

“Introduction: The Past and Future of Ego-Centric Network Analysis”
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Network analysis is ubiquitous. In recent years, it has shaped how researchers and society as a whole understand issues as diverse as the spread of disease, the precursors of loneliness, the rise of protest movements, the causes of social inequality, the flows of air traffic, the rise of social media, and much more (Wasserman and Faust 1994; Barabasi 2002; Christakis and Fowler 2009; Watts and Strogatz 1998; Watts 1999).¹ This influence is due to the remarkable flexibility and power of network analysis. A network is simply a set of nodes and the ties between them, and a node can be anything—an individual, an organization, a website, a computer server, an airport, a nation, or any entity with the capacity to connect in any fashion to another entity. The ability to think of any relationship in network terms has proved remarkably generative for researchers.

Social scientists have traditionally conducted network studies in one of two ways (see Wasserman and Faust 1994; Kadushin 2012; Borgatti, Everett, and Johnson 2013; Crossley et al. 2015; Perry, Pescosolido, and Borgatti 2018; McCarty et al. 2019). Those adopting a *sociocentric* perspective examine a set of actors and all realized or potential ties between them; those adopting an *egocentric* one, a set of actors and their relations of any type that is of interest to the researcher. Sociocentric researchers know how everyone in their study is connected to everyone else. For example, they might study all students in a given high school, all board members in the Fortune 500, or even all users of a social media site, and thus know the entirety of connections within the chosen context. However, they will not know what connections any of those people have outside of, respectively, that high school, set of board members, or social media site. Egocentric researchers know how everyone in their study is connected to anyone (with a given role or type of connection) in their personal network universe—but not their connections to others in the study. They might study a representative sample of 3,000 Americans or a set of 60 undocumented immigrants from various countries residing throughout Spain, and thus know the Americans’ or immigrants’ connections to their confidants, co-workers, dearest friends, or anyone else specified by the researcher. However,

¹ With origins in the social sciences, network analysis, and its approach to relations, has spread to so many different disciplines that it has spawned its own field, “network science,” which is concerned with uncovering basic patterns in network structure and process across domains and contexts. The field now has PhD granting capacity (see, e.g., Northeastern University’s Network Science Institute) and at least one major new journal, *Network Science*.

the researcher will likely not know whether those 3,000 persons or 60 individuals are connected to one another.

The power of sociocentric analysis comes from capturing the totality of social structure. In a high school, a researcher can understand, among other things, the total number of cliques in the school, the degree to which particular students connect cliques not otherwise connected, and the extent to which popular students are tied to other popular ones. In a board member network, the researcher can capture the extent to which companies in different industries are nonetheless connected, the degree to which any two members in the entire network are exchangeable without altering the structure of the interlock, and the power of particular members as a function of the connectedness of the boards they have joined. In a social media network, the researcher can determine the level of a person's influence, the speed with which an idea spreads, and probability that any two persons will have a friend in common. This power does come at a cost. Logistically, the researcher would ideally need to have data on every person or node in the network.² But more fundamentally, the researcher is forced to assume that any persons outside that network—any students in a different school, or board members in slightly smaller companies, or friends and family who use a different social media platform—do not affect relations (or their consequences) within the observed network (see Laumann, Marsden, and Prensky 1989; Perry and Roth forthcoming). Across the majority of social relations, that assumption is implausible.

The power of egocentric analysis comes from capturing the entire set of people's personal connections of any type. In a sample of 3,000 Americans, a researcher can understand, among other things, how many friends or confidants Americans have, how connected those friends are to one another, whether any given friend plays more than one role, whether different Americans have personal networks of different structure or composition, and the relationship between Americans' networks and their income, education, political beliefs, health, or any other personal characteristic or condition. In a study of 60 immigrants in Spain, a researcher can understand, for example, whether connections in the country of origin differ in number, quality, or structure from those in Spain, whether immigrants turn to different kinds of people for different kinds of needs, and whether those from Latin America use their national or international connections differently from those from Northern Africa, among many other questions. This power has its own costs. Logistically, to fully understand the structure and composition of the networks of those studied, the researcher must collect a great deal of data from them, and since questions must be asked about relations between every pair of persons named, for every additional name the time required for data collection expands rapidly. More fundamentally, the researcher can only capture the totality of the network structure surrounding individuals, rather than the broader set of connections—including those between friends and friends of friends—that the individual may be unaware of. This is, in part, why egocentric analysis is known as the study of *personal networks*.

While sociocentric and egocentric perspectives can differ dramatically, in practice researchers do collect both kinds of data and adopt both approaches. For example, a researcher may study all students in a school, ask about their connections to other students, and also ask about their connections to anyone else (Harris et al. 2009; Small 2017). But each perspective inevitably asks different kinds of questions and can call for distinct analytical techniques. Sociocentric research has

² For example, if the researcher is missing data on the ties of an actor or set of actors who are especially well-connected, the inferences about the structural characteristics of the network may be wrong. Researchers have not yet fully addressed the implications of missingness in sociocentric data.

exploded in recent decades; it is the perspective that has most directly informed network science in other disciplines (e.g., Barabasi 2002).

This volume is dedicated to understanding the history, present, and future of egocentric or personal network analysis. Egocentric analysis conceives of each individual, or *ego*, as embedded in a personal community of *alters*, a community partially of ego's creation and nearly unique to them, whose composition and structure have consequences. The strengths of this approach are well suited for many of the important questions in mainstream social science. Particularly influential in research on social inequality, social networks have provided powerful insights about the precursors of upward mobility, educational achievement, social support, health inequities, poverty, immigration, and social movements, to name a few (e.g., see Fernandez and Weinberg 1997; Fernandez 2006; Smith 2007; Small 2009b, 2017, forthcoming; Erickson forthcoming; Lubbers and Molina forthcoming; Smith and Sanders forthcoming; Tindall et al forthcoming). **Our goal in this volume** is to take stock of these contributions—within and outside network analysis—which have been substantive, methodological, and theoretical in nature.

Before proceeding, we must address the role of theory in egocentric research. Social network analysis, unlike rational choice theory or structuralism, is not explicitly a theory of society. Rather, it is a perspective, or set of perspectives, on how to study social relations and their consequences for individuals and groups. Nonetheless, that statement must be qualified in two ways. First, network analysts have produced numerous theories, both descriptive and causal, about human behavior and social organization. While the theories have ranged widely, they have shared a *relational* orientation toward the world, the belief that ties, most often between individuals but also between organizations, cultural objects, and other social entities, represent an important indicator for understanding human nature and behavior (Emirbayer and Mische 1998). Second, adopting that belief means, implicitly or explicitly, assuming something about the ontological status of relations, as opposed to individuals, groups, classes, or other entities. Most often, it means assuming that ties are ontologically real entities (but see, e.g., Laumann et al 1989). And that assumption, in turn, results in epistemological decisions about how best to study such relations. So, egocentric analysis, while not a theory per se, inevitably requires adopting theoretical positions on the nature of society and human behavior and on how to study them.

Many practitioners of network analysis today spend little time thinking about these matters—and, in fact, one need not think about them to conduct an effective empirical study of, say, how social networks affect upward mobility among working class Americans. But the methods, analytical habits, and even vocabulary of egocentric researchers today reflect many theoretical decisions made one or more generations ago by sociologists, anthropologists, and psychologists who, proposing new ways of understanding society, first grappled with such questions. Knowing something about that history is essential to understanding where egocentric research is today—and where it is headed.

A SELECTIVE HISTORY OF EGO-NETWORK RESEARCH

Early notions

In many ways, the study of the relations between people and those they are connected to has been at the center of social thought from its beginnings. As Small (2017:11) has recently written, “Network-related thinking is as old as thinking itself. Aristotle proposed that the strength of ties among friends derives from their similarity and repeated interaction. Hume argued that people will tend to associate with those with similar characteristics. And Adam Smith proposed that friends made better confidants than acquaintances.” Nevertheless, the ideas that most directly informed egocentric

research, and network research more generally, as it is practiced today, only began to be systematized in the late 19th and early 20th centuries, most notably by German sociologist Georg Simmel.

An unusually creative thinker, Simmel proposed a number of ideas that network researchers adopted in later years. In his *Web of Group Affiliations*, Simmel (1964[1955]) proposed that society had evolved over the course of modernity: the reasons people associate with others had shifted from those imposed on individuals and based on “organic” criteria (such as age or kinship or village membership) to those entered into freely and based on “rational” interests (such as occupations, clubs, etc.).³ These patterns of relations translated into different social structures in premodern and modern society. The premodern form is local and best described as a set of concentric circles, wherein the individual feels a strong sense of self but fears outsiders and has limited access to mobility and information. The modern form resembles a set of *intersecting* circles, wherein the individual belongs to multiple different associations with only partly overlapping memberships, producing a web of affiliations—in essence, a network—that affects trust, solidarity, personality, conflict and more (see Blau and Schwartz 1997; Pescosolido and Rubin 2000). This work provided an intellectual foundation for thinking of society as what is now known as a two-mode network, in which people were connected to one another by virtue of their membership in common associations (see Breiger 1974). It also offered a way to think about how social relations, and people’s relations to their networks, have changed over the last century, including how social media has and has not altered personal networks (Pescosolido and Rubin 2000; Wellman 2018; see Wellman et al. forthcoming).

One of Simmel’s core beliefs was that the form and content of social relations could be separated, and that formalization in this sense was key to understanding society (Simmel 1971). A simple but consequential way he applied this idea involved numbers. Simmel believed that the mere number of individuals involved in a relation, or interaction, affected its nature. Among other things, he argued that the interaction between two people (a dyad) would be qualitatively different from that among three (a triad) with respect to the operation of trust, conflict, intimacy, alliances, power, authority and more. For example, the relationship between two conflicting parties is affected by the arrival of a third. And because the differences are structural, rather than substantive, they can be seen regardless of context, in relations as different as that of a child vis-à-vis husband and wife, or ancient Rome vis-à-vis Athens and Sparta. In this spirit, Simmel also wrote perceptively about the nature of secrets and strangers, arguing that the newcomers to a set of relations may find themselves hearing more than others, as they have no local allegiances to compromise their objectivity. His contributions would lay the foundations for dyadic and triadic analysis, and for the study of intimacy, secrecy, brokerage, and much more (e.g., Granovetter 1974; Gould and Fernandez 1989; Wasserman and Faust 1994; Burt forthcoming; Hollstein forthcoming).

A less well-known feature of Simmel’s work (1997) is that he also anticipated future research on the relationship between social networks and physical space. He proposed that the physical distance between people affected their social relations, foreseeing future arguments about importance of

³ The exact title and the date of this essay’s appearance is unknown. Typically, the date is listed as 1922, the date of Reinhart Bendix’ well-known translation (Leipzig: Duncker & Humblot 1922). Yet, the essay appears as early as 1908 in Simmel’s treatise *Soziologie*. Levine, Carter, and Gorman (1976:1114) argue that Bendix’s translation of the original title, “Die Kreuzung sozialer Kreise,” as “web of group affiliations” is inaccurate. They argue that the proper translation is the “Intersection of Social Circles.” Lawrence (1976) translates the original German into “The Intersection of Social Spheres.” Yet, the literal translation is “The Crossroads of Social Circles,” and Simmel did not use “*uberschneidung*,” the German word for “intersection.”

propinquity in networks (Festinger, Schachter, and Back 1950; Blau 1977; Reagans 2011; Small and Alder 2019). He also argued that “fixed locations” in space, such as local organizations in neighborhoods, were important, because they anchored social activity toward a common point. He offered as an example the church: “This fixed point in space becomes a pivotal point for the relationships and the cohesion of the faithful, so that communal, rather than isolated, religious forces are developed” (Simmel 1997:147; see Small and Adler 2019). This idea would reappear decades later in studies of how the focus of activity affects social networks (Feld 1981, 1982).

While Simmel’s conceptual writing at the turn of the twentieth century laid the theoretical foundations for a great deal of subsequent research, much of the growth in ego-network analysis over the course of that century was produced by empirical researchers either answering substantive questions or grappling with methodological problems. Not all of these scholars dealt directly with Simmel’s ideas (which would have to wait until translations in the 1950s and a resurgence of network research in the 1970s to be taken on explicitly and credited properly). But the social scientists who conducted what we now recognize as ego-network analysis addressed equally important questions, at times echoing Simmel’s concerns with modernity, with the role of the individual in society, with group affiliation, and with the formalization of social relations. Moreover, subsequent generations of researchers often pushed for a much more systematic, evidence driven, and scientifically rigorous understanding of how personal networks matter. These survey researchers, ethnographers, and experimenters, working in sociology, anthropology, and psychology were at times unaware of research in other disciplines, but nonetheless set the foundation for today’s egocentric research.

Survey researchers and mathematical sociologists

The idea of sampling individuals and giving them questionnaires to understand something about society as a whole blossomed over the course of the twentieth century, and was instrumental to the growth of egocentric research. Among the most important innovators in survey design was Paul Lazarsfeld, a Columbia University mathematical sociologist who over a series of studies on voting behavior and cultural taste in the 1940s and 1950s began to examine how individuals were influenced by others (Lazarsfeld, Berelson, and Gaudet 1944[1968]; Katz and Lazarsfeld 1955; Centola forthcoming). Probably his most important study for egocentric analysis was Katz and Lazarsfeld (1955), which attempted to understand how the political opinions of residents of Decatur, IL were affected by social influences. Rather than asking respondents in general terms whether they tended to trust others’ views, the authors asked respondents to name those who had an influence on their opinions: “Do you know anyone around here who keeps up with the news and whom you can trust to let you know what is really going on?” (1955:140). This kind of question, which later became known as a “name generator,” was a crucial innovation, as it allowed the authors to know exactly who had been influential.

This approach also allowed them to collect precise data on those individuals who had been named. The authors asked about the characteristics of each named person, such as whether they were neighbors, friends, or work colleagues. Additional questions of this kind later came to be known as “name interpreters.” The resulting data allowed the authors to paint a kind of picture of the social circle that affected how individuals made decisions. While Lazarsfeld did not ask respondents for the connections among those they named—that insight would wait a few decades to arrive—his decision to elicit names and their characteristics became foundational to how the majority of ego network data are collected in surveys.

Lazarsfeld's contributions were more than methodological. Working with Robert Merton, he developed and tested a set of propositions about the friendship formation process that centered around the idea that the process would encourage people to connect with others who shared their characteristics. In so doing, they coined the term "homophily," or the tendency of people to associate with others who resemble them (Lazarsfeld and Merton 1954; McPherson, Smith-Lovin, and Cook 2001; McPherson, Rawlings, and Smith-Lovin forthcoming).

At Columbia, Lazarsfeld and Merton taught several future network researchers, including Charles Kadushin. Though Kadushin would produce a number of works in the sociocentric tradition, two would be important to later egocentric research. Based on data from 1,500 patients in psychiatric clinics in New York City, Kadushin (1969) found that the decision to seek a psychiatrist was a deeply networked process, both because there was a network of elites in the city with strong connections to a subset of the psychiatric field but also because whether a person made the decision was affected by connection to that network and, more generally, the extent to which alters helped recognize their problems and reinforce the need for professional help. Recent work on mobilization echoes some of these ideas (Pescosolido forthcoming; Small 2017). In addition, for a study of network formation, Kadushin tried to understand the psychological motives underpinning the development of different network structures. He argued that fundamental psychological needs matter, particularly safety and efficacy: "Safety corresponds to and is generated by networks of cohesion, while efficacy comes about from separation and corresponds to networks with structural holes and is typical of brokerage situations" (Kadushin 2002:77).

Perhaps Lazarsfeld's most influential student was James Coleman, a mathematical sociologist who would later become known for his work on educational inequality in the U.S. (1966), on social capital (1988), and on rational actor theory (1994). But beginning in the 1950s, he devoted himself to the development of mathematical sociology, and the role of formalization in personal networks formed a core part of that process (Coleman 1958, 1964).⁴ In one of the first studies of diffusion, Coleman, Katz, and Menzel (1957) examined how networks affected doctors' adoption of new drugs. The authors interviewed nearly all the doctors in a particular specialty in a community, asked them name-generator questions about other doctors they consulted or socialized with, and then tracked, based on pharmacy records, the date at which they first prescribed a new drug. The authors found that popular doctors prescribed earlier, that well-integrated doctors in general prescribed more quickly, and that the rate of diffusion for integrated doctors followed a simple model in which social contagion—the influence of other doctors in a given doctor's personal network—played a role.⁵ Because the authors had data on nearly the entire population of doctors in that field, they could use ego-data collected from a standard survey to understand the whole network in a natural, unbounded community socio-centrally. While later researchers questioned whether what the authors observed was spread among physicians, or rather spread to physicians via marketing from drug companies, or a two-step diffusion process, the role of networks in medical innovation was clear, and the study remains a mainstay of understanding drug adoption (Van den Bulte and Lilien 2001; Chami et al. 2017).

⁴ Coleman (1964) wrote a massive volume that served as an introduction to mathematical sociology, and presented ideas not only in diffusion but also in the study of social structure, in both graphic and matrix form, using examples from his previous research on adolescent networks, among others. These works helped convince researchers at the time that studying the network structure of individuals could be done rigorously.

⁵ The authors concluded with a methodological note, proposing "a marriage between sociometric techniques and survey research," which would allow the formalization of relations only studied previously in small group contexts (1957:269).

In the 1950s and 1960s, the number of surveys using name generators to study association or influence grew in number. An especially important one was Edward Laumann's intervention in the 1966 Detroit Area Study (DAS), a representative study of residents of the city. Concerned with what he called "microstructure," or the "pattern of social relations" surrounding an individual (Laumann 1973:4), Laumann believed that the structure of a person's immediate friendship network was important to how a city was socially organized. The survey asked a name generator—"think of the three men who are your closest friends and whom you see most often[; they] can be relatives or non-relatives, as you wish"—and name interpreter questions that included age, occupation, education, religious background, and political orientation. Laumann then *also* asked whether each pair among three best friends were "good friends with one another" (1973: 264-268)—a move that made possible the characterization of the structure of this friendship network. For example, the researchers could examine the density of the network, as in a standard sociocentric study. Finally, the 1966 DAS was also probably the first to trace social networks out one step. That is, a subsample of respondents was asked for the address and contact information of the named friends, who were then contacted and asked about *their* closest friends, their characteristics, and the characteristics of the closest friends. This additional survey provided an opportunity to assess the reliability of the initial reports, which documented that people could be trusted to accurately report basic characteristics of their network ties.⁶

Other ego-network researchers would build on this early survey work in multiple ways. Many of them were trained at Harvard University under the influence of Harrison White. A theoretical physicist turned sociologist, White wrote influential papers on blockmodeling and vacancy chains that are central to the sociocentric network analysis tradition, in addition to major works on network influences in markets, identity, social interactions, and control (White 1970, 2008[1992]; Boorman and White 1976; White, Boorman, and Breiger 1976). White's students, who would include Nancy Howell Lee (1969), Barry Wellman (1979), Mark Granovetter (1973), Bonnie Erickson (forthcoming), Ronald Breiger (1992), Kathleen Carley (1991), Scott Boorman (1975), Peter Bearman (1991; Bearman and Parigi 2004) and others, would go on to make significant contributions to ego-network theory and methods (see Freeman 2004: Ch. 8; Wellman forthcoming; Erickson forthcoming; Mische forthcoming).

In the late sixties, Lee found over 100 women with unwanted pregnancies who had obtained an abortion at a time when they were not yet legal. She asked how they found out who would perform them, tracing the networks involved in doing so, and thus conducting one of the early modern studies of how people mobilize their networks when needed (Lee 1969). Wellman (1979) employed an ego-centric network perspective to answer a longstanding question in sociology—whether modernity had destroyed "community" (see Durkheim 1933 [1893]; Toennies 1957[1887]; Simmel 1976[1903]; Wirth 1938). In a multi-faceted survey of residents of East York, Toronto in 1968, he asked respondents to report on their "intimates" or close friends and families, asking a battery of questions about where the alters lived and the kinds of support they provided. He found that modernity and urbanization had not destroyed community, but rather had "liberated" it from its physical confines, as people maintained intimate ties well beyond their local neighborhood.

⁶ Laumann innovated in other ways, and would use the survey data to propose smallest space analysis (a type of multidimensional scaling) for representing social structure, to develop more refined ways of measuring social distance, and to understand the role of networks in the diffusion of disease and health conditions; he would also expand on the implications of the boundary specification problem (Laumann et al. 1989; Laumann et al. 2004; Cornwell et al. 2009; Perry and Roth forthcoming).

(Wellman and Wortley 1990; Wellman et al forthcoming). He also found that the diversity of contemporary personal networks meant people turned to different intimates for different needs (Wellman and Wortley 1990; Wellman et al forthcoming). In 1969, Granovetter (1974) studied employed professionals in Newton, MA using both surveys and in-depth interviewing to examine the role of people's network ties in the job search. He found that acquaintances were more important than close friends, a finding that helped inform one of the most influential papers in social science. "The Strength of Weak Ties" proposed that weak ties are more likely than strong ties to be bridges, and thus are better source of new information on job availability (Granovetter 1973; Fernandez forthcoming).

In the late 1970s, another Harvard graduate, but not a White student, Claude Fischer (1982) conducted a large comprehensive survey of the personal communities of Northern Californians to address the impact of urbanization on social relations.⁷ Importantly, his survey contained not one but multiple name generators, and thus could capture much more comprehensively than almost any survey before it the personal networks of a representative sample of respondents (Fischer 1982; Fischer forthcoming). He found that popular fears were largely unfounded; personal networks were maintained in robust though somewhat different ways in both small communities and cities. The East Yorker and Northern California Studies, and their recent restudies, remain, to this day, two of the foundational studies of community-based networks.

One of Fischer's name generator questions turned out to be important in ways few might have predicted. He asked respondents whom they turned to when they had "personal matters" to discuss. That question captured the attention of Ronald Burt, a former student of Coleman's and then colleague of Fischer's at Berkeley, who contended that a nationally representative view of social networks was important and thought the General Social Survey could serve as a platform. Since asking a large number of name generator questions, as Fischer had, was cost prohibitive for the omnibus GSS, Burt analyzed the Northern California data and became convinced that the single most important question to ask was the following: "From time to time, most people discuss important matters with other people. Looking back over the last six months, who are the people with whom you discussed matters important to you?" (Burt 1984). To this day, and despite controversy, the question remains the most frequently used egocentric name generator (see Bearman and Parigi 2004; Perry and Pescosolido 2010; Smith et al 2012; Paik and Sanchagrin 2013; Fischer 2009, 2012; Brashears 2011; Small 2013, 2017).

Network analysis continued to explode in the 1970s and 1980s (Mische forthcoming). Ronald Breiger (1974), echoing Simmel, proposed influential techniques for studying the duality of persons and groups, the connections between people made by their membership in the same organizations, and between organizations made by the people who join them. Scott Feld (1981) proposed that "foci of activity" are important for the formation of social ties (Feld et al forthcoming). Burt (1995), a student of Coleman's, examined the implications of Granovetter's idea that only weak ties could be bridges. Burt developed the notion of structural holes—or unconnected spaces in a network between sets of connected nodes—and, particularly relevant for this volume, systematized and demonstrated the advantages that brokers gain from being positioned near those holes (see also Marsden 1983; Gould 1989; Gould and Fernandez 1989; Burt forthcoming).

⁷ Fischer's dissertation adviser was Lee Rainwater; Fischer did not take courses from White, either (Fischer, personal communication, July 13, 2020).

Coleman (1988), writing three decades after his study of diffusion, would pen an influential paper both inside and outside of network analysis. Defining “social capital” as the set of resources—such as trust or information—contained in people’s networks, he proposed that social capital was as essential as human capital for upward mobility (Volker forthcoming; also Loury 1977, Portes 1998). A rational choice theorist deeply grounded in sociology, Coleman saw personal networks as incorporating the role of the social in how individuals make decisions. Nan Lin (2002), who had earlier used the idea of “social resources” to make a similar point, would go on to systematize social capital research, and introduce the important distinction between “access” and “mobilization” in social capital, or between the advantages one has, passively, by virtue of one’s network and those one has to act upon to realize (Lin and Bijan forthcoming). Also centered on people’s decisions, Bernice Pescosolido (1992), echoing Mayer, Boswell, and the “action set” theorists, would develop a model of how people mobilize their networks for support in which existing social structure played a role, but activation at the time of event or crises was equally important (Pescosolido forthcoming).

Ethnographers and anthropologists

Much of the work of survey researchers was directly shaped by that of ethnographers who, beginning in the 1940s and 1950s, had observed social interaction in villages, neighborhoods, and cities and come to see the benefits of understanding social relations from a network perspective. In sociology, a classic ethnography of the 1940s had quietly relied on network thinking. William Foote Whyte’s (1943) study of Italian American street corner men in a Boston neighborhood examined the status hierarchy inherent in the structure of relations he observed among the men. Whyte used sociograms—pictures of the networks as individuals with lines connecting them—to depict graphically the relationships among them, proposing that the structure of relations affected the allegiances and orientations of the group. Whyte’s work influenced several generations of ethnographers (e.g., Gans 1962) who would themselves go on to shape survey researchers’ thinking on egocentric networks (see extended discussion of Gans’ work in Granovetter 1973).

In anthropology, networks in one or another way had long been part of the researcher’s toolkit. Levi-Strauss, of the structural tradition, had proposed that the cultural rituals and practices observed in the field reflected an underlying structure of relationships and at times represented exchange systems or kin relations using directed graphs (Levi-Strauss 1969/1949; e.g., pp. 300, 377). Indeed, Alfred Radcliffe-Brown (1952), an enormously influential figure in the first half of the twentieth century, explicitly described social structure as “a network of actually existing social relationships” (1952:190).

But anthropology’s greatest direct influence on modern network analysis came from what became known as the Manchester School. Max Gluckman, a South African structuralist anthropologist and founding chair of University of Manchester’s Social Anthropology Department in 1949, assembled a group that would become known for their sophisticated research on social networks. Many, like Gluckman himself, were Africanists of the southern or central regions of the continent. In a study of legal and interpersonal relations among the Lozi in Barotseland, now Zambia, Gluckman found that many relationships between individuals served multiple different interests or roles; he termed the phenomenon “multiplexity,” which became staple in the modern study of social ties (Gluckman 1955:19; see Verbrugge 1979:1287).

Gluckman’s student, John A. Barnes (1954) was probably the first modern network anthropological theorist. Based on fieldwork in the 1950s in Bremnes, a Norwegian fishing town of 4,600, Barnes proposed that social relations could be understood as a “social field,” or what he called a “network.”

His conception of the network, like that of future egocentric researchers, began with the individual: “Each person is, as it were, in touch with a number of other people, some of whom are directly in touch with each other and some of whom are not. Similarly, each person has a number of friends, and these friends have their own friends; some of any one person’s friends know each other, others do not. I find it convenient to talk of a social field of this kind as a *network*” (1954:43). He explained how to visualize this network: “The image I have is a of set of points some of which are joined by lines. The points of the image are people, or sometimes groups, and the lines indicate which people interact with each other” (1954:43).

Over the 1960s, many other anthropologists would follow (Mitchell 1969; Boissevain and Mitchell 1973). Elizabeth Bott (1955, 1957) studied the personal networks of husbands and wives in a set of London families, and found that the conjugal roles were related to the structural characteristics of each spouse’s network, particularly in what she called the “connectedness,” or the density, of the network (see Bidart forthcoming). Adrian Mayer (1966) made at least two important contributions. Adopting Barnes’ language, he proposed that researchers should distinguish much more clearly the two separate levels at which social relations can be observed: the “network” and the “set,” or what today we call the whole network and the egonetwork. In addition, based on research on political behavior he observed in Bhopal, India, he proposed that the “action set,” the people with whom ego interacts around a set of activities, provides an accurate picture about how social networks are used in practice. David M. Boswell (1969:245) built on this idea. Studying how bereavement and burials were managed after death in Lusaka, the capital of now Zambia, he showed that the network that gets mobilized during a crisis cannot be fully observed beforehand; it can only be identified during the crisis itself (see Small forthcoming).

Perhaps no Manchester anthropologist was more important than J. Clyde Mitchell, who synthesized discoveries, compiled several collections of work, and charted the theoretical and methodological questions—qualitative and quantitative—that the field needed to answer (1969; Boissevain and Mitchell 1973; Borgatti and Halgin forthcoming). For example, he showed anthropologists that networks can be presented equivalently in matrix form and graph form, made a case for distinguishing density from centralization, identified several of the most important characteristics of social ties (e.g., frequency and duration), and outlined several methodological and conceptual issues that network researchers continue to contend with (see Mitchell 1969). Mitchell’s idea of “anchorage” would be essential to crystallizing egocentric network analysis as a distinct perspective.⁸ While a network can be observed from many perspectives, he noted that several fieldworkers had begun with the individual, tracing those connections out, anchoring the network in the person. “This has led to the specification of this type of network,” he explained, “as egocentered[,] though the term ‘personal network’ may be more acceptable” (1969:13).⁹

⁸ This work shaped how Laumann and others conceived of their survey research. Though Laumann, a Harvard sociologist trained by Talcott Parsons, had Harrison White on his dissertation committee, the Manchester anthropologists were arguably more important. He attributed the inspiration of his notion of the microstructure (1973 to Mitchell’s (1969) “personal network” and Barnes’ (1954) “first order zone.”

⁹ As a group, the network researchers of the Manchester School were also methodologists. They would work not only to formalize many of their ideas quantitatively but also to anticipate several of the problems network analysts would face for years, including how to specify the boundaries of a network (e.g., Barnes 1969; see Laumann et al 1989; Perry and Roth forthcoming) and how to quantify a node’s centrality (e.g., Mitchell 1969; Kapfrerer 1969). In addition, they would also contribute to ethnographic research methods, developing situational analysis and the extended case method (Epstein 1967; Evens and Handelman 2006; see also Burawoy 1998, 2009; Small 2009a).

In the 1970s and 1980s, a different team of anthropologists and their collaborators would emerge as important. H. Russell Bernard, along with oceanographer Peter Killworth, produced a series of studies that examined the limits of memory, recall, and perception, and the impact of these limits on our ability to understand networks (McCarty et al forthcoming). They found repeatedly, and in different contexts, that when asked to recall whom they were in touch with or had come into contact with, respondents often could not do so with any accuracy (Bernard, Killworth, and Sailer 1979; Bernard et al. 1984). These works helped inform a later preoccupation with cognition that provided much more clarity on what people can and cannot be relied upon to tell researchers about their networks—and, more broadly, how cognition affects our network interactions (Krackhardt 1990; Smith et al. 2020; Sun, Brashears, and Smith forthcoming).¹⁰

Psychologists and psychiatrists

While anthropologists were developing ideas essential to egocentric analysis, so were psychologists. Their work contributed to sociometric methods, cognition, diffusion, and memory, among other topics. While we cannot do the work justice here, a few contributions are especially notable (see Freeman 2004 for a history this work). Perhaps no one was more important to the early development of network analysis than Jacob L. Moreno (1934), a Romanian psychiatrist, public intellectual, and prolific writer, who, in a pioneering study, mapped the relationships among individuals with directed graphs, laid out a lexicon for network language still used today, and coined the term sociometry. In 1937, Moreno founded *Sociometry*, a journal for the systematic analysis of social relations (it later became *Social Psychology Quarterly*). While Moreno was a creative thinker, many attribute the formal aspects of his work to Helen Jennings, a psychologist with the scientific training to conduct systematic data collection and analysis, who, among other things, helped collect the network data in a school for girls that was one of the foundations of Moreno's major work (e.g., Jennings 1943; Moreno 1934).¹¹

Beginning in the 1940s, a set of psychologists working in a different tradition became concerned with cognitive distress, and the extent to which individuals found themselves in balanced or imbalanced states. Fritz Heider (1946), as Simmel had before him, believed that people and their attitudes were related. He proposed that two persons were in a balanced state if they had the same attitude—like or dislike—toward an object, and that “the state of imbalance will produce tension” (1946:108) in the relation. Dorwin Cartwright and Frank Harary (1956) generalized the idea, and defining it in graph theoretic terms, both clarified and formalized it even further. Theodore Newcomb (1956) showed that the idea helped explain how people became friends with others, based on a naturalistic, longitudinal study of 17 college students who agreed to be observed over their first year at the University of Michigan. The ideas of this group of psychologists would become a pillar of triadic analysis.

Finally, in a highly creative, multi-faceted study, with wide-ranging implications, Leon Festinger, Stanley Schachter and Kurt Back (1950) examined how the configuration of space affected friendship formation and the diffusion of information, based on a study of World War II veterans who were taking up residence as students at MIT (Martin and Kwan forthcoming). Echoing

¹⁰ Other anthropologists would make important contributions in the sociocentric tradition. Especially notable is Douglas White (White and Harary 2001; White and Johansen 2005), a complexity researcher and anthropologist who would innovate and increase communication across disciplines in multiple ways.

¹¹ The authors also published, in *Sociometry*, perhaps the first statistical analyses of sociometric choices. For that paper, the authors asked Lazarsfeld to produce a mathematical model to account for the choice process.

Simmel's point about the importance of physical propinquity, the authors found that the physical arrangement of housing units shaped friendship formation, with ties most likely among those whose units were closest. These friendships affected "the flow of information and opinions," and the latter, in turn, contributed to conformity in the group (1950:151). The work helped inspire large literatures on the role of space in the formation of social ties, on diffusion, and on group processes (Small and Adler 2019; Martin and Kwan forthcoming).

Consolidation and expansion

Research in sociology, anthropology, and psychology, only some of which we described above, helped set the foundation for a period of remarkable productivity, not only in egocentric research but also in network analysis more broadly, as the perspective became a formal field. By 1977, Wellman had founded the International Network for Social Network Analysis and a bulletin, *Connections*; by 1979, the journal *Social Networks* was established.

Beginning in the 1990s, there was a different kind of expansion. Natural and physical scientists began to turn to network analysis to understand a wide range of phenomena, from cellular organization to global communications. Some studies were methodological or theoretical in nature, developing models to understand network structure across multiple contexts; others were empirical, using large-scale datasets or computationally-intensive methods to understand network phenomena (e.g., Watts and Strogatz 1998; Watts 1999; Barabasi 2002, 2009; Newman 2010). While social network analysis had made its way into the study of inequality, health, education, and poverty, this new "network science" became a major interest among natural scientists, computer scientists, engineers, and their supporting institutions, such as the National Science Foundation. By 2006, a National Research Council Committee had called "network science" "the study of network representations of physical, biological, and social phenomena leading to predictive models of these phenomena" (National Academies Press, 2006). Network science and the study of complex systems have expanded well outside and even independent of the social sciences (Luke and Stamatakis 2012). The impact of this emerging turn on ego-centric research remains unknown (see Pescosolido et al. 2016 for more detail).

THE CURRENT ERA

The first two decades of the twenty-first century also witnessed an explosion in egocentric analysis, as researchers pushed the boundaries of what had become traditional network analysis. Well versed in the study of social structure, the importance of effective survey sampling, the boundary specification problem, the value of linear algebra and graph theory, the multiple approaches to conceiving of tie relations, and the advantages and disadvantages of individual, dyadic, triadic, and full network analyses, they sought not only to adapt these perspectives to new kinds of questions in social inequality, but also to break free of the limits of the ideas they had inherited. They studied job finding, social support, health management, immigration, social media access, and more. They eschewed conformity to convention and pushed egocentric analysis in new directions (Sun et al forthcoming; Small forthcoming; Smith and Sanders forthcoming; Perry forthcoming; Shepherd and Garip forthcoming; Hampton and Chen forthcoming). Those directions can be summed up in five themes, which represent both a connection to tradition and an emerging agenda.

First is the contrast between *constraints and agency*. For years, the predominant concern of sociocentric network analysts, and some egocentric researchers, was to examine how network structure imposed constraints upon action, how what people were able to do was affected by their network position, by the structure of opportunity inherent in their relations, by the resources they

had or did not have access to be virtue of their connections, and so on (e.g., White 1971). Agency, particularly in egocentric analysis, did play a role in the works of several early researchers. For example, Lee's (1969) work on how people used their networks to find doctors willing to perform abortions, Pescosolido's (1991) work on how people muddle through the act of using their networks to manage illness, and Lin's (2001) work on the "mobilization" of social capital assumed that people at times needed to exercise agency to take advantage of their network position. But a new generation of scholars have taken this work further, conceiving of agency as *decision-making* and imagining the consequences of seeing the network of relations as following the actions of ego, rather than determining them, of seeing networks as something ego must decide to take advantage of, rather than an advantage passively received (Smith 2007; Marin 2012; Perry and Pescosolido 2015; Small 2017, forthcoming; Pescosolido forthcoming; see also Kadushin 1969; Emirbayer and Goodwin 1994; Bruch and Feinberg 2017; Huckfeldt forthcoming; Lin and Bijan forthcoming).

Second is the contrast between *maps and events*. The starting point of both sociocentric and egocentric network analysis has been mapping the network, capturing either the total network structure or the personal networks of individuals. From that point, the researcher could describe its structure, study its origins, or identify its consequences. Yet as early as the 1960s, a few researchers had proposed a different starting point—not the structure of the network but the event of calling up. Mayer (1966) and Boswell (1969) made a case for the action set because the set of individuals involved in addressing one crisis event—say, a funeral—would not necessarily be the network involved in another. A similar idea emerged years later as Pescosolido (1992) and others proposed an event-focused approach to data collection, as the crisis situation would call for people who otherwise would not necessarily interact. Others found problems with the GSS's core discussion name generator by asking people not whom they typically talked to but whom they had talked to the last time it had happened (Bearman and Parigi 2004; Small 2013; Brashears 2014). Similarly, Small (2017) recently argued that, when people need support when facing a crisis or problem, beginning with that event, rather than the stable personal network, is likely to uncover the existence of many actors that the researcher had not thought of. Among several new egocentric researchers, the dictum that one must begin by mapping the network is less a universal principle than one tool in varied toolbox, a tool that, like others, has important limitations (see Small forthcoming).

Third is the contrast between *structure and context*. As early as Simmel's work, a foundation of network analysis has been a distinction between form and content, between the nodes and ties that constitute a network and the particular conditions of the context in which those relations manifest themselves. This foundation has been the reason network analysts feel comfortable comparing, say, friends Amy, Beth, and Cathy to countries Mexico, Canada, and the U.S.—a triad is a triad, and balance issues play a role regardless of the context. It is the reason the raw data reported by network analysts has traditionally been little more than adjacency matrices—the appendix of Wasserman and Faust's (1994) classic work contains page after page of 1s and 0s. The structure of nodes and ties *are* the data. But a new generation of scholars have leaned heavily into context, showing that the context of social interaction is essential to the operation of network processes. Context, to these scholars, has been spatial (Chua 2012; Doreian and Conti 2012; Spillane et al 2017; Small and Adler 2019; also Doreian 1980), organizational (Small 2009b; Mazelis 2017; Stretesky et al. 2020), urban (Stack 1974; Smith 2007), cultural (Lizardo 2017; Vaisey 2009), online (Rainie and Wellman 2012; Hampton and Chen forthcoming), and more.

Fourth is the contrast between network *perception and reality*. Egocentric research has traditionally depended on asking people to report their connections. But as research by Bernard and Killworth

(1979) has shown, such reports can be suspect, not only because people's recollections are flawed but also because they are sensitive to the process of elicitation (see Schwarz 1999). Still, for many earlier researchers the questions were merely how to effectively capture the real network. A new generation of researchers have pushed this question further, asking whether traditional methods for eliciting egocentric networks might also provide insight into the cognitive and psychological processes by which people encode, store, and retrieve social information (Smith, Menon, and Thompson 2011; Brashears 2013; Hui et al forthcoming). New research in this area has examined how these cognitive, or "micro," processes impact people's networking behavior and access to social capital (e.g. Parkinson, Kleinbaum, and Wheatley 2018).

Fifth is the contrast between *stasis and dynamics*. Just as early sociocentric studies were limited, due to computational capacity, to networks with a few dozen nodes, so were socio- and egocentric studies limited to capturing static snapshots. Researchers had neither the resources to collect nor the capacity to analyze dynamic processes extensively. There were some exceptions—Coleman, Katz, and Menzel (1957), for example, studied diffusion over time by cataloguing the date on which doctors prescribed a drug. But by and large the data and analysis constraints on empirical research meant that static perspectives were common. The growth in computational capacity and improvements in dynamic modeling have changed network research, giving rise to analyses that begin with the individual and model structural change based on actor-based processes (Snijders 1996). More recently, researchers have pushed even further, conceptualizing personal networks as inherently dynamic systems that are responsive to biographical changes and periods of crisis or elevated need in the lives of individuals (Burt and Merluzzi 2016; Perry forthcoming).

Still, the outline of ideas we have presented in these pages only scratches the surface of new work. The pieces that follow take seriously the work of the past, but are fully oriented toward the future. They show that the consolidation of network analysis in the last decades of the twentieth century and early ones of the twenty-first have paved the way for an increasingly creative, far-reaching, and powerful new wave of egocentric research.

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