue modeled a good “work/life balance.” Never missing an opportunity to study a network, we perfected participant observation data collection on the beach; social networks among windsurfers! But looking back, the most important part of windsurfing was the time it gave me with Lin, driving to and from Dana Point, Doheny Beach, or on more ambitious days, Mission Bay in San Diego. During those rides we talked about everything. Lin regularly gave me mini-lectures about his views on how a social group is defined by proximity, similarity, and common fate which he learned from Don Campbell at Northwestern. He was fascinated with the work of Eleanor Rosch on cognition and categorization and spent quite a bit of time trying to figure out how her results translated to social networks. We also talked about the world. About the human race and scary things like nuclear war. Lin reassured me that with every step we take backward, we take two steps forward. This belief has helped sustain me throughout my career as I found myself at the epicenter of revolutionary new technologies, such as the Internet browser and social media, and now genomics, which have the potential for bad, and good. I think Lin was an optimist.

As opinionated, and obstinate as Lin appeared, I knew him to be extraordinarily open-minded. He thought I was crazy when I talked about the sense of smell in networks, however, every few years he sent me an article or book implicating olfaction in networks among human and other creatures. The scientific journals in which he chose to publish is a testimony to Lin's intellectual range, for instance, *Journal of Social and Biological Structures*, *Brain and Behavior Science*, *International Journal of Man-Machine Studies* as well as classics like *American Journal of Sociolo-*

gy and *American Anthropologist*, garnering well over 40,000 citations to date according to Google Scholar. All this while he was establishing the journal *Social Networks* as a conscious effort to transform the field into a normal science.

When my life and career veered outside the inner circle of social networks, Lin and Sue's genuine interest in me, my family and my work never waned. Recently, in response to my email updating them on my role at the Carl R. Woese Institute for Genomic Biology, Lin wrote to me, “glad to hear you are still learning. That's my favorite activity.”

Clear thinking, open mindedness, optimism, work/life balance, and a love of learning, especially when it comes to science. This is what I learned from Lin Freeman, my advisor. I am thankful to him and to Sue for their mentorship and friendship, and I am thankful to the Social Network community for this opportunity to reflect and share.

Lin Freeman was my mentor

Steve Borgatti



I started graduate school (UC-Irvine, School of Social Sciences) in 1978 to study cognitive anthropology. After a couple of years, I left school to work at a consulting company (selling “cultural services”), then moved to a more conventional marketing research firm, and then came back to school. When

I came back, everything was different. The Freemans had arrived. I didn't take to them right away. They seemed almost too magnificent. It was like having a King and Queen of the School of Social Sciences. And it bothered me that during presentations, they would keep scanning the audience instead of fixing their full attention on the speaker (Little did I know that, just a few years later, they would publish a terrific paper (Freeman, Romney and Freeman, 1987) based on attendance at colloquium).

Things changed when I moved to an office on the 6th floor of the Social Science Tower, where Lin's office was located. His door was always open, and there were always people in there, if not forming a cluster at the door. Often the discussion took the form of a debate and was about something scientific, for lack of a better word. I remember at least two days of discussion about discrete versus continuous models of social reality.

Even though I loved cognitive anthropology, over time, my dissertation became wholly networky, and my advisor Kim Romney booted me over to Lin. Lin was an intense mentor. He had very strong views (or, at least, very strong expressions of views). For example, I remember him telling me in no uncertain terms that no student of his was going to read mainstream sociology journals: they would rot your brain and cripple your thinking. I was also never to use LISREL – a substitute for thinking. And when I said something he didn't like, he would say NO! with a very expressive combination of hurt, disbelief, and exasperation in his voice. He really cared about what you said and did not tolerate bullshit.

Lin never talked to me about my career. He didn't tell me how to get a job, how to prepare to be a professor, how to review a paper – anything about the professional side of the business. What he did do was try to develop me intellectually. One of his mentoring techniques was to ask me to look at a measure and see how it related to other measures. The first one he asked me to do was Robinson's A, which I spent a week analyzing. Another was his own segregation measure S. These exercises were invaluable because they taught you that there are underlying grammars to measures, and obvious locations where different options may be taken. They taught you to see underlying similarities and differences.

Lin once told me with some passion that the most important distinction in social network analysis was R.H. Atkin's distinction between backcloth and traffic. So I read Atkin (1974) and didn't understand a word of it. But the distinction and the weight Lin placed on it stuck with me. I now realize that several of my best papers are essentially elaborations of that distinction.

What I loved most about Lin were his presentations. There are a lot of great speakers in our field, but Lin was amazing. He had an incredible voice and physical presence, and he had a mesmerizing story-telling style. I used to sit in on his undergraduate networks class just to hear him tell the foundational tales of our discipline. I especially loved his truly dramatic reading of the Bavelas-Leavitt experiments. But more than that, a wonderful and important thing about Lin was that his conference presentations were exactly like his classes. The objective was always to explain an idea. Obfuscating, dressing up, over-complicating, name-dropping, reifying, over-promising and p-hacking were simply not part of the equation. Many of his talks would begin with a simple observation and start drawing out implications that had gone unnoticed – like a forensic pathologist saying 'do you see this line here? That could only have come from a large weight attached to the other side of the body [...].'

I thank Lin for my career, including everything from the long arm of his social capital to his wax-on wax-off attempts to get me to think deeply and not just sufficiently. Lin Freeman was my mentor.

In memoriam: Tribute to Linton Freeman

Russ Bernard



My introduction to Lin's wonderful eclectic scholarship goes back to 1963, when I was a graduate student of anthropology. I was fascinated by the possibility of using cultures as units of analysis in a statistical study. And so, my introduction to Linton Freeman's work was his 1957 article on using Guttman's method for scaling societal complexity

and then his 1965 book, *Elementary Applied Statistics*. In 1972, when I was working with Peter Killworth at Scripps Institution of Oceanography, in San Diego, I heard about some conferences on network analysis being held in Hawaii by Linton Freeman and realized that was the same Linton Freeman who had written my stats text. Later that year, I went to West Virginia University, in Morgantown and a year later, the Mathematical Social Science Board of the Social Science Research Council funded my proposal to hold a conference on social network analysis at Cheat Lake, West Virginia – a sylvan, idyllic spot near the university. I was thrilled when Lin accepted my invitation to the conference. By then, Lin was teaching at Lehigh University in Bethlehem, Pennsylvania, about 300 miles from Morgantown, having recently arrived from Dalhousie University in Halifax, Canada.

And why was Lin in Halifax? Because, as Lin explained it to me, after four years of living in a leasehold bungalow on the water in Hawaii, he had no pension and he and Sue had no house. He accepted an endowed chair at Dalhousie and then another at Lehigh within a year. He was, he said, edging his way back to Hawaii.

In December 1978, I attended a conference in Hawaii that Lin had called at the East-West center on the campus of the University in Honolulu and learned that Lin was still trying to get back there. He took several of us out on a Hobey Cat and steered it close to the shore, so we could all see the house he and Sue had lived in while he was at the university there. I still laugh

every time I remember that scene: Lin waxing poetic, going on about living on the island, water sports, and social networks. In 1979, he and Sue managed to get to California ... only about two-thirds of the way back to Hawaii from Halifax, but they did manage to get a really nice house.

I miss Lin's wit and his impatience and his unrelenting enthusiasm for science and for passing it all on. Lin was an inspiring teacher and he never stopped teaching. Even now.

Linton Freeman – The networker

Barry Wellman



Lin Freeman was always at Sunbelt Social Network conferences – and always visible – he invariably stood in a central spot outside the meeting rooms schmoozing with whoever came along. I used to be annoyed at Lin because he never, ever came to hear one of our team's talks. But then I realized that he was doing what he did best – networking with everyone – and mysteriously, he knew what everyone was doing, from his central spot in the hallway.

It is only as I write this remembrance that I realize that Lin's key scholarly writing professed what he practiced. He was between us all – at the Sunbelt, on Socnet, and in-person. His most cited scholarly articles by far are about "betweenness": "Centrality in social networks conceptual clarification" (1978) has 13,862 cites (September 18, 2018), followed by "A set of measures of centrality based on betweenness" (1977) with 6,896 and the later (1991) "Centrality in valued graphs: A measure of betweenness based on

network flow" – coauthored with Steve Borgatti and Doug White – with 996. And the second biggest citation is to various forms of the UCINET software (developed with Steve Borgatti, Martin Everett) and others that help us to discover betweenness, et al. among our research subjects.

Lin was a networker from before the instant when I first met him. In the early 1970s, he and his wife/partner Sue Freeman organized an NSF-supported online network of about a score of social network scholars: a listserv before there was such a thing. It turned out we didn't have much to say to each other on a daily basis, but Lin and Sue were smart enough to organize an in-person meetup at his then-home base of Lehigh so we all bonded in-person as well as online – just at the start of the self-conscious development of the social network movement. Then, until their sad recent passing, Lin and Sue were a great team – thinking, organizing, and playing together.

While the NSF experiment nicely foreshadowed the internet, Lin's two foremost accomplishments were just beginning. Those at UC Irvine can tell you about Lin's relentless leadership in forging a strong social network analytic movement there.

But to my mind, Lin's even more important legacy was his lead in the mid-1970s in founding and editing our *Social Networks* journal. He thought of it and secured the contract with Elsevier, when social network analysis was scarcely known. Importantly, Lin lead the way in defining the journal as a broad journal of "structural analysis" – connecting theory and substance with the methodological innovations that social network analysis is sometimes limited to. Betweenness was not a measure – it was a way of thinking.

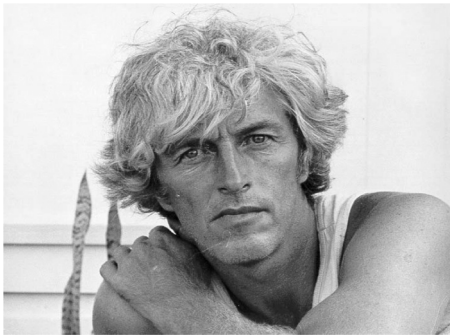
Lin's work was a key to the mid-1970s transformation of social network analysis from a vague movement to a coherent program. It was part of a triad: Lin and the journal working separately but together with Russ Bernard and associates founding the annual Sunbelt Social Network conference, and Bev Wellman and I founding INSNA – the International Network for Social Network Analysis. Lin gave his passion to linking social science with mathematics in thinking about social networks. A deep networker, he developed and linked the ideas and people that have helped to define our field broadly and move it forward. And he was a strong supporter of colleagues such as Steve Borgatti, Katie Faust, and Stanley Wasserman as they developed the methodological vocabulary and tools to enable systematic research.

I close with a characteristic story: one night the phone rang with Lin on the line. "It turns out that our founding mother, Elizabeth Bott, was raised in Toronto

by interesting parents. Could you help me find out more?" Yes, I could and the results are in our only written co-production, "A Note on the Ancestral Toronto Home of Social Network Analysis" – in which we showed that young Elizabeth Bott was the first child to wear a snowsuit (Connections 18, November, 1996: pp. 15-19). This was mostly a Lin show, and it was a treat to work with him. He was a lover of life, ideas, windsurfing, food, mentoring – and ideas. Bev and I fondly recall seeing him at the Sunbelt – networking in his vividly-colored shirts. "Let's be serious – but casual," Lin would say – and role model.

Right man, right time

Ron Burt



Lin Freeman was a man of generosity and scientific elegance who found his time. That he no longer walks this earth is a knife to my heart. I am grateful to Katie Faust and Carter Butts for crafting their broad appreciation of Lin. There is left to add only our idiosyncrasies. I highlight two by which I learned to distinguish and admire Lin.

I was first struck by Lin's generosity. I met Lin in the late 1970s, when I was a new Assistant Professor and he was a Senior Professor at Lehigh University. As Lin describes in his *Development of Social Network Analysis*, social network analysis (SNA) in the 1970s was fragmented, wide open for the application of alternative points of view. It was exciting, but it was also lonely.

Lin provided a sense of community. Lin drew you into intellectual challenges that engaged your mind in the company of others similarly challenged. Lin didn't give you a membership so much as he brokered connections between people likely to find one another engaging. The sense of community emerged as a by-product of shared intellectual engagement. Lin did this through his teaching (ask David Krackhart how he got into network analysis), through his conferences (from which I retain so many memories of friendships

emergent), and through his journal, *Social Networks*, and his concomitant early work on bits of software that became UCINET. I was among those who argued with Lin against creating the journal (I and others preferred the goal of taking over a mainstream institution to assert the legitimacy of SNA). At the same time, Lin and I were discussing computer subroutines and I argued that it would be better to have special-purpose software targeted for substantively successful kinds of analysis versus generic software that did a little bit of everything (personal computers were smaller back in the day – my first network software for a personal computer ran on an Osborne).

What I missed in my arguments was the important role that a journal and software would have in creating a sense of community. Outside a few people associated with prominent university centers, social network analysis was a fugitive enterprise in the 1970s. I, like so many others, felt that we were on the outside looking in. And I, like so many others, found intellectual community around Lin Freeman. It was a perfect example of an invisible college network – people connected indirectly through their strong admiration for a central figure. Perhaps Lin had a such a good feel for young fugitive scholars perhaps because he had spent much of his own career on the edge of the mainstream. This is what I meant by Lin finding his time. At the same time that Lin brought community to social network analysis, SNA gave Lin a community to lead. To my mind, there is currently no scholar in SNA with Lin's generous charisma, but it is also true that SNA is no longer the fugitive enterprise it was, in need of the charisma Lin brought to us. It would be difficult for a guru to pull together today the community that Lin successfully created back in the day. Lin and SNA met at a time when each was a blessing to the other.

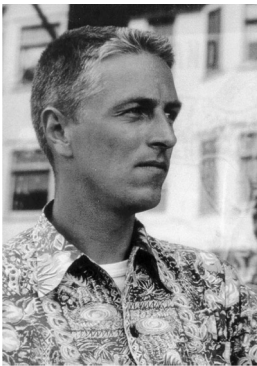
The second of Lin's qualities that stays with me is his scientific elegance. He had a taste for simple, replicable prediction. He admired it in others, and took me to task when he (often) found it absent in my work. Discussing explanations with Lin took me back to my undergraduate courses in the natural sciences. The touchstone work to which I often return is Lin's initial proposal for his "betweenness" index (about half of the 42 thousand Google cites to Lin's work are to his betweenness index – which indicates the importance of his index at the same time that it indicates Lin is equally recognized for diverse works other than his index). In a 1977 issue of the American Sociological Association's social network journal, *Sociometry*, Lin proposed a measure of the extent to which a person brokers connections between others (i.e., stands "between" others). The proposal is simple, elegant, but

Lin goes on to show how his proposed index does a more consistent job of predicting in a classic study the key outcome for which a more familiar measure had been used (picture of Steve Borgatti). One would like to believe that routine practice involves simple argument combined with evidence of improved key prediction in comparison to prior measures. It is not routine. It is rare. Most network measures are proposed in complicated text, with no more empirical evidence than numerical illustration of how to compute the measure. Lin's (1977) proposal is an exemplar to which I return from time to time when in need of an aspirational goal.

I learned of Lin's death when his daughter, Stacey, responded to an email message I sent to Lin asking about a convenient time to visit. Upon hearing the news, I stopped what I was doing and stared at my desk for a long while, my world a darker, colder place. He will forever walk with me a silent partner – likely telling me I could do better.

A tribute to Lin Freeman

Pat Doreian



When thinking about Lin, my thoughts follow three distinct but interlinked strands. The first centers on friendship. The second features issues related to the social organization of research fields. The third strand concentrates on doing network research. I write about all three in this order while thinking about Lin and his many contribu-

tions to my life, the nature of the social networks field, and the brilliance of his academic contributions.

Friendship

On a personal level, having Lin as a close and great friend for such a long time enriched my life immensely. When Lin formed friendships, he remained committed to these relationships and provided constant support. I am sure many others have experienced this as well.

But in writing about Lin as a friend, it is impossible to not fully include Sue Freeman. Together, they formed a fine couple living a rich and full life. Together, they provided a kind of role model worthy of emulation. Esther and I rented apartments with them in Paris on multiple occasions as well as a house on

Oahu in Lin's beloved Hawaii. These were times of immense fun involving discussions about life – both social and regarding research issues, the places where we were, good food and fine wine. When Lin did things, he went 'all in' when doing them. It did not matter if this was downhill skiing, wind surfing, or cooking. He excelled in all three – as well as in doing coherent and influential research.

Lin did not care much about dealing with finances or real estate, tasks Sue handled with aplomb. They had a nice division of labor in organizing their lives. Both were forceful individuals. As noted by others, Lin had firm views and held them with passion. He could change his mind on an issue and hold firm to an opposing view with equal vehemence. Yet he would argue his side with humor and grace. He could listen to other views without wanting to be dominant. Despite his many accomplishments, I never saw any effort at self-aggrandizement on his part.

Social organization of the social network field

Others have noted that he founded *Social Networks*, the premier journal of the field, and edited it for a very long time. He had a clear vision for the role this journal could play as a venue for publishing important work and how it could help to define our field. Especially important was the breadth of his commitment to encouraging interdisciplinary work across multiple fields. Disciplinary departments tend to be insular turf-protecting machines designed to keep within narrow definitions and strong exclusives impulses. Lin would have none of this. Put differently, he was catholic in encouraging multiple approaches and different ways of doing research so long as it was rigorously defined within sound research designs.

Both Lin and Sue were socially active at the annual Sunbelt Social Network conferences both in sessions and, more importantly, outside sessions when a lot of ideas are generated in free-flowing discussions about our field and potential future directions. I look back fondly at Lin 'holding court' as these Sunbelt gatherings, especially as they grew larger. He would sit in some public area. Others would be drawn to talk with him, learn from him, and enjoy his company.

His creation of the NSF Funded Electronic Information Exchange System (EIES) experiment with a gathering of researchers also helped define the emerging field. Currently, we take for granted the free flow of information on the Internet. But this experiment was in the early days of this form of communication. Even though we exchanged messages at an incredibly slow baud rate, we had a sense of the

future thanks to another aspect of Lin's vision of what could be done.

Lin's contributions to the social network literature

My idiosyncratic career path from mathematics to social science in England meant that my entry into the social network field had nothing to do with Lin! Indeed, in the late 1960s I had not even heard of him. I was busy trying to generalize many of the theorems characteristic of the early work done at the University of Michigan and associated with the work of Frank Harary and Doc Cartwright, among others. I did not meet Lin until the EIES gathering mentioned above. In many ways, I wished I had met him earlier.

Without doubt, some of his most influential, and highly cited, work dealt with centrality. Others are better placed to comment further about his contributions in this realm. I was struck particularly by the clarity of his articulation of some different conceptions and formulations of this concept. Until he brought such clarity, the concept had been rather fuzzy and was used sloppily. He was clear about the substantive meaning of these different concepts and the importance of selecting the one most appropriate measure given a specific research endeavor. I am sure that he would be appalled by the impulse of so many to compute a lot of centrality measures without thinking through the rationales for using them.

Here, I will focus on only two productions involving Lin. Early on, Norm Hummon and I were developing methods for citation networks that have become known within the rubric of 'main path' analysis. Lin had collected the citation network for 20 years of the centrality literature. With characteristic generosity, he gave us his data. We analyzed them and sent him a draft of a manuscript. He wrote a paragraph that led him to becoming a co-author. It was a (positively) sobering experience for us. We had some neat results, but he transformed them with a deeper understanding of the broader context of this area. He turned a good paper into a very good paper and, critically, forced us to broaden our perspective. It was one of the most valuable lessons he taught us. No doubt, students fortunate enough to have had Lin as one of their faculty members will have experienced many such learning experiences.

The next study featuring Lin and Sue was about informant accuracy (or inaccuracy) developed by Russ Bernard, Peter Killworth, and, later, Lee Sailer. By questioning the quality of the typically collected network data, this line of research rattled many cag-

es. While some responded with irritation or a sense of foreboding about collected social network data, Lin responded in a typically deeper fashion. The design of Lin and Sue's study was pure elegance. Attendance data for a long running seminar at Irvine were collected. Following one session, with a time lapse, the participants were asked about who was there. Of course, there were errors in the form of forgetting some who were there and claims that some not attending on that occasion were there. By considering the social organization of the seminar and the programs from participants came, both types of error could be accounted for. It was another example of considering a broader context to understand the operation of social processes to generate deeper understandings of social life.

On the future

My stating that I will miss Lin and Sue greatly counts as a total understatement. No doubt others will share this sentiment. The creation of the set of tributes in this volume testifies to this. The nature of our field was shaped indelibly by Lin, in terms of his clear vision as to what was possible for doing social network research, his ability to organize events critically important for our field, and the great support he gave to so many of us. We must continue to do quality research for this is the only way forward for our field. Perhaps more importantly, this work will be inspired by his acumen and a sense of standing on the shoulders of Lin as a giant in the field.

Lin Freeman is science

Elisa Bienenstock

In my mind and memory, Lin Freeman is Science. When I think of Lin, I think of the scientific method. Not because I took Research Methods from Lin, I did not. For me, Lin personified the promise of science. My contact with Lin was sporadic. When I met with him some things were constant, and others were not. There was a persistence of curiosity, energy, humor, kindness and generosity. What differed were the theories he passionately espoused about the way the world worked. At any point in time Lin enthusiastically and emphatically would argue in support of a position on one or another topic (from coffee to methods), and then a short time later, I would find he had abandoned or updated that view. New data, new evidence, new measurement demanded an update. Lin easily eschewed that which "was not supported" by reason and data and revised his theory. Lin had no conventional

biases. He did not presume based on sex, race or any other “sociological” variable associated with personal characteristics. Lin evaluated everything and everyone based on the data presented to him. Not constrained in his search for knowledge, Lin would seek out any data and master any method to answer a question or solve a puzzle that enticed him. This made Lin the ideal teacher, researcher and mentor. It was obvious that for Lin science was not a vocation. Lin lived, loved and embodied science. Thoughts of Lin evoke thoughts of the beauty and promise of science done right. For me, when I think “science,” I see Lin.

Freeman dependency and distance

Ulrik Brandes



Lin Freeman was, quite literally, a towering figure. While others are infinitely more qualified to give personal accounts of their interactions with him, for me he symbolizes my relationship with the social sciences.

I was trained as a computer scientist and specialized in algorithmics. As a

doctoral student in the 1990s, I regarded the social sciences in general, and Lin’s contributions to the peculiar science of social networks in particular, as highly interesting but only mildly impressive. In the absence of deep mathematical concepts and challenging proofs, it seemed that a bit of extra reading and learning a few names and ideas would suffice to be able to contribute to the field of social networks like the pros.

Little did I know.

In Michael Ende’s children’s book *Jim Button and Luke the Engine Driver*, a Mr. Tur Tur appears as a giant from afar and the closer you get the more he shrinks to what eventually is a rather normal person. The opposite was the case with Lin and his work: to the contrary and to this day, he has grown bigger and bigger the closer I got to grasping where the issues even started.

Lin, I have come to realize, had thought through many of these issues, albeit decades ago. His appropriation of mathematics was often ahead of its time, however, so that we have yet to give birth to ideas that in retrospect will turn out to be conceived already in his work.

In a last article he saw published in the journal he founded and shaped, we, with Steve Borgatti, picked up on one such idea from a quarter of a century ago.

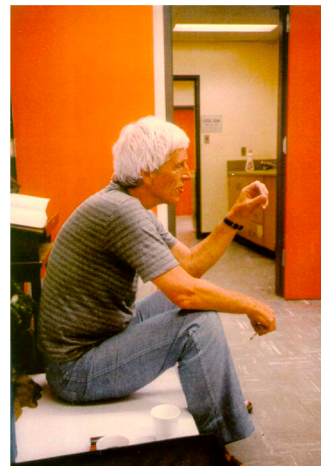
While the associated 1980 paper has been cited fairly, I dare say rarely for its most important aspects, including by myself. Two concepts involved in this work, an asymmetric dyadic relationship indicating the degree to which an actor depends on another to reach the rest of the network, and a closely related notion of distance in terms of the average number of intermediaries on shortest paths (think weighted networks!) are essential in linking two of the most important centrality indices, betweenness, (which Lin introduced) and closeness (for which he gave crucially distinct interpretations in terms of efficiency and independence).

Our conversations were confined to Sunbelt and email but I will remember him as having an aura of unassuming depth and open-minded firmness. His approach to interdisciplinarity was not one of lecturing about the things he knew better. His rigor was of a different kind than is known to those trained in the exact sciences. It is thus easily underappreciated, and yet so much more convincing and inspiring when you admit of it.

I will be grateful for the example he set, and my way to honor him will be to refer to the relations mentioned above as Freeman dependency and Freeman distance.

Thoughts on the passing of Linton Freeman

David Krackhardt



Perhaps no one is more responsible for me pursuing a career in studying social networks than Lin Freeman. The story of how I took up the challenge to use network analysis to study organizations is a bit strange, but exemplifies Lin’s role in many of our lives. He was a true intellectual, one who thrived on discourse, even argu-

ment, but with serious curiosity and respect. He didn’t suffer fools lightly, but he did engage, even when you might disagree with him. My background was organizational psychology; his interests lay in sociological explanations. My training emphasized applications, deriving practical solutions to managerial problems. He preferred science for its own sake. He often told me that social science was not mature enough for us to be

making sound judgments or conclusions about complex organizational problems. Social scientists should spend our efforts, he would say, focusing on sound and basic research into fundamental human behavior questions. Applications were better left to consultants or other pretenders. Despite these differences in perspectives, he seemed to enjoy my company and our conversations about such issues. He never insisted that I adopt his view on these partisan topics; rather he seemed to thrive on the discussions because of these differences. I always felt respect from him, even liking, in spite of views that diverged from his, and despite the fact that I was clearly a kid just beginning in my chosen field and he was an established, eminent scholar in his. His support and guidance were key to my converting from a student of job attitudes to the study of social structure in organizations.

My conversion was not gradual, but almost Road to Damascus-like, and it is due to both his kindness and intellectual enthusiasm. The particulars are revealing about Lin as a scholar and as an inspirational leader in the field. By 1980, I had spent four years in a PhD program as a research assistant to Lyman Porter, a renowned organizational psychologist who published regularly in the most prestigious APA journals. My dissertation proposal, fully supported and accepted by my committee, was to study attitude changes in junior auditors as they joined and were absorbed into one of the large professional auditing firms in Southern California. There were eight big auditing firms in the area I could choose from to study. One by one, however, they turned me down, until only Arthur Anderson was left. My contact at Arthur Anderson, a senior partner at the local office, was enthusiastic about my proposed study, saying that the firm could gain important insights into how they bring along young employees into the AA professional fold. I called my contact at Arthur Anderson to tell him that he was the winner that I had decided to go with their offer to study them. He then gave me the calamitous news: "David, our lawyers won't let you come near our firm or our new employees to study them. Apparently, there is too much liability assumed by the firm with such an arrangement." I was devastated. My career plans, all my aspirations, my whole life went out the window with that phone call.

The Graduate School of Management at Irvine, where I was a student, occupied the 3rd floor of Social Science Tower. The top floors, floors 4-7, contained the School of Social Sciences, which in those days was an interdisciplinary array of scholars with no departmental structure or affiliations. Having just got off the phone with Arthur Anderson, I was in a sorry, depressed state. I entered the building on the ground

floor, walked into the elevator, not sure what I was going to tell Porter, my advisor. For some reason, one that I cannot begin to recall, I failed to push the 3rd floor button on the elevator and instead pushed the button for the 7th floor. I don't recall doing that; all I recall is that when I stepped off the elevator I was in unfamiliar surroundings, wondering where I was. No one was on the floor, except a tall gentleman with shocking-white hair, wearing sandals and a flowery short-sleeved shirt (it was January). He looked at me, probably noticing that I was lost and confused, and said kindly, "Can I help you?" I had never met him before, but I recognized him from pictures I had seen. He was the Dean of Social Sciences, Linton Freeman.

I was embarrassed. I didn't know what to say in response to his question. I couldn't just tell him, "Oh, I'm sorry, I pushed the wrong button on the elevator. I meant to go to the third floor." So, instead, I just made something up on the spot. I said, "Oh, I came to see you. Someone told me I'd be interested in your research." An avuncular smile came over him, and he invited me into his office (corner office, with a great view). He spent the next one and a half hours telling me stories about network analysis and how this perspective is different than the one I was likely to have on social phenomena (he was right about that). At the end of that session, he suggested that I sit in on a PhD and faculty seminar he and Doug White were running together. He also mentioned that Harrison White would be sitting in on the seminar, too. I had no idea who any of these people were, but I certainly had nothing better to do, so I decided to take him up on his offer.

At the first day of the seminar, Lin handed me a type-written carbon copy of a book manuscript. There was a magical twinkle in his eye when he said, "Here, you're an organizations person. This is a book written by a young sociologist who studies networks and organizations. Your job is to read this manuscript and tell us what it says." When you have to explain the contents of a new book to a room full of experts, you read the book very carefully. It was Ron Burt's first book, *Toward a Structural Theory of Action*. Chapter 2 contained a succinct yet detailed history of various constructs in the field of social networks. Chapter 5 emphasized the importance of perceptions of networks. Light bulbs went off as I read it. Page after page, I could see these ideas could be very useful in the field of organizational behavior. Indeed, I came to see that almost everything we study in OB could be looked at anew through this network lens. Moreover, there were questions that we had never even thought about asking that could be researched from this network perspective, questions that would give

us new insights into the organizational phenomena that we care about in our overtly psychological field. I abandoned my old dissertation plans and developed a new proposal to study the effect of employee turnover on attitude change in fast food restaurants as a function of the network structure in the restaurant. I've been doing social network studies in organizations ever since. All because I pushed the wrong button on the elevator.

It has been nearly 40 years, but I recall vividly many of the details in this story, especially Lin's words and that "magical twinkle" in his eye when he handed me Ron's book. Did he know that this book would have such an effect on me and my career plans? I don't know. What I do know is that he never stopped engaging me, inspiring me, comforting me in rocky times over the years. I will miss him, his challenges to my way of thinking, his support, his friendship.

Intellectual lineage: A grandson and a son reminisce

John Skvoretz and Tom Fararo



A remembrance of Linton Clarke Freeman in which, first, the grandson, John Skvoretz, narrates how he came to be Lin's intellectual grandson and then the son, Tom Fararo, reminisces more expansively about Lin's deep influence on his life and career.

The first time I met Lin turned out to be extremely consequential for me, resulting in my becoming his intellectual grandson. I was a senior at Lehigh University double majoring in Mathematics and Sociology. At the time the two disciplines were but vaguely linked in my mind. I liked math because its problems had answers in the back of the book and I like sociology because its problems had no answers anywhere in the book. That the two could be put together in something called mathematical sociology was as yet unknown to me.

The occasion of Lin's visit was a colloquium. I think he was invited by James McIntosh, a former colleague at Syracuse, and it may have been the initial overture to his recruitment as chair of the Lehigh department of Social Relations. In any event the talk he gave had as its theme how mathematics could be used to improve concepts and theories in sociology. The example I remember most vividly was based on residential segregation. Lin proposed a method of measuring residential segregation that compared the observed boundary around a set of minority households to the length of the boundary that would occur by chance, that is by the random scattering of m minority households and M majority households over a stylized housing grid. The mathematics came in to calculate the expected length of the boundary and variation in that quantity due to chance. As I recall what struck me the most was Lin's point that this approach not only served to measure segregation as commonly understood – when the observed boundary was significantly smaller than expected – but also its polar opposite, regimented integration, when the boundary was significantly larger than expected.

So with a fired-up imagination I hung around after the talk and spoke with Lin, telling him about my background and my interests. He advised me to check out a young professor, Tom Fararo, at the University of Pittsburgh to see about working with him for my graduate education. At the time I did not realize that Lin was Tom's dissertation supervisor. So a friend and I took a day off and hitchhiked across Pennsylvania on the PA Turnpike, he to visit the Physics Department at Pitt and me to visit Tom. Well, long story short, I enrolled at Pitt in 1969 and finished a dissertation under Tom's supervision seven years later. And that is how in 1976 I became one of Lin Freeman's intellectual grandchildren.

And now the son, Tom Fararo, shares his memories.

I first met Lin in 1960. He was 33, an Assistant Professor in the Department of Sociology at Syracuse University. I was 27, a graduate student at Syracuse in a program leading to a degree called Doctor of Social Science.

Unlike Lin and John, I had not been an undergraduate major in sociology but in history and political science, with no background at all in research methods and statistics. Nevertheless, looking for income in the upcoming summer of 1960, I applied to be an assistant on a research project dealing with community power structure, a lively topic in both political science and sociology at that time. I was hired by Lin – after a very pleasant interview – and worked closely with him not only that summer but for a number of years beyond that.

Working with Lin was a transformative experience. I had brought to the project an interest in the history and philosophy of science but now I was doing science. By mid-summer, Lin made me an offer: switch to the sociology graduate program and continue to work with him as a research assistant. It was an easy decision to make and one that shaped the remainder of my academic life.

In the following academic years 1960-62, Lin taught a number of courses I attended. As a teacher, he was a model of logical organization and clarity. About that time, he began work toward his book *Elementary Applied Statistics: For Students in Behavioral Science*. I believe I read and commented on a draft and years later, when I stepped in to replace the usual teacher of statistics at Pitt, I adopted Lin's text. It was the only time I ever taught statistics during my career. It was a very gratifying experience both for me and for the students, thanks to the sophisticated and lucid way that Lin presented the material.

Following his advice, I looked beyond the department of sociology for further research-relevant course work, in particular taking courses in the psychology department, including social psychology and some quantitative courses, in particular factor analysis because Lin had figured out a way for us to use it in the data analysis phase of the project. I also attended Lin's course on the use of computers in social science research. He and I spent many hours at the university computer center watching the flashing lights on an IBM 650, a bulky early desktop computer.

Eventually, as we concluded the data analysis, Lin asked me to write a first draft of a paper to be submitted to the *American Sociological Review*. It was quite an honor! I gave it my best and waited for his reaction. Ouch! What happened to my draft? He had produced a completely new paper in his distinctive crisp style that covered all that was needed to receive strong referee reviews that led to publication in ASR in 1963, "Locating Leaders in Local Communities: A Comparison of Some Alternative Approaches." Naturally I was very pleased when he included me as a co-author, but all the credit goes to Lin when I mention that the paper was quickly reprinted in at least seven compilations of papers in political sociology. The last that I know of appeared in 1971.

Eventually I had to define and pursue a doctoral thesis project. There was an opportunity to draw upon the community power structure data and so to deal with a problem we had faced at the data analysis phase. Namely, a great deal of our data was similar to sociometric data and yet more complex. Much of the analysis was done using factor analysis, later

described in Lin's 1968 monograph *Patterns of Local Community Leadership*.

At about that time, in late 1961, Anatol Rapoport and William Horvath published their pioneering paper "A Study of a Large Sociogram" in *Behavioral Science*. In his 2004 book, *The Development of Social Network Analysis: A Study in the Sociology of Science*, Lin includes a short discussion of the Syracuse project, nicely summarizing how it emerged (pp. 111-112). I think he is correct when he writes there that he "leaned on" me to use the Rapoport model in my dissertation research.

Accordingly, during the summer of 1962, after studying Rapoport's papers in the *Bulletin of Mathematical Biophysics*, I wrote to him about my dissertation project (I can't recall if I consulted Lin before doing so, but it is likely that I did). Rapoport shared with me some of his recent work, including a revision of the biased net model that he and Horvath had constructed in their study. The term "net" was used in the *Bulletin* papers and "bias" referred to parameters that were proposed to explain departures from a random net model.

The Syracuse interviews had generated an enormous amount of relational data, but it was organized around participation in 39 community decisions. My dissertation, therefore, had to be a compromise: I would apply a biased net model to the largest of these decision sociograms even though they were nowhere near as large as the sociogram analyzed by Rapoport and Horvath. Nevertheless, Rapoport encouraged me to go forward with the project, as did Lin.

When I presented Lin with what I thought would be the first draft of the thesis, I expected to get back a manuscript with his critical remarks and questions throughout. I even wondered if he might suggest a complete revision. A week later, I was standing before him as he sat at his desk when he returned the manuscript to me. I looked through it: no markings at all. "That's it?" I recall asking with some trepidation as to what this meant. He gave me that big grin I remember so well and chuckled. "Defend it," he said, enjoying my own overwhelmed surprise. And I did.

There is an acknowledgment statement in the Preface to my dissertation that reads:

"Anatol Rapoport provided me with the revised theory of biased nets before its publication. More than that, he encouraged me to proceed with this study and provided invaluable advice. Indeed, in the absence of personal correspondence with Anatol Rapoport, this whole study would have collapsed. I owe him an intellectual debt of great magnitude, not only because of the theory and the correspondence, but

because through his writings I caught a glimpse of what Rapoport once called ‘disciplined imagination.’”

But I didn’t forget the formative role that Lin played. In that Preface I also thanked Lin for his

“personal reinforcement, support, and teaching [...]. It was he who taught me that if I were really interested in theory, then I had better get interested in mathematics. More than making it plausible, he made it possible by setting an example and by encouraging me to go forward with this particular research effort.”

In 1973, I wrote in the Preface to my book *Mathematical Sociology*:

“It is a pleasure to acknowledge the influence of Linton Freeman in shaping my sociological inclinations. As my mentor during my graduate student days, he was an important source of my commitment to exact methods in social theory. My ideas about mathematical social science were formed and transformed under diverse influences. To name but a few [...] [here I mentioned Rapoport, as well as philosophers Patrick Suppes and Stephen Toulmin, among others including sociologists Jim Coleman and Harrison White].”

However, I made an error of judgment in not asking Lin to read a draft of that book. In retrospect, I think he would have suggested that I omit certain materials not only to shorten the book but also to make space for the coverage of the Rapoport-Horvath model and my own later follow-up publication (mentioned below). This is a negative instance of my theme: not drawing upon my connection to Lin led to a less positive outcome than would have occurred with his advice.

By the way, the insightful and influential paper by Granovetter (“The Strength of Weak Ties”) appeared in *AJS* that year (1973) but too late for me to know about when my book went to press. It also drew upon the Rapoport-Horvath paper.

Lin also created numerous intellectual opportunities for me during my graduate student days at Syracuse. In the early years, all my support came from fellowships and research activity. Then Lin suggested that I do some teaching and spoke with the chairperson about it. Despite his relatively junior rank, on this occasion and many others it was apparent to me that Lin had considerable influence within the department. He was able to persuade the department’s senior members, including the chairperson, that I should be assigned certain specific courses of my own even though I had not even had any experience as a teaching assistant.

Thus, my earliest teaching focused on theory: an undergraduate course in sociological theory and another course for sociology majors called “the integration seminar.” In the theory course, one of the texts I

had students read was *Games, Fights and Debates* by Anatol Rapoport and in the integration seminar one of the texts was the newly published *Types of Formalization* by Joe Berger and co-authors. Both books were indicative of new developments in social science centering on formal models.

Lin was among the sociologists who recognized the importance of this frontier work in the social sciences. I recall that in one of Lin’s courses he lectured on elementary set theory, finite probability theory and elementary matrix algebra. These mathematical ideas were the key ingredients that were pulled together by John Kemeny in his innovative textbooks with co-author Laurie Snell, starting with *An Introduction to Finite Mathematics*, which I believe was first published in 1957.

Lin also drew upon his professional acquaintance network to open up career opportunities for me, including getting invitations to give talks, applying for and receiving funding for research, and another important act on his part, writing a strong recommendation regarding my application for a post-doctoral fellowship. I’ll try to recall a little of each of these efforts on his part that helped to shape my career in sociology.

I think it was late in 1962 that Jim Coleman invited me to give a seminar on my dissertation work. He was at Johns Hopkins at the time and interested in Rapoport’s work. Indeed, he had written an extensive essay on it that appeared in 1960 in *Mathematical Thinking in the Measurement of Behavior* (edited by Herbert Solomon). This little-cited essay should be recognized as part of the history of social network analysis. There was a similar invitation from Peter Rossi to talk about my thesis work at the University of Chicago.

At about the same time, I received an offer to remain at Syracuse as an assistant professor starting in the academic year 1963-64. Perhaps this was another example of Lin’s behind-the-scenes influence. However, I surmise that he must have been ambivalent about it. I know he suggested that I wait to take the best offer, which would be from Johns Hopkins or Chicago, should either or both actually make an offer. However, the Syracuse chairperson pressed me to decide while Coleman and Rossi both indicated that it was too early for them to decide among candidates. Thus, I accepted the position at Syracuse. Maybe I should add that I had a wife and two very young children so that prospective financial security was a factor in the decision.

Once it was clear that I would be a Syracuse faculty member in the academic year 1963-64, I began to think about getting support for a research project I had in mind. My prospective collaborator (Morris

Sunshine) and I applied for support for a study that would relate to the theory of differential association that was often cited at that time in regard to the explanation of juvenile delinquency. We planned to do a sociometric study of an entire local junior high school student population. Lin was instrumental in speaking on our behalf to the director of the Syracuse University Youth Development Center. I think we each received an appointment as research associate at the Center as well as support for conducting the study.

From my point of view, the Center's support enabled a study of a large network and so a better follow-up to the Rapoport-Horvath paper than my dissertation had been. At its conclusion, our research project led to a monograph on random and biased net theory and the empirical testing of a biased net model. A link to differential association theory also was included. Sunshine and I called it *A Study of a Biased Friendship Net*. In the course of the formal work, I found a problem in Rapoport's most recent "tracing formula" that led me to devise and use a new formula. Ironically, years later, John Skvoretz found a problem in my formula, leading him to a series of formal and computational studies in the theory of random and biased nets.

Gradually, amidst this teaching and research, I realized that the direction my academic activity was taking would require more than finite mathematics. I applied for a three-year post-doctoral fellowship for studies in pure mathematics and mathematical models in the social sciences at Stanford University. There is no doubt in my mind that Lin's recommendation strongly contributed to my getting the fellowship. Thus, there was a match between what I wanted to do and what funding agencies were ready to support during that era. And what I wanted to do was at least in part the outcome of my extended interaction with Lin since I first met him in 1960.

Toward the end of that three-year period at Stanford, I think Lin was ready to leave Syracuse. We had remained in contact and he had stopped by to visit my wife and I in Palo Alto at least once. His proposal was that we form a research group at the University of Pittsburgh that would engage in teaching and research on the new intellectual frontier.

This idea probably was sparked by an opportunity that existed at Pitt at that time. Namely, funds were made available by the university administration for departments that had a "vision" for what they could become in terms of stature. The sociology department chairperson at the time, Burkart Holzner, came up with a vision that was quite ambitious, involving hiring three research groups, each on the frontier of new developments in the field. I only recall two of these: historical sociology and what he called formal sociology. Although not a formalist in his own work, Holzner had taken note of the new developments that I mentioned earlier. Thus, in 1967, Lin and I both joined the department, as did Otomar Bartos, who had just published a very nice textbook called *Simple Models of Group Behavior* (One chapter deals with a dominance model, right out of the *Bulletin of Mathematical Biophysics*).

I wish I could say it all worked out beautifully. But it didn't. Maybe it was the late 1960s turmoil. I don't know. Bartos left very soon. And Lin spent only two years at Pitt before moving on in 1969, the same year that John Skvoretz arrived to join the graduate program – through Lin's influence. I remained at Pitt for my entire career and John would eventually become my frequent collaborator.

Farewell to Lin Freeman, my mentor and more!
Social scientist extraordinaire!

