Of Pride and Prejudice: The Role of Sociology and Social Networks in Integrating the Health Sciences*

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Calls have been issued for understanding the "contexts" or "environment" shaping the causes and consequences of health and health care. Existing efforts raise concerns about how a panorama of influences can be considered simultaneously. Sociology's view of contexts as social network structures that shape and are shaped in social interaction offers one key to resolving this dilemma. Because social networks have become central in the social, natural, and physical sciences, this perspective provides a common platform for bringing in sociology's rich theoretical and methodological insights. Yet, to do this well, three conditions must shape our response. First, all levels relevant to health and health care must be considered, separated out, and linked by network mechanisms. The genetic-biological level, perhaps the most foreign level to sociologists, represents the greatest need and best prospect for advancing a sociologically based solution. Second, room must be made to tailor models to populations, whether defined socially or medically. Third, sociologists must find a voice within "big science" to address problems from social construction to social causation that contribute to basic social processes as well as health. I trace developments in the Network-Episode Model as one theoretical starting point.

> The sociologists in the main deem it their duty to deny there is any necessary connection between sociological and biological struggles.
>
> —Lester Ward, "The Establishment of Sociology"

> It is time to reconceptualize nature and nurture in a way that emphasizes their inseparability and complementarity, not their distinctiveness: It is not nature versus nurture, it is rather nature through nurture.
>
> —Jack P. Shonkoff and Deborah A. Phillips, *From Neurons to Neighborhoods*

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> In the past 25 years, the study of human health has included a distinguished, but neglected, intellectual tradition put forth by numerous investigators, who saw the need for broad integrative frameworks that capture complex pathways to illness and disease.
>
> —Burton Singer and Carol Ryff, *New Horizons in Health*

While the turn of the twentieth century witnessed the infancy of the social sciences and their efforts to differentiate themselves from the natural and physical sciences and from each other, the turn of the twenty-first century has seen a chorus of calls to integrate theory, methods, and insights. The centrifugal force that characterized the development of the first 100 years of social science has produced disciplines and fields with a solid body of rich ideas and empirical findings. It has also produced concerns and occasional laments about whether conversations within disciplines have become less fluid, fertile, and relevant under such differentiation (Burawoy 2005; Collins 1986; Pescosolido and Kronenfeld 1995). The sociology of health, illness, and healing is no exception, contributing to a wide range of issues, from individual illness profiles to national health care systems; from the deep and textured ethnographies of the social rhythms of chronic illness to the historical documentation of the social roots of the medical profession; and from the social construction of illness to national surveys of social epidemiology (Bird, Conrad, and Fremont 2000). Medical sociologists, among others, have also expressed real but conflicting concerns that their work is seen only as peripheral to biomedical agendas, or that too close a partnership would strip their work of its critical edge (Gold 1977; Office of Behavioral and Social Sciences Research 2001). Finally, some are troubled by the relatively greater attention sociologists give to understanding health rather than health care, particularly given the tremendous institutional changes occurring in the response to health problems (Mechanic 2004).

Such conversations have also taken place outside of sociology and the social sciences. Recent reports use terms such as "linking," "bridging," "synergy," "collaboration," "translation," and "integration" to reflect limits of biomedical approaches and to call for building integrated approaches to predict who gets sick, who seeks treatment, who recovers, and why. While the appeal for integration is not new, it reflects the unprecedented "groundswell of support" for social science (Institute of Medicine Committee on Building Bridges in the Brain 2000:vii) that is beginning to counteract the traditional emphasis on all things biomedical. The success of the Human Genome Project has only reinforced initial suppositions that a complex gene-environment interaction underlies health, disease, treatment possibilities, and outcomes (Bates, Elman, Johnson, Karmiloff-Smith, Parisi, and Plunkett 1998). Signaling "symbolic inheritances" (e.g., beliefs surrounding gender, health, religion) and "behavioral inheritances" (i.e., embodied "scripts" that mold everyday routines affecting health and illness behaviors), calls for research suggest a "new appreciation of the coactivity of nature and nature" (Shonkoff and Phillips 2000). In essence, the current climate is "driving the disciplines toward each other" (Institute of Medicine Committee on Building Bridges in the Brain 2000:1) and "bringing the behavioral and social sciences more strongly and visibly into the full panorama of health research" (Singer and Ryff 2001:xi). Yet, the Institute of Medicine (IOM) contrasts the significant progress in unpacking genetic factors with "comparatively little progress . . . (in) identifying factors in the environment, especially the social environment" that matter (Committee on Assessing Interaction Among Social, Behavioral, and Genetic Factors and Health 2005).

I argue that this set of developments places sociologists in an advantageous position, not only for participating in future research but for sharing leadership in it. While there has been no shortage of attempts to build synergistic models, existing models have never been "uniformly accepted nor systematically applied" (Office of Behavioral and Social Sciences Research 2001:2; see also Singer and Ryff 2001:157). Recent emphasis on social networks across the social, behavioral, physical, and natural sciences, combined with sociology's stock of knowledge on the power of social interactions across levels of society, offers an organizing metaphor, a unifying mechanism, and a wide set of possible methods. However, leadership from sociology will require an inventory of conceptual and pragmatic challenges as well as opportunities in the current research landscape.

Toward this end, four tasks mark the goals of this paper. First, I briefly review the calls for synergy and the inroads that sociology and social sciences have made into medical research and practice. Second, I catalog requirements for a theoretical frame, suggesting why existing multilevel models have failed to capture widespread attention; and I put forward sociology's fundamental premise of the centrality of structured social interaction as a promising base for synergy. Using the Network-Episode Model (NEM) as a potential prototype, I lay out the limitations that drove its development, its essential building blocks, its current support, and its gaps. Third, I evaluate the role of an overarching framework, the necessity of theoretical flexibility, and the challenges of data collection. Fourth, I consider and respond to the typical arguments that have stalled interdisciplinary research and sociological participation in it.

BACKGROUND: THE UPSIDE OF WINNING BATTLES AND LOSING WARS

The Turn toward the Social Sciences

While I do not suggest that the only research that matters is that done under the auspices of the National Institutes of Health (NIH), it would be hard to dismiss the symbolic place that the NIH holds as the leading U.S. center of health-related sciences. Despite a clear allegiance to biomedical science, the NIH's "Roadmap Initiative" directs the lion's share of its resources toward integrating promising "science" from research arenas that have addressed critical pieces of the puzzle of mortality, morbidity, treatment, and outcomes. That said, social science cannot be naïve. The Roadmap continues to hold preeminent the basic, bench, and clinical sciences, seeing the most critical advances as those coming from research at the borders of traditional biomedical disciplines (e.g., genomics, proteomics).

Ironically, the success of "pure" biomedical science has led to the call to look from the microscope to the "environment." Consider, for instance, the holy grail of biomedical research, genetics, and its hallmark approach, twin studies. Early studies documenting many phenotypic similarities between twins raised apart, in behavior as well as in appearance, have given way to a more sophisticated focus on epigenetic modification. That is, even with identical twins, clear-cut differences appear, from slight variations in appearance to stark differences in disease susceptibility. Esteller et al. (2005) found that such differences monotonically increase with age; in fact, these tripled between the ages of 3 and 50.

Cutting-edge science suggests that 90 percent of diseases do not follow simple genetic rules of inheritance (Brownlee 2005). Even traditional theories of infectious disease are now called into question by some biologists who believe that early infections, coupled with the right environmental conditions, shape the virulence of the infectious agents themselves and underlie diseases that mostly appear later in life, such as tuberculosis or mental illness. Further, Ewald (1994) has hypothesized that the presence of dirty water makes strains of cholera bacteria more virulent in one place than in another.

Importantly, such thinking has not been limited to the occurrence of illness and disease. Treatment and services research share the same stalled quality, accompanied by calls for rethinking (e.g., see Hohmann 1999; National Advisory Mental Health Council Workgroup on Clinical Treatment and Services Research 1997; Hohmann 2002). Across the landscape of medicine, including diabetes, heart disease, mental illness, tuberculosis, and HIV/AIDS, concerns with "utilization," "adherence," or even "preventive behavior" remain among the most frustrating problems facing providers and researchers (Chesney, Morin, and Sherr 2000; Lutfey and Wishner 1999). Even more perplexing for the medical model are findings that suggest that population health and recovery from disease are better where medical care is less sophisticated and more poorly supported (e.g., Hopper and Wanderling 2000; Vaillant 2002). The now-classic distinction between efficacy (i.e., which treatments work in tightly controlled clinical trials) and effectiveness (i.e., what works for whom in the "real world") marks a shift from clinical explanations to concerns about the contexts of care. Expectations that treatments have identical effects or that individuals always react similarly have been rendered suspect by research on the psychological impact of an individual's outlook, the effect of the culture and climate of the treatment site, and the importance of supports in the community (e.g., see U.S. Department of Health and Human Services 1999:257).[1]

What Is the "Environment"? Science's Myopia Confronts Social Science's Promiscuity

While DeWaal (1996:B1) notes that "environmental influences are nothing new to the biologist," the environment is a black box to those outside of social science. For physiologists and geneticists, the "environment" can be anything from toxic exposures in utero to economic conditions in neighborhoods and nations. In the worst cases, these influences take on the flavor of "luck." In a recent study, scientists reported that human immunity and drug resistance are less important to the spread of bacteria than previously thought. With regard to *Neisseria meningitides, Streptococcus pneumoniae,* and *Staphylococcus aureus* (and its drug-resistant form MRSA), Fraser, Hanage, and Spratt (2005) concluded that most of the variation in the spread of bacterial pathogens occurs simply by chance (i.e., neutral drift). While realizing that the "spread of directly transmitted bacteria within a social group is much more likely than between randomly chosen hosts from the population as a whole" (Fraser et al. 2005:1968), the researchers failed to realize that social life is, in fact, patterned and predictable.[2] Biomedical researchers concede that the mechanisms underlying these cases are poorly understood and not amenable to investigation with their standard toolbox of theories and methods.

So when biomedical scientists call for putting "all possible factors on the table . . . to fashion a more complex, more realistic analysis than is possible by focusing just on genes or just on the environment" (DeWaal 1996:B2), this opens up a staggering number of possibilities and no way to adjudicate among them. A National Academy of Sciences (2005a) report describes the social and behavioral sciences as having an almost "uncountable" number of relevant factors that may interact in complex ways. Thus, an IOM committee targeting the synergy issue ended by asking, "How should social environments be conceptualized and measured? . . . Which aspects of the social environment should be included and at what levels of analysis? . . . How do we consider present influences and those that have accumulated over the life course?" (National Academy of Sciences 2005b).

Biologist E. O. Wilson (1998) has called for such a unification agenda and has raised similar questions. He observed disciplinary boundaries across the natural sciences disappearing, being replaced by "shifting hybrid domains in which consilience is implicit" (Wilson 1998:10–11). Yet Wilson saw no role for the social sciences in this linking of "facts and fact-based theories across disciplines to create a common groundwork of explanation" (1998:8). Indeed, he saw no future for the social sciences at all, painting them as rancorous and eventually dividing into two camps, with one part to be absorbed by biology and the other by the humanities. It is little wonder that social scientists, and especially sociologists, have been wary of following leadership from the biological sciences in forging synergy.

In the main, the sociobehavioral sciences are not paradigmatic in nature. Rarely is there one agreed-upon approach or only two rival theories. The history of the social sciences is littered with battles, some of which have had extraordinary consequences. The traditional debates in psychology between experimental and descriptive approaches (Cole 1979) may now have given way to the growing gap between research and clinical concerns (e.g., the 1998 establishment of the American Psychological Society). In anthropology, the contrast between the "scientific" and "postmodern" visions of its work has produced irreparable schisms (e.g., the 1998 split at Stanford into Anthropological Sciences vs. Cultural and Social Anthropology). And in sociology, even the hackneyed debate between qualitative and quantitative work continues to find voice in some corners of the discipline (Levine 1995).

Too often, however, the biomedical, physical, and natural sciences incorrectly interpret this absence of paradigm as a lack of rigor. While such scuffles do us no favors, it is implausible to expect that one paradigm or some paradigm shift will provide a single best approach. Neither is it likely that one new variable, theory, or method from social science will provide *the* answer to the integration of the biomedical and social sciences. Sociologists, philosophers, and historians of science have been skeptical about whether Kuhnian paradigm shifts reflect "truth" and "inevitable progress," on the one hand, or the operations of power dynamics and social processes, on the other. Scientists themselves—at least the most sophisticated among them—understand the

social construction of science, the social role science occupies, and the privilege it has conferred upon its practitioners (Gieryn 1983; Mulkay 1991). These facts challenge the notion that the "continued disarray of the social sciences" faces off against "a unified biology" (DeWaal 1996:B2).

"Harder Than Rocket Science"

In Dalton Conley's recent address commemorating his receipt of the National Science Foundation's prestigious Waterman Award, he noted: "I would like to argue that sociology is among the hardest sciences of all—harder than the proverbial rocket science" (Reichardt 2005:1024). Specifically, the advantages of control, manipulation, and randomization available to the natural and physical sciences are not ethically possible in most social sciences, thereby presenting greater research challenges. In fact, the complexity of individual behavioral and social life allows for—even requires—the operation of different processes, a focus on different levels of analysis, and the use of very different investigative approaches. Even more to the point, the diversity of theories, methods, and analytic tools in the social sciences can equal the challenge of unpacking the "environment" for biomedical research. Sociology's traditional strength (as a cross-institutional discipline) and perceived weakness (as the least paradigmatic discipline) converge to offer a platform for understanding and investigating the contexts of and mechanisms underlying health, illness, and healing.

This diversity in theoretical and methodological approaches has produced an impressive body of empirical knowledge about how (1) social, psychological, economic, and cultural factors predispose individuals to health and illness (as explained by social epidemiology and political economy); (2) "diseases" are often a reflection of current theories, diagnostic procedures, trends, and resources in medicine, as well as cultural understandings (as explained by social construction, medicalization, and labeling); (3) the quality and quantity of treatment are not tagged solely to some clear disease profile and are not consistently amenable to a single set of treatments (as explained by utilization theory and health services research); and (4) the eventual outcomes of health, illness, and healing are shaped by extramedical or extratreatment factors.

Facing the Enemy—and the Enemy Is Us

That said, without some unifying prototype, social science is likely to be integrated into a larger scientific endeavor in a piecemeal fashion, in the form of borrowed bits from previous research. In that scenario, we would face a body of integrated research where social science has a tacked-on quality. For example, the "stress" hypothesis finds easy entry into traditional thinking about the etiology of disease. Focusing on the serotonin transporter (5-HTT) gene, Caspi et al. (2003) document that those who carry the s-allele gene are more likely to experience self-reported depressive symptoms, major depressive episodes, and suicidal ideation and attempts when they are confronted with negative life events. However, social science has gone far beyond counting of life events to understand the dynamics of social influence (the effect of role histories on life events, Wheaton 1990; e.g., sequences on distress, Jackson and Finney 2002). But the life history calendar, a "highly reliable method" (Caspi et al. 2003), "fits" the biomedical paradigm. Arguing about measures, using measures that are theoretically richer but perhaps less psychometrically vetted, and putting issues of theoretical causality and nuance to the test—all of which occupy some substantial part of social science debates—reflect the biomedical scientist's frustration with integration (see Modell 2002:384 ff).[3]

The dilemma may go much deeper, reflecting a larger epistemological angst that replicates itself within our own subfields and disciplines. For example, considering only dueling perspectives within the sociology of culture, Wagner-Pacifici (2005) raises a set of concerns directly applicable to this discussion: "How can we make room in our theories and in our lives for both the absolute and the socially constructed? How do we adjudicate between them? How do we create a theoretical language whereby they can communicate with one another?"

I argue that meeting the challenge of integrating the biological and the social must rest on the development of a framework and set of models that meet four requirements. The framework and models to be used in integra-

tion must: (1) consider and articulate the full set of contextual levels documented to have impact in past empirical research; (2) offer an underlying mechanism or "engine of action" (Coleman 1986) that connects levels, is dynamic, and allows for a way to narrow down focal research questions; (3) employ a metaphor and analytic language familiar to both social and natural science, so as to facilitate synergy; and (4) understand the need for and use the full range of methodological tools proven useful in the social and natural sciences.

These requirements represent a challenge. But within and across social and behavioral science, researchers demarcate levels, focusing on the individual (e.g., cognition, personality, the self, the "rational actor"), the group (e.g., family, friendship, chat room), organizations and institutions (e.g., schools, religions, work), and the larger culture (community, nation, globalization). Indeed, common to all social science–based frameworks is a shared sense of the environment as a set of nested structures or "multiple ecologies," using images of Russian dolls (Bronfenbrenner 1979) or Chinese boxes (Susser and Susser 1996). These metaphors fulfill the first requirement—a reasonable accounting of the environment as levels of social life that influence individuals.

I argue that the adoption of these multilevel frameworks has been hindered because the focus on contexts overshadows the concern with conceptualizing the *mechanisms* driving the impact of environmental forces. As Mechanic (1990) notes, no widely shared and convincing view is available to replace the dominant individually focused theories of health and health care. Thus, while attending to the first requirement to stake out multiple contexts, these frameworks failed to deliver on the second requirement: specifying an "engine of action" that links place and connects time.

Sociology to the Rescue: The Structured Social Interaction Bases of Health, Illness, and Healing

The second requirement points directly to the single idea about which all sociologists, of whatever ilk, agree (Pescosolido 1992): Social interaction is the basis of society and the individual. In Simmel's (1955) classic statement, "Society arises out of the individual and the individual out of association." In the earliest days of American sociology, Albion Small defined sociology as the "actual investigation of concrete relations in society" (1907:636), with its "primary task . . . to discover and formulate the laws of these processes in human association" (1907:637). In the 1930s, Louis Wirth continued to emphasize social interaction as "the central problem of sociological theory" (Wirth 1939:965). Ironically, it was a psychiatrist, Moreno (1934), who pioneered the focus on structural analyses, per se, through the invention of sociometry.

This is the key: Social networks provide the structural element of the mechanism of social interaction. Social networks are built by social interaction, whether those interactions are routinized and regular or spontaneous and fleeting. They create the friendship group, the organization, and global structures. However, social networks are more than impartial or sterile connecting structures. They are neither randomly distributed nor egalitarian. They can be flat or hierarchical, facilitating or restricting access to resources, including power. Social networks are equally able to be structures of domination and coercion or of emotional and instrumental support. Further, they hold important content. Interaction in social networks creates cultures of information, beliefs, and action scripts. With regard to issues of health and healing, network cultures can be parochial or cosmopolitan (Suchman 1964), promedicine or antimedicine (Freidson 1970). It is the structure and content of social networks that together shape and give meaning to context.

A social network framework can fulfill the second requirement of providing a unifying perspective on context. How do large, abstract structures in the complex environment affect individuals, biological processes, medical conditions, and treatment use or outcome? The underlying engine of action is real human contact. Networks link levels of the environment and influences across time (Coleman 1990; Giddens 1990; Pescosolido 1992; Stryker 1980; Tilly 1984). Social network theory, data-collection methods, and analytic techniques can link the building blocks and dynamic processes of biology and society through human interactions (Carrington, Scott, and Wasserman 2005; Moody, McFarland, and Bender-DeMoll 2005; Wasserman and Faust 1994; Wellman et al. 1996). The network perspective holds the potential to answer the two critical problems facing the integration of bio-

medical science and social science conceptions of context. First, how do we pare down the innumerable possible hypotheses about the environment? Second, given the abstract nature of these influences, how can findings be translated into effective social and medical interventions?

The network perspective both simplifies and enriches theorizing, selection of research questions, and data collection in the complicated designs required to answer complex questions about the society-individual-biology interface. The network perspective suggests that the ties surrounding individuals, whatever their source, be enumerated, replacing sociodemographics. Further, in cataloging social support—a commonly understood but rudimentary positive aspect of social networks—the network approach requires a systematic accounting of whether the number, duration, valence, and strength of social ties make phenotypic expression from genotypic predisposition either more likely or less likely, or whether social ties are even implicated in adaptations of genetic profiles. Finally, a network approach reconfigures questions about and potential solutions to major problems that face the medical care system (e.g., compliance with medical treatment). The social network construction realizes that the social bond between patient and provider (i.e., personal networks) and between the medical and social communities (i.e., institution-community networks) shape the medical encounter and the social reaction to it. Both sets of social networks can support or discourage identity shifts (at the social psychological or cognitive levels) that can reframe and reinforce the view of (1) a medical problem as real and chronic *or* ignorable and temporary (e.g., the low adherence rates of hypertensive drugs), (2) symptom relief *or* doctor's orders as the appropriate marker of discontinuing medication (e.g., compliance problems with all of the most common antibiotics), and (3) social costs (i.e., stigma) *or* medical costs (i.e., need) as the important determinant of illness behavior (e.g., mental illness, HIV/AIDS; Coser 1958; Day et al. 2005; Pescosolido et al. 1998; Rosenfield 1997).

Social networks also fit the third requirement. Networks, network influence, and network language have increasing resonance across the social, behavioral, natural, and physical sciences. The agenda-setting reports cited earlier see relationships as the "fundamental mediators of human adaptation" as well as the "active ingredients of environmental influences" (Office of Behavioral and Social Sciences Research 2001; Shonkoff and Phillips 2000:28;). This conclusion is based on almost four decades of research documenting the role of social networks as important factors in onset of and response to illness and disease, developing and arguing over different methods of data collection, and confronting success and failures in sociomedical research (see Pescosolido and Levy 2002 for an overview). For example, Darrow and his colleagues at the Centers for Disease Control (Darrow et al. 1981) made the first advance in understanding the HIV epidemic not through the microscope but by using social network models of transmission among infected individuals (Bearman, Moody, and Stovel 2004; see Cohen et al. 2004 on the common rhinovirus). Further, studies of the response to illness have found social networks to be the key to understanding whether physicians or individuals "see" a disease and whether they see adopting a medical solution as an appropriate response (Coleman, Katz, and Menzel 1966; Fadiman 1997; Figert 1996; Pescosolido, Brooks-Gardner, and Lubell 1998; Preston and Campbell 1993). On the organizational level, social scientists have documented that the major determinant of the type of care (e.g., family-based) or outcomes of care is *not* treatment modality but the nature of organization-based social networks among providers (Glisson and Hemmelgarn 1998; Holschuh and Segal 2002; Wright 1997).

It is the physical sciences that have come late to an understanding of networks. For example, the recent shift in the cutting edge of physics from nuclear physics to condensed-matter physics represents a shift from a focus on understanding single-particle dynamics to a more integrated model that focuses on network ties among particles and on novel states that can arise only through many-body interactions (Stix 2001). Further, across the natural and mathematical sciences, research on a range of phenomena—from complex networks on the World Wide Web, to protein-linking structures, to networks of cellular molecules involved in biochemical reactions—have suggested commonalities in structure (Barabasi 2003; Strogatz 1994; Watts 2003; Weiner 1998).

Fourth and finally, social network theory and research has welcomed all comers. It has enjoyed periods of favor and periods of virtual abandonment in social science; it has used

both qualitative and quantitative approaches to build its foundation; it has found historical archives and reinterpretations of existing histories to be as useful as contemporary data (Bearman, Moody, and Stovel 2004; Padgett and Ansell 1993; Pescosolido and Martin 2004). And it has found increasing acceptance in biomedicine. While Wilson saw no role for the social sciences per se, the key to integrating the health sciences comes, ironically, from social science's willingness to tolerate, and even embrace, diversity in research. What Wilson missed was the central role that the disarray of the social sciences has played in creating a conceptual and methodological toolbox for the consilient development of cross-cutting hypotheses.

MOVING IN THE RIGHT DIRECTION: THE NETWORK-EPISODE MODEL

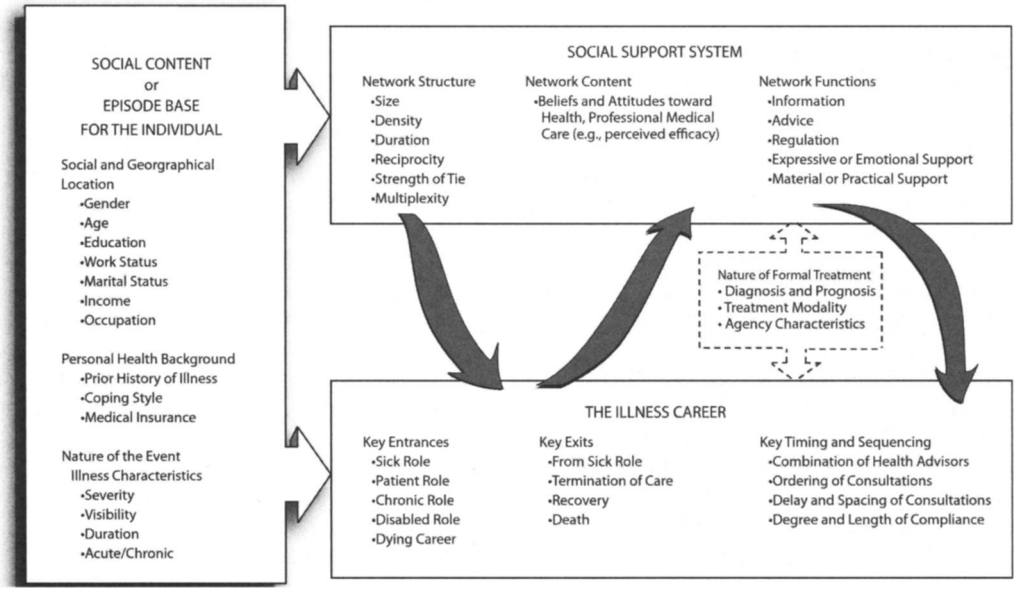
The Network-Episode Model (NEM) (Pescosolido 1991) was initially offered as an approach to understanding how individuals recognized and responded to health and illness problems. It was a specific model drawing from the Social Organization Strategy (SOS) framework (Pescosolido 1992). That framework offered a network- and event-centered counterpart to the dominant individually focused rational choice perspectives on social action. The SOS was a synthetic, transdisciplinary, multilevel frame, drawing useful ideas and methods from past research but privileging social networks as the organizing dynamic. The individual is seen as embedded in an ongoing relational dynamic with sequences of events seen as patterned, contingent, and emergent.

Phase I: Epidemiology and Health Services through a Social Lens—Social Interaction Matters

Following from the SOS, the naming of the NEM targeted the two most critical aspects of response to illness. First, as depicted in Figure 1, the entire illness career, rather than any decision to seek assistance, becomes the focus. That is, the timing and sequencing of key role exits and entrances across an entire *episode* create patterns and pathways. Second, the NEM conceptualized response to illness as a social-influences process that worked through the mechanism of networks. The NEM did not ignore the nature of the illness, social location, or the effect of treatment; rather, these were conceptualized as static starting points (e.g., race) or potential intervention points affecting network and illness career trajectories.

The NEM refocused attention on the dynamic nature of social and behavioral

FIGURE 1. The Network-Episode Model, Phase I



processes, drawing from three sources: (1) the increasing stock of knowledge on the life course (e.g., Elder 1975; Phelps, Furstenberg Jr., and Colby 2002); (2) the rich original ethnographic work across the social sciences on the illness career (Clausen and Yarrow 1955; Janzen 1978; Young 1981; Zola 1973); and (3) the resurgence of interest in and suspected increase in the use of care and advice outside the rubric of modern medicine (Press 1969; Unschuld 1987). In response to problems, individuals are pragmatic, dynamic, and inherently social. Responding to but not rejecting the dominant rational-choice-theory approach to utilization, the NEM can subsume the narrow view of individuals as rational, calculating individualists as a special case within the larger model.[4] The initial version of the NEM attempted to convey an emphasis on fluidity, time, and co-construction of the problem and response.

Thus, the NEM began with a focus on the illness career, with networks between and among individuals as an integrating mechanism connecting environmental levels. Social network theory had precedent in health care utilization research (Freidson 1970; Horwitz and Scheid 1999; Lee 1969; McKinlay 1972; Suchman 1964) but had not found the same place in services research as it had in epidemiology, due to inconsistencies in prior research. While Kadushin (1966) had documented that networks facilitated entry into treatment, almost a decade of research followed that produced a series of contradictory findings, leading researchers to abandon study of the role of social networks (McKinlay 1972). The NEM suggested that Freidson's (1970) initial insights about the interaction of the structure and content of lay networks had been overlooked. The NEM stated that the structure and function of networks interact with cultural contexts to influence critical decisions that individuals make through onset and course of a health problem.

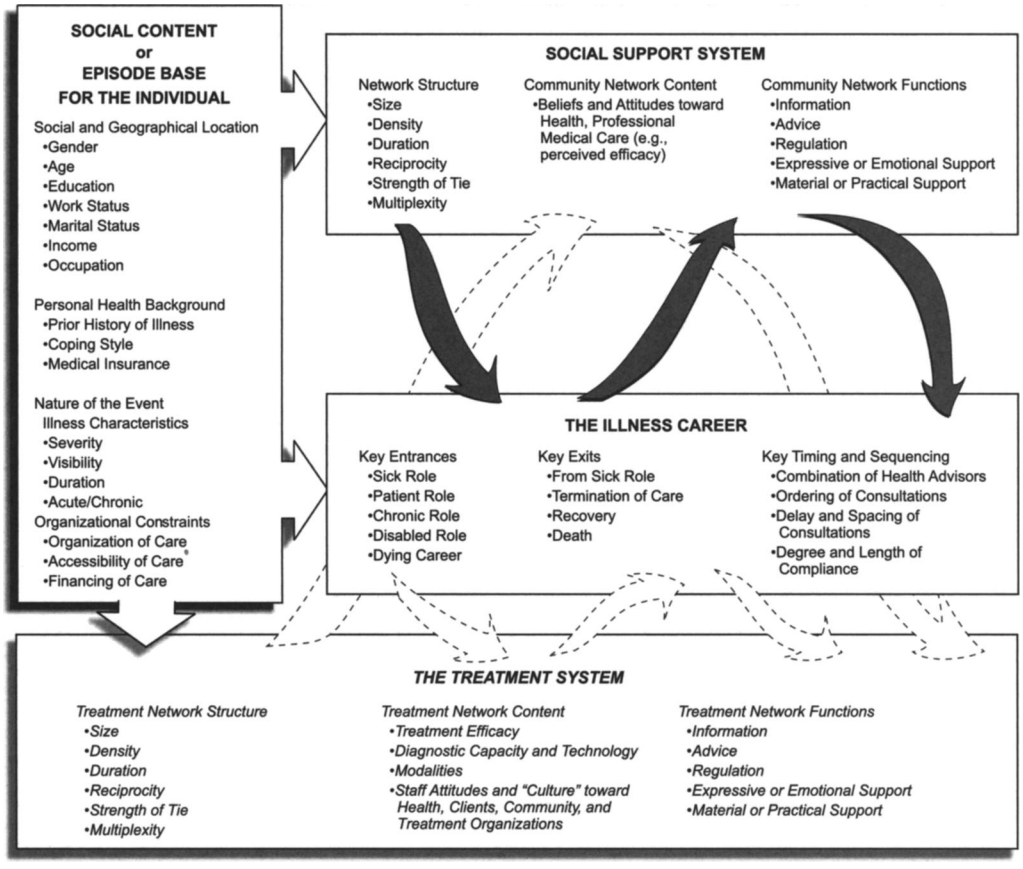
Using Puerto Rico as a case where social networks harbored negative beliefs and attitudes about the mental health system, we found that large social networks in more traditional communities keep people out of formal treatment (Pescosolido et al. 1998). Thus, the NEM would say that the structure of networks calibrated the "push" or amount of social influence, but only cultural context determined the direction of the force, i.e., either toward or away from the formal medical system. Just as important, we reopened issues of the connection between physical symptoms (if not diagnoses) and pathways to care. Using both qualitative and quantitative data from the Indianapolis Network Mental Health Study, we found that the interaction of networks (i.e., large networks) and type of symptom profile (i.e., bipolar disorder) together shaped coercive or involuntary pathways to treatment (Pescosolido, Brooks-Gardner, and Lubell 1998; see also Carpentier and White 2002).

To its credit, then, Phase I of the NEM laid out the limits of dominant models and began to elaborate the roles played by other people and time, as well as cultural options within and outside of the medical care system. It shifted the focus to dealing with the consequences of illness, the primacy of studying interaction directly, and seeing networks as determining how individuals evaluate need, gather data, and perceive the sociocultural fit of available options. But it elaborated only one context (the personal support system), looked only at the consequences of illness problems, and conceptualized health problems and treatment as static.

Phase II: Centering on the Interaction of Community and Treatment Systems

While Phase I shifted the perspective away from the individual to social network interactions and from static to dynamic pathways, Phase II reconsidered the effect of dynamics in treatment contexts on illness trajectories. The NEM–Phase II conceptualized social networks within the community and even within large and sometimes daunting institutions such as the health care system as the organizing vector of environmental influences on treatment and outcomes (see Figure 2; Pescosolido and Boyer 1999). This conceptualization elaborated three theoretical questions: (1) How do the dynamics of organizing and financing treatment systems alter network ties in treatment sites, among providers, and between providers and patients? (2) How do culture and climate within treatment organizations shape treatment options, bonds between providers and patients, and outcomes? (3) How do the structure and culture of treatment and community systems reinforce or clash, sending very different messages to patients and providers?

FIGURE 2. The Network-Episode Model, Phase II



While the NEM–Phase II acknowledged issues of medical efficacy (e.g., type or dose of treatment), it laid them aside in favor of conceptualizing how social networks in the delivery of care shape important aspects of the illness career. Even the most sophisticated and efficacious treatments are provided through human communication, with or without human touch, aided by or devoid of human compassion. The NEM–Phase II viewed treatment and community systems as human systems where powerful network ties link contexts and lives. While medical researchers and providers were quite willing to acknowledge the importance of networks in the community, they seemed to be less willing to see their role within medical treatment settings. This response led to the differentiation of "outside" networks from "inside" networks.

"Outside" networks, those commonly understood as consisting of social ties, are those that exist in the community (i.e., the personal network system). "Inside" networks theoretically join issues in the physician-patient relationship, the therapeutic alliance, notions of organizational culture and climate, and system integration—issues more familiar to social and administrative scientists. The kinds of social networks that exist in treatment settings create a climate of care, affect the work of medical providers, and shape reactions of individuals in treatment (Pescosolido and Boyer 1999; Pescosolido, Wright, and Sullivan 1995; Wright 1997). Different financing structures set limits on trust, treatment options, and the "therapeutic alliance" (Mechanic and Alpine 1999). Finally, changes in the organization and financing of care can dramatically change networks in systems of care (Morrissey et al. 1994).

To its credit, the NEM–Phase II moved from the notion that social networks are everywhere and can be anything to a more sophisticated view of real organizational structures, distinct

levels of analysis, and the changing dynamics of health care systems. However, development of a model integrating context into the biomedical sciences still faces great challenges. The role of the individual—as conceived by social psychologists, as well as by those who see "the disease in the body in the bed" with its many levels (individual psychology, physiology, genetics)—is missing.

Phase III: Embracing the "Other" and Rediscovering Place—the Individual, the Body, and Community

Integrating context into the biomedical sciences requires two radical shifts in the NEM. First, the NEM has focused primarily on the *consequences* of illnesses; accordingly, it would need to recalibrate its starting point to the *causes* of disease. This would be useful in bridging the artificial divide between epidemiology and services research by considering the whole of people's lives. Fortunately, there is a wealth of epidemiological research on networks, including social support studies, that provides the foundation for this shift (Berkman and Kawachi 2000). Second, the call for an integrated health sciences model means that social network influences are not devoid of the individual variation in personality, biology, and genetics that individuals bring to networks. An accounting of basic contributions and weaknesses of the development of the NEM is provided below, focusing on future directions.

Figure 3 provides a visual elaboration of contexts three levels above the individual's illness career and two levels below it. Networks remain as the mechanism connecting different levels and marking changing processes. However, even as geneticists and other biomedical scientists move to network models within their areas of research (e.g., Antonov, Tetko, and Mewes 2006; Brazhnik 2005), the NEM's goals are limited only to understanding social network influences at contextual levels "at" or "above" the illness career and those interactions with levels "below" it. Here, I can only outline those goals of the NEM–III.

Specifically, in the levels "above" illness career pathways, explicit consideration of the networks in the physical community adds to those in the treatment and personal support contexts. Even if individuals construct the meaning of "community" in terms of personal networks (Fischer and Oliker 1983), geographic areas have been shown to influence health, illness, and preventive care (Entwisle et al. 1997; Robert 1998), treatment rates and types (Quadagno 2004; Wennberg and Gittelsohn 1973), and outcomes (Beckfield 2004; Navarro and Shi 2001). More to the point, "place-based contacts" have been shown to shape tuberculosis transmission (Klovdahl, Graviss, and Musser 2002) and suicide (Pescosolido and Georgianna 1989).

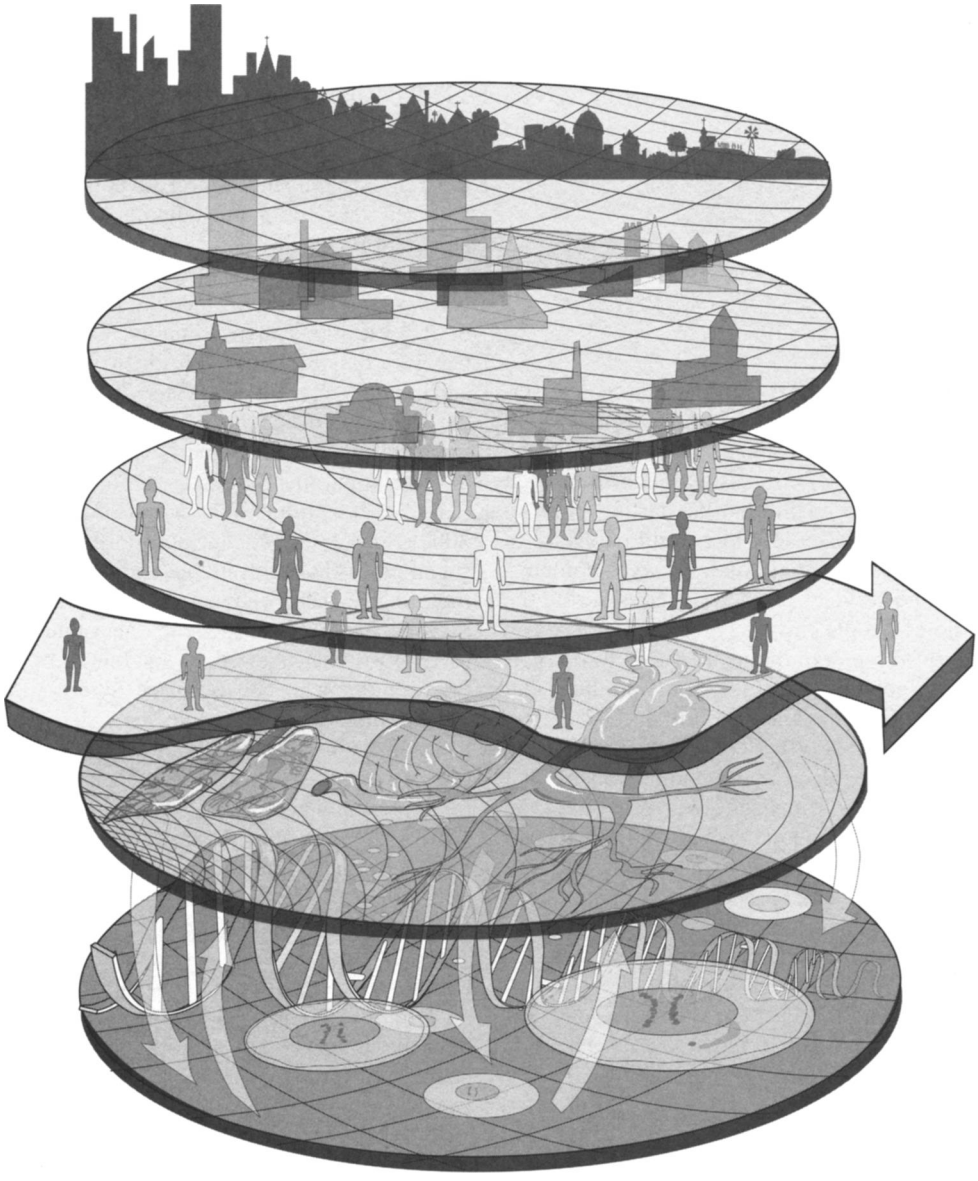
"Below" the level of the illness career pathways, social network influences are not devoid of the variations in personality, biology, and genetics that individuals bring to them. Self and identity provide the filter through which the social environment, including community, organization, and personal networks, come to have personal meaning and encounter biology (Crocker and Quinn 2001; McLeod and Lively 2003; Stryker 1980). Further, no matter what social networks are available, individuals' abilities to use them or even acknowledge them may be hindered by genetic inheritance and predispositions, as well as by the symptoms they experience. The onset of symptoms of mental illness, for example, can shape both profound disruptions and basic cognitive processes that have, in turn, been linked to treatment and health outcomes (Breier et al. 1991; Green 1996; Lysaker et al. 2000). Finally, we least understand how networks and physiological processes interact. Researchers seeking to understand the relationship between social support and cardiac risk have documented that networks affect plasma fibrinogen levels (Helminen et al. 1997). Others have shown that the presence of the hormone oxytocin appears to increase "trust" in human interaction (Damasio 2005).

In any case, these elaborations of the NEM require the most attention and collaborative effort. Even at these newer levels, there is enough research support for the promise of human association to provide the theoretical scaffolding to integrate context into the health sciences.

THE FUTURE AND ITS DISCONTENTS: LOCKSTEP OR DIVERSITY?

Our histories, whether disciplinary or individual, have taught us to be cautious. Sociologists see in biological models the ten-

FIGURE 3. The Network-Episode Model, Phase III (under construction)



dency to be functionalist, conservative, and contrary to social progress (e.g., organic images of stratification systems that reified the status quo). The hierarchy of power and resource distribution across the sciences leads us to consider whose agenda integration may serve. We continue to differentiate the sociology *of* medicine from the sociology *in* medicine (Strauss et al. 1964), even as we wonder whether this distinction has meaning. And, certainly, seeing the sentiments of renowned biologists mentioned here regarding the social sciences would make the most optimistic of medical sociologists pause.

But it would be neither wise nor fair to fall back on our traditional understandings of the natural and physical sciences. As Shanahan and colleagues (2003) note, biology has undergone a dramatic reconceptualization of itself and the role of society. The language of physics and the language of sociologists who study social networks have come curiously close. Yet three questions stand in the way of marking out an agenda for medical sociologists: Need we

all embrace a social network frame, the Network-Episode Model, or even the network metaphor? Is the agenda of medical sociology limited to participation and engagement in multilevel, multidisciplinary endeavors? How are these integrated, multilevel studies likely to be accomplished?

The Limits of One Framework

The insight of the NEM was synthetic, drawing on the best of past work that had operated in almost closed social scientific worlds (e.g., qualitative/quantitative methods), and helping to unravel past inconsistencies in research (e.g., networks as facilitating or suppressing utilization). The NEM drew, and continues to draw, liberally from social science theory and method. While the NEM offered a way out of the dead ends in utilization research, its major function may be to offer a point of departure, to engage other views, and to provide a platform for tailored models in the effort to bring context into the biomedical sciences. Already, the NEM has been tailored to the situation of children and adolescents (Costello, Pescosolido, Angold, and Burns 1998) and has been reorganized to understand the illness career from the first turning point in contact with formal systems of control (Stiffman, Pescosolido, and Cabassa 2004).

The Limits of a Narrow Agenda

Each contextual level of the NEM is built on insights from the wide range of theories, methods, and analytic techniques available to sociologists. Many social scientists who find the social network approach appealing also think that we are at the beginning, not the end, of understanding how social networks work, how they can and cannot be mapped, and how they can be used in research and policy (A Coalition to Protect Research 2005). Continuing the social science contribution to integrating the health sciences—and, more importantly, avoiding dead ends—*requires* research diversity, rather than simply allowing for it. Having diversity in research is what has put the social sciences in a position to stand as a strong partner in integrating biomedical and sociobehavioral research. It makes little sense to adopt a paradigmatic view, so roundly criticized by social scientists, regarding the natural sciences. As British political scientist Jane Lewis (2003:197) warns us, "All too often it is insisted that there is only one kind of data, one methodology that should be employed, when everything we know about the major issues in the development of the social sciences should warn us against such imperialism."

For its part, sociology as a discipline is multilevel, and we continue to find that our insights and our questions fit different research methods. But, more importantly, strong interdisciplinary research can only be built on strong disciplinary foundations. Rather than turning every researcher into an interdisciplinary researcher, truly synthetic research requires *multidisciplinarity.* That is, integrating health science demands collaboration around the table by researchers with a deep and broad understanding of their own unique disciplines, their own stock of research findings, and their own views of the adequacy of approaches to data collection and analysis. While familiarity and willingness to speak across theories and methods will be critical, superficial training across the disciplines will not advance research. Consider the explosion of very badly designed surveys appearing in research designs, on the Internet, and as marketing devices to serve other purposes. In that sense, I disagree with any attempts to homogenize training in health and health care. The best training would foster strong disciplinary training with regular and routine points of research contact and collaboration with other disciplines.

What sociology needs to do is not to change its own multifaceted agenda but to continue to reject the artificial bifurcations (e.g., qualitative/quantitative, social organization/social psychology) and old-fashioned reward structures (e.g., holding single authorship as the revered goal) that are remnants of the past century. Individual research agendas that are allowed to embrace the diversity of the discipline itself, evaluating and rewarding quality in each effort as it builds to a career contribution, must replace outmoded models of career paths.

Conducting Integrated, Multilevel Studies

The real questions in integrating social science conceptualizations of context into biomedical sciences are: How would sociologists,

or anyone else, do such studies? Who will fund the collaborative teams? How would multiple levels be selected? What kind of monitoring and mapping would be required? Given that research for pieces of the puzzle is critical, one answer is the way research is done now, i.e., within the discipline. Another answer is to support team-building, novel training, and unique funding streams across disciplines, as the agenda-setting reports have done, in theory.

But the ability to integrate social sciences depends on the composition and leadership structure of the research team. In recent research where social network theory and data collection were central (e.g., the Nan Rong project, Entwisle et al. 1997; Add Health, Udry, Li, and Hendrickson-Smith 2003), social scientists have led the way. Both studies are examples of "big science," projects that are years in the planning and many millions of dollars in the execution (Capshew and Rader 1992). But much, if not most, "big science" is not initiated by social scientists. While such projects offer the opportunity for medical sociologists to examine questions that have been out of our reach because of logistical and financial difficulties, they also raise problems. Biomedical science has become accustomed to asking about sociodemographics, and, given the demonstrated socioeconomic gradient in health and health care (Link and Phelan 2005), even to expanding data collection on this count.

Of course, there is a "but." Collaborative studies will provide an exciting window into social life, medical problems, and health disparities if and only if the measures include our current best: our best theoretical insights, questions and hypotheses, methods of data collection, measures, and training protocols. The network frame presents a challenge to this need for top-quality measures. As all of the pieces in Morris's (2004) book illustrate, collecting network data is complex and time-consuming. Taking a network perspective requires more than arguing for a single "add-on" question or set of questions. Individual network batteries routinely add 20 minutes to survey designs for each type of tie; complete network data require nearly 100 percent response or completion rates; and the preferred design includes multiple types of ties. While some types of network data are relatively easy to collect (e.g., spatial network data; Entwisle et al. 1997), these data add yet another level of complexity. And for these data, analysis can still be complicated (Faust, Entwisle, Rindfuss, Walsh, and Sawangdee 1999). Taking a network perspective, in its fullest sense, requires rethinking the standard biomedical research design. To that end, it is essential that sociologists and other social scientists monitor, participate, and provide input whenever possible.

CONCLUSION

While E. O. Wilson (1998) never questioned the intelligence of individuals who choose social science as a vocation, he charged that they could not see what was obvious to even the casual observer: that "shackled by tribal loyalty," "snarled by disunity and a failure of vision," and "demanding a precision in words in their specialties" (1998:182), social scientists would play no role in consilience. He was wrong on two counts. At whatever cost, diversity in research approaches has provided a rich toolbox of theories, findings, and methods that can respond to the biomedical call for synergy to confront health problems that biomedical scientists have not been able to solve on their own. Second, despite the alleged tidiness of science and messiness of social science, significant schools of thought in each have arrived at the understanding that social network interactions constitute a promising avenue for future research and are a potential platform for developing a common language and framework. Social networks put a human face on contextual issues of risk, access, barriers, and interventions by conceptualizing these as the results of the actions of individuals.

The key to the accumulation of scientific knowledge is "mutual credibility" (Modell 2002:350). And it is social scientists who take the leading roles in the development of network theories and methods defining and understanding "context." For our part, as Freese et al. (2003) suggest, our "biophobia" undermines our credibility. To suggest that participation in an integrated health science does disservice to our agenda as sociologists because it makes us handmaidens of "science" is also equally wrong, on two counts. First, it bespeaks a lack of confidence in our own potential contributions and our ability to add to both the mainstream of sociological theory and the integrated agenda. Second, it forgets the goal of sociology: to improve our understand-

ing of society and, in the end, to offer something to improve the lives of those who live in it. If sociologists don't participate, then we—and, most ironically, the medical sociologists among us—have written a recipe for our own irrelevance.

In Jane Austen's novel *Pride and Prejudice,* Elizabeth Bennett, the social inferior, believes Mr. Fitzwilliam Darcy to be prideful, based on an overheard public slight regarding her "qualities." However, she herself fostered the antagonism between herself and Mr. Darcy, based on deliberately created misunderstandings. Only in the face of crisis are the two of them forced to reconsider their willful antagonisms. If we continue to see sociology and biology, social science and biomedical science, "locked in an explanatory zero-sum game in which any ground ceded" diminishes the value of the other (Freese, Li, and Wade 2003:234), our well-honed observational insights have failed us.

NOTES

1. However, a reading of the Roadmap suggests that it stops at the expression of health, illness, and diseases, and that outcomes refer only to health outcomes. Efforts embrace health over health care. Treatment and treatment outcomes, as well as health services research, once again appear to have the status of second-class citizen.
2. Sociologists have unpacked at least some of the "luck" conception, and their insights are easily translated to biomedical research. Recall the line of research on employment outcomes that suggested that variation left over from looking at the role of human capital was due to chance. Countering this logic, Granovetter's (1982) groundbreaking work empirically demonstrated that so-called luck was actually the result of the systematic operation of social network ties that provided or lacked key information for job-seekers (see also Royster 2003).
3. Case in point: social networks and social capital that bring together sociologists, economists, and political scientists in agreement and argument.
4. Indeed, Hechter and Kanazawa's (1997) critique of the NEM and its larger organizing framework (Pescosolido 1992) suggests that the NEM is quite consistent with rational-choice theory. I have never argued for an either/or possibility; I have simply argued that much action occurs without proceeding from a rational cost/benefit analysis. Simmel, the father of the social network perspective in sociology, proposed that all human association, while having some aspect of purposiveness, has a "residue of pure sociability or association for its own sake" (Simmel 1909; Simmel and Hughes 1949:254).

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