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BIRDS OF A FEATHER: Homophily in Social Networks

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■ **Abstract** Similarity breeds connection. This principle—the homophily principle—structures network ties of every type, including marriage, friendship, work, advice, support, information transfer, exchange, comembership, and other types of relationship. The result is that people's personal networks are homogeneous with regard to many sociodemographic, behavioral, and intrapersonal characteristics. Homophily limits people's social worlds in a way that has powerful implications for the information they receive, the attitudes they form, and the interactions they experience. Homophily in race and ethnicity creates the strongest divides in our personal environments, with age, religion, education, occupation, and gender following in roughly that order. Geographic propinquity, families, organizations, and isomorphic positions in social systems all create contexts in which homophilous relations form. Ties between nonsimilar individuals also dissolve at a higher rate, which sets the stage for the formation of niches (localized positions) within social space. We argue for more research on: (*a*) the basic ecological processes that link organizations, associations, cultural communities, social movements, and many other social forms; (*b*) the impact of multiplex ties on the patterns of homophily; and (*c*) the dynamics of network change over time through which networks and other social entities co-evolve.

INTRODUCTION

People with different characteristics—genders, races, ethnicities, ages, class backgrounds, educational attainment, etc.—appear to have very different qualities. We often attribute these qualities to some essential aspect of their category membership. For example, women are emotional, educated people are tolerant, and gang members are violent. These essentialist attributions ignore the vast differences in the social worlds that these people occupy. Since people generally only have significant contact with others like themselves, any quality tends to become localized in sociodemographic space. By interacting only with others who are like ourselves,

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anything that we experience as a result of our position gets reinforced. It comes to typify "people like us."

Homophily is the principle that a contact between similar people occurs at a higher rate than among dissimilar people. The pervasive fact of homophily means that cultural, behavioral, genetic, or material information that flows through networks will tend to be localized. Homophily implies that distance in terms of social characteristics translates into network distance, the number of relationships through which a piece of information must travel to connect two individuals. It also implies that any social entity that depends to a substantial degree on networks for its transmission will tend to be localized in social space and will obey certain fundamental dynamics as it interacts with other social entities in an ecology of social forms.

The literature on these ecological phenomena is spread through the studies of social networks, voluntary associations, social capital (at the individual and community levels), social movements, culture, organizations, and a variety of substantive topics that are affected by network processes. Because the principle of homophily is so key to the operation of these systems, we use it as our organizing concept. We first review the classic uses of the concept, then briefly summarize the voluminous evidence for this empirical pattern. In particular, we focus on the many *types* of network relationships that researchers have found to be homophilous, and on the wide range of *dimensions* on which similarity induces homophily. We then examine the sources of homophily, focusing on the social structures that induce propinquity among similar others and the cognitive processes that make communication between similar others more likely. Finally, we end with implications for future research.

HOMOPHILY: A BASIC ORGANIZING PRINCIPLE

A pattern as powerful and pervasive as the relationship between association and similarity did not go unnoticed in classical Western thought. In Aristotle's *Rhetoric* and *Nichomachean Ethics*, he noted that people "love those who are like themselves" (Aristotle 1934, p. 1371). Plato observed in *Phaedrus* that "similarity begets friendship" (Plato 1968, p. 837).[1] The positive relationship between the similarity of two nodes[2] in a network and the probability of a tie between them was one of the first features noted by early structural analysts (see a historical review in Freeman 1996). Social scientists who began systematic observations of group formation and network ties in the 1920s and 1930s (e.g., Bott 1928,

[1]Both Aristotle and Plato stated in other locations (Aristotle 1934:1155; Plato 1968:837) that opposites might attract, so it would be inappropriate to think of them as unambiguously anticipating later social scientific observations.

[2]A "node" is any element (person, organization or other entity) that can be connected (or not) to other nodes through relational ties in a network.

Wellman 1929, Hubbard 1929) noted that school children formed friendships and play groups at higher rates if they were similar on demographic characteristics.

The classic citation in the sociological literature seems to be Lazarsfeld & Merton's (1954) study of friendship process in Hilltown and Craftown. Lazarsfeld & Merton drew on the theoretical work of Simmel (1971) and Park & Burgess (1921). Their use of the term "homophily" coalesced the observations of the early network researchers and linked it to classic anthropological studies of homogamy (homophily in marriage formation). They also quoted the proverbial expression of homophily, "birds of a feather flock together," which as has been used to summarize the empirical pattern ever since.[3]

Studies of Homophily Across the Century: Methodological and Substantive Progressions

The earliest studies of homophily concentrated on small social groups, in which an ethnographic observer could easily ascertain all of the ties between members (whether those ties were behavioral, like sitting together at a cafeteria table, or reported, as when an informant tells about his or her close friends). Therefore, our first systematic evidence of homophily in informal network ties came from school children, college students, and small urban neighborhoods. The initial network studies showed substantial homophily by demographic characteristics such as age, sex, race/ethnicity, and education (e.g., Bott 1929, Loomis 1946), and by psychological characteristics like intelligence, attitudes, and aspirations (e.g., Almack 1922, Richardson 1940).

By mid-century a vigorous research tradition had grown, with two main themes. As issues of race and school desegregation dominated the US political arena, many researchers focused on the extent of informal segregation in newly desegregated schools, buses, and other public places (see review in Schofeld 1995). While observation of relationships eventually lagged behind the study of prejudice and other attitudinal measures, researchers found strongly homophilous association patterns by race and ethnicity (although these behavioral patterns were sometimes weaker than the attitudinal prejudice). A second tradition began with the strong assumption that peer groups were an important source of influence on people's behavior (especially among adolescents). Whether the focus was positive influence (e.g., of college aspirations) or negative influence (e.g., of deviant subcultures), cross-sectional association between some individual characteristic and the corresponding characteristics of that individual's friends were used as evidence for the potency of peer context.

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[3]Lazarsfeld & Merton attributed the proverb to Robert Burton (1927[1651]:622). Like Lazarsfeld & Merton, Burton acknowledged his own conceptual predecessors in classic Western thought. The closest to the modern proverb is Diogeniasnus' observation that "Jackdaw percheth beside Jackdaw" (quoted in Burton 1927[1651]:622).

The 1970s and 1980s produced a change in scale of the evidence on homophily, as researchers applied the technology of modern sample surveys to the study of social networks for the first time (see a brief review in Marsden 1987, pp. 122–24). Whether in large-scale studies of schools (Duncan et al 1972, Shrum et al 1988), communities (Laumann 1966, 1973, Verbrugge 1977, Fischer 1982), or the US population as a whole (Burt 1985, Marsden 1987), we now had information about the networks in large systems with the ability to generalize to a known population. These large-scale studies also allowed us to measure homophily simultaneously on multiple characteristics, just as theoretical developments about cross-cutting social circles (P Blau 1977) made us aware of the importance of a multidimensional view for the integration of society.

Recent work has concentrated on the organizational contexts of networks (and, to a lesser extent, on networks connecting social entities above the level of the individual—organizations, movements, web pages, and the like). An interest in the effects of networks on both individual careers and organization success fostered many studies of connections in work organizations (Ibarra 1997, Burt 1992, 2000), in the work force more generally (Campbell 1988, Lin et al 1981a,b, Ibarra & Smith-Lovin 1997), or on the interconnected resources necessary to accomplish tasks in the business world (e.g., Aldrich et al 1989, 1996, Burt 1998). As studies moved back to the context of social organizations, longitudinal data occasionally became available to sort out the effects of selection, socialization, and attrition (Hallinan & Smith 1985, Matsueda & Heimer 1987, Podolny & Baron 1997; see review in Burt 2000).

Types of Relationships

Researchers have studied homophily in relationships that range from the closest ties of marriage (see review in Kalmijn 1998) and the strong relationships of "discussing important matters" (Marsden 1987, 1988) and friendship (Verbrugge 1977, 1983) to the more circumscribed relationships of career support at work (Ibarra 1992, 1995) to mere contact (Wellman 1996), "knowing about" someone (Hampton & Wellman 2001) or appearing with them in a public place (Mayhew et al 1995). There are some subtle differences that we mention below, but in general the patterns of homophily are remarkably robust over these widely varying types of relations. The few studies that measured multiple forms of relationship (notably Fischer 1982 and others who have analyzed his data) show that the patterns of homophily tend to get stronger as more types of relationships exist between two people, indicating that homophily on each type of relation cumulates to generate greater homophily for multiplex than simplex ties.

The analytic strategies for analyzing homophily have varied almost as widely as the types of ties. Some researchers, guided by Blau's (1977) theoretical ideas, have concentrated on the relative frequency of in-category and out-category ties (Blau et al 1982, McPherson & Smith-Lovin 1987). The fact that these patterns are powerfully affected by the relative size of groups in the pool of potential contacts

is one of the central insights of the approach. Others discuss homophily as a deviation from what a baseline model of random assortment would predict. Here, the concept represents a bias that leads similar people to associate more often than they would be expected to, *given* their relative numbers in the opportunity pool (Coleman 1958, Marsden 1988, Mayhew et al 1995).[4] Many other researchers simply use the homogeneity of a network or the similarity of a dyad, measured on some characteristic, as a source or outcome of social processes, without being clear whether this homogeneity is created by demographic opportunity or selection within that opportunity framework (e.g., Fischer 1982). Perhaps surprisingly, full network measures of heterogeneity and measures of dyad similarity often are not strongly related; Marsden (1990: footnote 7) finds the correlations of diversity-based and difference-based personal network measures range between .47 and .63.

We review all of these variants in the work below, attempting to distinguish between homophily effects that are created by the demography of the potential tie pool as *baseline homophily* and homophily measured as explicitly over and above the opportunity set as *inbreeding homophily*.[5] In addition, we occasionally introduce related research on range, density, embeddedness, and other concepts closely related to homophily but not equivalent. See Campbell et al (1986) for a discussion of how different measures of density, diversity, and multiplexity coalesce as indicators of network range.

Evidence about Homophily: Salient Dimensions

Lazarsfeld & Merton (1954) distinguished two types of homophily: *status homophily*, in which similarity is based on informal, formal, or ascribed status, and *value homophily*, which is based on values, attitudes, and beliefs. Status homophily includes the major sociodemographic dimensions that stratify society—ascribed characteristics like race, ethnicity, sex, or age, and acquired characteristics like religion, education, occupation, or behavior patterns. Value homophily includes the wide variety of internal states presumed to shape our orientation toward future behavior. We begin with the former, then move to the latter because they often prove to be derivative of social positions themselves.

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[4]Fararo & Skvoretz (1987) called this feature *tau bias* in their theoretical formulation, while Marsden (1988) called it *inbreeding* or *social distance*, depending on whether the dimension was two category, ordered category, or continuous in nature.

[5]While one might be tempted to think of inbreeding homophily as equivalent to choice homophily [a concept used in McPherson & Smith-Lovin (1987) to refer to selections within voluntary organizations[5]], notice that we use 'inbreeding' here to refer both to homophily induced by social structures below the population level (e.g., voluntary organizations and other foci of activity), to homophily induced by other dimensions with which the focal dimension is correlated (which Blau 1977 called consolidation), and to homophily induced by personal preferences. Therefore, it does not in any sense indicate choice or agency purified of structural factors.

RACE AND ETHNICITY Race and ethnicity are clearly the biggest divide in social networks today in the United States, and they play a major part in structuring the networks in other ethnically diverse societies as well. In this domain, the baseline homophily created by groups of different sizes is combined with the differences in racial/ethnic groups' positions on other dimensions (e.g., education, occupation, income, religion) and the personal prejudices that often result from the latter to create a highly visible, oft studied network divide. We find strong homophily on race and ethnicity in a wide array of relationships, ranging from the most intimate bonds of marriage (Kalmijn 1998) and confiding (Marsden 1987, 1988), to the more limited ties of schoolmate friendship (Shrum et al 1988) and work relations (Lincoln & Miller 1979, Ibarra 1995), to the limited networks of discussion about a particular topic (Schneider et al 1997), to the mere fact of appearing in public together (Mayhew et al 1995) or "knowing about" someone else (Lawrence 2000). Even the negative ties of crime victimization and rape follow the pattern (South & Felson 1990, South & Messner 1986).

In a national probability sample, only 8% of adults with networks of size two or more mention having a person of another race with whom they "discuss important matters" less than one seventh the heterogeneity that we would observe if people chose randomly from that population (Marsden 1987). People also are much more likely to report that their confidants are connected to one another if these confidants are same race (Louch 2000). Of course, people often mention spouses and other kin as confidants, so the powerful marital homogamy on race increases the homophily of confiding relations. But the degree of the racial heterogeneity is still only one fourth the potential, even if we look only at people who mention no kin in their discussion network (Marsden 1987).[6]

This summary picture includes powerful elements of both baseline homophily and inbreeding homophily. Baseline homophily within most opportunity structures—the national population, SMSAs, workplaces, and other foci of activity—leads Anglos to have much more racially homogeneous networks than any other racial or ethnic group. African Americans and Hispanics fall at moderate levels of homophily, while smaller racial and ethnic groups have networks that are dominated by the majority group (see Marsden 1987 for the clearest example of this ordering; Laumann 1973, p. 45, provides an excellent early treatment). Blau and his colleagues (Blau et al 1982a,b, 1984, 1991, Blum 1984) have demonstrated that many facets of ethnicity (e.g., mother tongue, national origins, ethnic group, and region of birth) also display this characteristic. Interestingly, African-American/Anglo contacts are the occasional exception to the pattern, in that their intermarriage rates are not well explained by their population distributions (Blau

[6]Other ways of measuring interracial friendships have produced higher estimates of cross-race contact, but there is good evidence that these other measures underestimate homophily (Smith 2000). Asking people if they have a friend or confidant who is of another race leads people to search their memory more broadly for any cross-race tie, oversampling cross-race ties relative to same-race ties in memory and possibly creating interviewer demand effects.

et al 1982). This rare failure to support Blau's structural predictions about baseline homophily is a result of the fact that areas where African Americans are a larger part of the population also show larger African-American/Anglo differences in education, income and other social class variables. Once the extent of these group differences (which Blau calls *consolidation*) is controlled, the effect of population distributions again predicts the homogeneity of ties. Blau's structural ideas have remarkable power in explaining both positive (intermarriage, friendship) and negative (crime) contacts (e.g. South & Messner 1986, Sampson 1984).

The baseline phenomenon is important not just in large populations, but also in more limited settings like classrooms and work organizations. Reskin et al (1999) report that almost one in four business establishments employ no minorities, while slightly more than one quarter employ fewer than 10% minority. Similarly, the National Organization Study found that 34% of all establishments are all white; the median establishment is 80% white (Kalleberg et al 1996, p. 53–55). Ibarra (1995) found that racial/ethnic minorities in such a skewed workplace have much more heterogenous advice and support networks than their majority counterparts. Instrumental networks of mentoring and advice show this pattern more strongly than social support networks, because minorities reach beyond the bounds of their local organization and occupational level to achieve some same-race friends (Ibarra 1995, Lincoln & Miller 1979). In classrooms, where children have fewer options for moving outside the organizational bounds, being in a numerically small racial category makes cross-race friendships more likely to grow close over the course of a school year (Hallinan & Smith 1985), probably because there are fewer same-race alternatives in the setting.

The extraordinary level of racial/ethnic homophily is due not just to baseline phenomena, however. This sociodemographic feature also leads to the highest level of inbreeding homophily (in-group deviations from a random assortment model) of all the characteristics that researchers have studied. Racial homophily occurs in friendship networks by the early grades (at least in the Southern towns and urban neighborhoods where researchers have tracked it). In the third grade, for example, Shrum et al (1988) observed only two thirds of the cross-race friendships expected by chance. Racial homophily increases steadily until only 10% of expected cross-race friendships are observed in middle school, then levels out for the rest of the high school years. Boys are less homophilous in their racial choices than girls, probably because of the nature of boys' play in larger, less intimate groups (Maccoby 1998).

In both schoolchild and adult studies, African Americans display more inbreeding homophily than do Anglos (and, in the school studies, show it earlier) (Shrum et al 1988, Marsden 1988). Since this pattern of inbreeding homophily works against the pattern of baseline homophily (which would lead African Americans to have networks of mostly majority members), it suggests that (*a*) foci of activity are more segregated for smaller racial/ethnic categories or that (*b*) minorities actively counteract the markedly cross-race patterns generated by the opportunity

structure to generate some same-category contacts.[7] Laumann (1973), in his classic analysis of the Detroit Area Study, provided an unusually detailed analysis of ethnic and religious friendship. He found a rank order correlation of −.821 between an ethnic group's size and its tendency to select friends from within the group (Laumann 1973, p. 45). These choices were structured to a substantial degree by the overlap between ethnic, religious, and socio-economic characteristics (Laumann 1973, p. 67–68). In an unusual study of five different ethnic groups in Toronto, Ooka & Wellman (2001) found that more recently arrived groups had more homophilous job search networks. The pattern was accentuated among less educated, first generation respondents, reinforcing the idea that other domains of segregation (residential, voluntary association, occupation, language, etc.) and hidden value homophily (information, attitudes, tastes, etc.) may drive the inbreeding process (see also Kalmijn 1998, p. 410, Marsden & Gorman 2001).

SEX AND GENDER The homophily of networks with regard to sex and gender poses a remarkable contrast to that of race and ethnicity. Race and ethnic homophily are dominated by the strong structural effects of category size and by category differences on many socially important features (education, income, residence, etc.). In contrast, men and women are roughly equal in number and are linked together in households and kinship networks that induce considerable similarities in residence, social class, and other characteristics. Until men and women enter the sex segregated voluntary association structure and labor force, most sex homophily is created by inbreeding rather than baseline phenomena.

By the time children enter school, they have learned that gender is a permanent personal characteristic. At about the same developmental stage, researchers first observe homophily in play patterns and a tendency for girls to play in smaller groups than boys (see reviews in Smith-Lovin & McPherson 1993, Maccoby 1998).

Hallinan and her colleagues have done the most comprehensive studies of gender in young children's network relationships. Eder & Hallinan (1978) found that girls are more likely to resolve intransitivity by deleting friendship choices, while boys are more likely to add them. For example, if A likes B and B likes C, a young boy would be more likely to add an A–C relation to resolve the intransitivity, while a young girl would be more likely to drop B as a friend. The Hallinan results are important primarily because of their implications for the emergence of cliques and larger network structures. Her data demonstrate how sex barriers to youthful friendships and these patterns in the resolution of relationship intransitivity influence the development of social networks. Children are significantly more likely to resolve intransitivity by deleting a cross-sex friendship than by adding another cross-sex friendship. In fact, most youths are more likely to delete a same-sex choice than to resolve the intransitivity by adding a cross-sex one (Tuma &

[7]Marsden (1988) found no significant social distance effect for race, after taking baseline and inbreeding into account. The key distinction appears to be same-different, not any more elaborated form of stratification.

Hallinan 1979). These simple, small tendencies toward homophily and sex differences in resolving problems in the structure of relationships mean that boys and girls will move toward very different social circles. Their worlds become gender segregated, with boys in larger, more heterogeneous cliques and girls in smaller, more homogeneous groups. This tendency is especially marked in the early grades and abates as adolescents move into the romantic ties of puberty (Shrum et al 1988).

By the time that they are adults, people have friendship and confidant networks that are relatively sex-integrated (at least when compared to other dimensions like race, age, and education). People "discuss important matters with" a group of confidants that are roughly 70% as sex heterogenous as the general population (Marsden 1987). While 22% of people have no cross-sex confidants, 37% have networks that are almost perfectly mixed by sex. This pattern is a bit misleading, however, since close ties contain many kin, and kinship links one to confidants of the other sex. When Marsden (1987) controlled for kin, he found that among kin the heterogeneity of networks was very close to the population value, while for nonkin there was considerable gender homophily. Still, the inbreeding homophily for sex in confiding networks is considerably less than that for race, education, and other social dimensions (Marsden 1988).[8] In contrast, Huckfeldt & Sprague (1995, p. 195–201) found considerable homophily in political discussion networks, with men showing much higher levels of segregation than women; 84% of men reported discussing politics only with other men.[9] There may be a tendency for less intimate, more content-bound relationships to be more gendered than close, strong ties.

Gender homophily is lower among the young, the highly educated, and Anglos (as compared with African Americans and Hispanics) (Marsden 1987). This structuring of gender homophily is mirrored in other societies (Blau et al 1991, Verbrugge 1977) and in more ephemeral relations (Mayhew et al 1995).

Interestingly, the pattern of connections *among* respondents' confidants is quite different for sex than for race/ethnicity. Alters of the same sex are significantly *less* likely to be connected than alters that aren't matched on sex (Louch 2000). This patterns appears because spouses are quite unlikely to know other-sex friends. This is especially true for men, whose wives are especially unlikely to know their female friends from other foci like work or voluntary organization membership.

While the general population is almost perfectly sex heterogeneous (with men and women being almost equal-sized groups), most environments where networks have been studied are not. Work establishments, for example, are highly sex

[8]Verbrugge (1977) found that sex homophily was stronger than education and religion, especially among closest friends, where 90% of all men and 68% of all women mentioned a same-sex person. Verbrugge did not study race in her Altneustadt, German, data.

[9]Part of the gender difference is evidently a reporting difference between men and women. When Huckfedlt & Sprague (1995:197–99) looked at political discussion between spouses, they found that wives were much more likely to report discussing politics with their husbands than husbands were to report discussing politics with their wives.

segregated (Bielby & Baron 1986, Kalleberg et al 1996 pp. 53–55) as are voluntary associations (McPherson & Smith-Lovin 1982, 1986, 1987, Popielarz 1999). Therefore, it is not surprising that the networks formed in these settings display a significant amount of baseline homophily on gender. The sex composition of the establishment, group, and occupational level creates powerful sex differences in homophily of networks, with the minority sex having much more heterophilous networks than the majority category members (South et al 1982, 1983, McPherson & Smith-Lovin 1986, 1987). Researchers have studied this baseline phenomenon most intensively among upper-level managers and entrepreneurs. Here, the findings are very consistent. Men tend to have more sex homophilous networks than do women, especially in establishments where they are a strong majority (Ibarra 1992, 1997, Brass 1985). This pattern is especially strong when we consider instrumental or status-loaded ties of advice, respect, and mentoring; socio-emotional ties of friendship and support are much more sex homophilous, in spite of skewed environments (Ibarra 1992, 1997, Lincoln & Miller 1979, Greenberger & Sorenson 1971). Across many cultures and work settings, both men and women use men as network routes to accomplish tasks and to connect to information in more distant domains (Aldrich et al 1989, Bernard et al 1988).

AGE The degree of age homophily in networks varies a great deal, depending on the type of tie studied. Homogamy on age in marriage is so taken for granted that it is seldom even studied (see the lack of discussion in Kalmijn 1998). In studies of close friendship, homophily on age can be stronger than any other dimension (excepting perhaps race, which is seldom even studied in these contexts) (Verbrugge 1977, Fischer 1977, pp. 93–98). Fischer (1977) found that 38% of all Detroit men's close friends were within two years of their age; 72% were within eight years. Similarly, when the ties studied are relatively superficial (like talking about hobbies or work, or general sociability and support around the neighborhood), age homophily is high (Feld 1982). When ties are close confiding relations or involve emergency help with money or other services, ties are less age homophilous because significant numbers of kin are mentioned (Feld 1984, Marsden 1987, Blau et al 1991). Marsden (1987, p. 127) found that age heterogeneity in confiding networks was about 60% of what would be expected by random assortment in the population; eliminating kin confidants reduces age heterogeneity to less than half of expected. Fischer (1982) found that nonkin friends were separated by only six years of age, compared to 24 years for nonsibling kin alters.

Age homophily includes a powerful baseline component. The fact that schools group ages together into classrooms induces strong homophily, although this tendency weakens as children move from early to later grades (Shrum et al 1988). Age homogeneity of contexts like neighborhoods, work environments, and voluntary organizations induces considerable age homophily in both positive ties like friendship and negative ones like crime (Feld 1982, Sampson 1984).

Age homophilous ties tend to be more close, longer lived (often reflecting the perseverence of ties formed in childhood), to involve a larger number of exchanges, and to be more personal (Fischer 1982). The probability that two nonkin confidants

will themselves be connected decreases with their absolute age difference (Louch 2000).[10] Age-similar dyads are slightly *less* likely to have multiplex relations, however (Fischer 1977).[11] Evidently this is because people tend to keep in close touch with same-age childhood friends with whom they share no other current ties.

Marsden (1988) found an interesting patterning of age homophily for different age categories. In confiding relations, there was both a strong tendency to confide in someone of one's own age (especially for the four youngest age categories) and a social distance effect: The further away someone was in age, the less likely that they were someone with whom one "discussed important matters." There was more distance between the 60+ age group and other age groups than there was between other age categories, perhaps indicating the social importance of retirement and other institutional processes associated with aging. The over-60 category was the only age group for which there was significant outbreeding. Older people often connect with younger confidants, especially their children (see also Blau et al 1991, Burt 1990, 1991).

RELIGION Marriage, friendship, and confiding relations show religious homophily in all societies with religious diversity, although the pattern is not as typically strong as it is for race and ethnicity (Laumann 1973, Verbrugge 1977, Fischer 1977, 1982, Marsden 1988, Louch 2000). Kalmijn (1998) argues that it appears to be decreasing during the past few decades.[12] As with the other forms of homophily, there is a combination of baseline and inbreeding occurring here. Protestants are likely to marry and be friends with other Protestants in the United States, because they are such a large group (Kalmijn 1998, Fischer 1977). Residents of small towns risk falling away from their religious roots, presumably because suitable coreligionists are less likely to be available, while residents of larger cities are more likely to be enveloped in a religious subculture (Fischer 1982). If we look at departures from these group size effects, however, Protestants show the lowest levels of inbreeding homophily, while Catholics, those with no religion and "other" religions, and Jews show higher levels of homophily (in that order) (Fischer 1982, Marsden 1988, Kalmijn 1998). As with race/ethnicity, we see a tendency for inbreeding homophily to counteract the likelihood that members of smaller categories will have almost totally outgroup relationships by chance. The Jewish men in Fischer's (1977) Detroit sample, for example, have 80% of their friendships with other Jews, while few would be predicted by random assortment. And 80% of all Jewish marriages are to Jews in this group that makes up less than 2% of the population (Kalmijn 1998).

Ties between people with the same religion are more likely to be close ties of giving emergency help, loaning money, giving trusted advice or even therapeutic

[10]This pattern weakens as the age difference gets very large, probably because of large age differences in relations among in-laws, mentor-protégés, etc.

[11]In another departure from the general pattern, Verbrugge (1984) also found that age dissimilarity of best friends actually increased their frequency of contact.

[12]Conservative fundamentalist Protestant groups are the exceptions to this decline.

counseling, while the less intense ties of hobby and work talk often show less religious homophily (Feld 1984, Marx & Spray 1972). This relationship between religious similarity and closeness extends even within the family: Men are more likely to name their spouses as someone with whom they discuss important matters (and to name them first, if they name them at all), if their spouse shares their religion (Liao & Stevens 1994). In relationships of less closeness, religion may not matter much at all. Bainbridge & Stark (1981) found that among West Coast college students, religious attitudes and beliefs were salient only when they were activated by a social movement or formal organization. Again, fundamentalist students were more likely to make this dimension a keystone of their friendships. Iannaccone (1988) reviewed literature differentiating churches and sects, indicating that sects (which tend to be more conservative, evangelical, and fundamentalist) are a more total social environment for their members, spawning a larger proportion of their friendships and social support networks while taking up more of their time. Parents also show greater religious homophily in their network ties than nonparents, supporting the idea that religious institutions are sought out for children's benefit (Fischer 1982). (An alternative hypothesis, of course, is that religious people both have more same-religion friends and are more likely to have children.)

EDUCATION, OCCUPATION, AND SOCIAL CLASS The dimensions of homophily that we have discussed up to this point are largely ascribed or strongly inherited from one's family of origin. Here, we address dimensions that, in modern industrial societies, are to a large extent achieved (although still shaped by family origins, of course). Social class of origin often determines neighborhood residence; education locates people in school settings; and occupation affects both workplace and voluntary association activity. Therefore, it is not surprising that we find significant homophily on these achieved characteristics as well. Marsden (1987) found that about 30% of personal networks were highly homophilous on education, with a standard deviation of less than one year. On average, respondents' confiding networks showed about half the educational diversity of the general population. This parallels Verbrugge's (1977) results a decade earlier, showing that education, occupation, and occupational prestige all showed roughly the same levels of homophily as religion and sex. Louch (2000) found that interconnections among alters were more likely when they had had the same education too, although this effect was less strong than for race and religion. Yamaguchi (1990) found that homophily in education extended to inbreeding bias among the statuses of the friends themselves, with one choice predisposing other choices of the same educational level. Laumann (1973, p. 81–82) found that the occupational structure of Detroit men's friendships had at least two dimensions: One was the dominant action of social status, education, and income, while the other represented a contrast between more bureaucratic and more entrepreneurial work activities (see also Laumann & Pappi 1976, p. 57–64). Wright (1997, p. 208–22) explored the class structuring of friendships in more detail, finding significant boundaries to friendship across property, skill, and authority boundaries. The property boundary is the most impermeable to friendships in most societies (with the notable exception of Sweden).

Kinship ties tend to introduce educational and class hetergeneity into confiding and support networks, for while marriages are quite homophilous on these characteristics (Kalmijn 1998) the cohort differences in educational achievement mean that many cross-generational links are dissimilar (Marsden 1987). Higher education and being male also lead people to have more diverse networks, since these groups have both homophilous high-status relationships *and* ties that extend lower into the educational/occupational status hierarchy (Marsden 1987, Campbell et al 1986, Campbell 1988, Fischer 1982). All educational groups show inbreeding tendencies, as well as a social distance effect: People are both more likely to confide in others who share their same educational level and become less and less likely to form such a tie as their difference from others' achievement increases (Marsden 1988). The edge categories of extremely high and low education show the biggest inbreeding tendency (Marsden 1988, Kalmijn 1998), with a socially significant divide between the college-educated and those without college experience and another major distinction between the white collar and blue collar occupations (Kalmijn 1998, Hout 1982, Hauser 1982).

Researchers have found educational and occupational homophily in a large number of societies, but there is some indication that its level varies somewhat from country to country (Wright 1997, p. 203–22). Blau et al (1991) found roughly the same level of homophily in a Chinese city as in the United States, but Verbrugge (1977) found that Altneustadt (German) friendship ties were more structured by occupation than those in Detroit. Educational homogamy in marriage has been increasing strongly in the United States, but most countries show no trend and some show a decrease (Kalmijn 1998). Indications are that it is the operation of US colleges as a locus of marriage formation and the cultural aspects of educational and occupational homophily, rather than the economic ones, that drive the structure.

In spite of the fact that we see strong educational, occupational, and class homophily in strong ties like marriage and confiding relations, there is some indication that such similarity is perhaps more important in the less intimate ties of one's network. Occupational homophily is one of the few factors that Verbrugge (1977) found was weaker for best friends than for second and third friends. Louch (2000) found that education was less likely to create links between confidants than most other characteristics (religion, race, etc.). Galaskiewicz & Shatin (1981) show that cooperative ties between community organizations are most likely to be activated between those with educationally similar backgrounds in turbulent, problematic times. Schneider et al 1997 find strong educational homophily in information flows about education choices in voucher systems.

NETWORK POSITIONS When networks within organizations or small communities are studied, they often display a core-periphery pattern, with a central group of closely interconnected people and a larger group of people who are less densely connected to the core and to each other (e.g., Brass 1985). Festinger's (1950) classic theory of social comparison posited that people would use as a reference group those who are similar to them in various ways, including structural position. More modern network research (Burt 1982, Friedkin 1993) has confirmed this

hypothesis. People who are more structurally similar to one another are more likely to have issue-related interpersonal communication and to attend to each other's issue positions, which, in turn, leads them to have more influence over one another. There are powerful homophily effects in who we consider to be the relevant others in our organizational environment: those to whom we compare ourselves, those whose opinions we attend to, and simply those whom we are aware of and watch for signals about what is happening in our environment (Lawrence 2000). While homophily on structural similarity has focused almost exclusively on influence and comparison processes, the core-periphery pattern that networks often show may indicate that other types of advice, friendship, and association respond to this basis of homophily as well.

BEHAVIOR A long tradition in the literature on adolescence demonstrates the tendency of teenagers to associate with others who share their behavior patterns, either of achievement or delinquence. Traditionally, these patterns were interpreted as evidence of peer influence. As your mother always told you, hanging out with the wrong crowd could get you into trouble. Longitudinal data first became available in the 1970s, and this led to a rather decisive shift in the interpretation of behavioral homophily. Cohen (1977) and Kandel (1978) demonstrated that both positive behaviors of school achievement and negative behaviors like smoking marijuana were homophilous more because of selection into relationships with similar others than because of behavioral influence within friendship cliques. There also was a slight tendency for relationships to disband when behavioral similarity did not support them. Later, Billy et al (1984) showed the same patterns for adolescent sexual behavior.

Among adults, behavioral homophily has been studied along two dimensions. Verbrugge (1977) noted a mover-stayer pattern in Altneustadt (German) friendships, with residential stability predicting friendship formation about as strongly as did sex, nationality, or religion. Knoke (1990) found homophily of political behavior and practice, with stronger shared political orientations predicting more behavioral involvement, especially within the context of voluntary associations.

ATTITUDES, ABILITIES, BELIEFS, AND ASPIRATIONS Having established that homophily exists on a wide array of sociodemographic and behavioral dimensions, we finally turn to the arena where most people spontaneously recognize that similarity breeds fellowship: value homophily. An extensive experimental literature in social psychology established that attitude, belief, and value similarity lead to attraction and interaction (see review in Huston & Levinger 1978). Homophily on traits like intelligence was one of the first phenomena studied in the early network literature (Almack 1922). The classic status attainment literature picked up this assortative pattern and used it to argue that aspirations for higher educational attainment were shaped by peer groups (Duncan et al 1968). As with behaviors, however, the selection into relationships with similar others appears to be a much more

powerful force than interpersonal influence within the friendship network (Kandel 1978, Cohen 1977). Much of what appears to be value homophily or influence also comes from the misperception of friends' beliefs and attitudes (Jussim & Osgood 1989, Huckfedlt & Sprague 1995); people tend to assume that their friends are like them, when in fact areas of disagreement simply are not discussed. There is considerable tendency for adults to associate with those of their own political orientations (Verbrugge 1977, 1983, Knoke 1990, Huckfedlt & Sprague 1995), but it unclear whether this homophily is due to actual political similarity or similarity on other social characteristics that are correlated with political beliefs. At any rate, selection almost certainly trumps influence or attrition in this domain as well.

SUMMARY The literature is remarkably consistent across many different relationships and many different dimensions of similarity: Homophily characterizes network systems, and homogeneity characterizes personal networks. In diverse societies, race, and race-like ethnicity create the most stark divides. Sex, age, religion, and education also strongly structure our relations with others. Occupation, network position, behaviors, and intrapersonal values also show considerable homophily, but they seem to be more specific to certain types of networks and/or derived from the basic facts of sociodemographic homophily. Baseline patterns strongly shape networks by influencing the opportunity structure for contacts, both within large populations and within smaller social settings. Inbreeding homophily often complements baseline, such that smaller categories of individuals who would otherwise have networks dominated by the majority group actually have associates that are much more similar to them than we would predict from the opportunity structure. We now move on to the sources of this remarkably consistent structural feature.

CAUSES OF HOMOPHILY: FOCI OF FORMATION, PROCESSES OF TIE DISSOLUTION

Geography

Perhaps the most basic source of homophily is space: We are more likely to have contact with those who are closer to us in geographic location than those who are distant. Zipf (1949) stated the principle as a matter of effort: It takes more energy to connect to those who are far away than those who are readily available. The classic community studies illustrated this fact (e.g., Gans 1968; see review in Campbell 1990), although purely local networks are a source more of contacts than close ties (Wellman 1996) and tend to become less important over time as other types of homophily trump mere propinquity (Gans 1968, Michaelson 1976). Even factors so seemingly trivial as the arrangement of streets (Hampton & Wellman 2000, Sudman 1988), dorm halls (Festinger et al 1950), and legislative seating (Calderia &

Patterson 1987) can influence the formation of relatively weak ties (and the potential for stronger friendship formation).[13] Women are more likely than men to form close ties with neighbors (Moore 1990, p. 729) because they are less likely to be tied to extralocal foci of tie formation like work and their voluntary associations are more likely to be geographically local (Fischer & Oliker 1983, McPherson & Smith-Lovin 1986). Older people also are more constrained by their immediate geographic environment and have networks that are more reflective of it (Fischer 1982, p. 184).

The advent of new technologies like print, the telegraph, the telephone, and e-mail may have loosened the bounds of geography by lowering the effort involved in contact (Kaufer & Carley 1993), but these new modes have certainly not eliminated the old pattern; Verbrugge (1983) still finds that residential proximity is the single best predictor of how often friends get together to socialize. Since most high-tech contacts still reflect contacts that are originally made and sustained through face-to-face encounters, even ties measured through this mechanism usually show geographic patterning (Wellman 1996). However, the new technologies may have allowed people greater latitude to create ties that are homophilous on other dimensions (Hampton & Wellman 2000; see review in Wellman et al 1996). In fact, these technologies seem to have introduced something of a curvilinear relationship between physical space and network association, with very close proximity no longer being so privileged over intermediate distances but both being considerably more likely than distant relations. Geographic space also seems more important in determining the "thickness" of a relationship (its multiplexity and the frequency of actual contact) than it does in determining the presence of a tie.

The homogeneity of neighborhoods on characteristics that are transmitted by parents—ethnicity, race, religion, and family background (Lieberson 1980)—clearly influences the homophily of ties that are formed in this arena as opposed to organizational foci like schools and workplace, which are organized along different dimensions. Urban areas, with their greater diversity within a moderate geographic distance, produce networks with higher levels of racial and ethnic heterogeneity (Marsden 1987, pp. 128–29). Geographic effects evidently influence the tendency for people with a farm background to marry others like themselves (Kalmijn 1998, p. 409). Similarly, the regional distribution of religions (with Baptists and Methodists concentrated in the South and Catholics in the Northeast) contributes to the religious endogamy observed in marriages (Kalmijn 1998, p. 408). Blau et al (1984) demonstrated systematically that the composition of an area with regard to its occupational structure, income structure, industry mix, and educational distribution all influenced the level of homophily in marriages formed there.

[13]Sudman (1988) found a large interaction effect between geographic proximity and the type of dwelling, with large apartment buildings creating little geographic distance effect and single family dwellings creating the most. Clearly, architecture and other sociocultural factors affect the use and influence of space.

Family Ties

While geography is the physical substrate on which homophily is built, family connections are the biosocial web that connect us to those who are simultaneously similar and different. The prevalence of heterosexual coupling and the roughly equal likelihood of having male and female children ensures that family connections will produce high heterogeneity on sex. Generational ties of exchange and affection also produce much greater age heterophily in the family than occurs in any other foci of tie formation. In a mobile society where generations often move to follow educational or occupational opportunities, kin ties often produce relatively close, frequent contacts among those who are at great geographic distance. Similarly, cohort shifts in the base rate of educational or occupational opportunities create substantial kin-based contacts with different educational and class levels.

On the other hand, the importance of the marriage bond within families and in larger society, creates rather dramatic structuring of kinship ties on other dimensions. Family-based ties are much more likely to be same race, same ethnicity, and same religion. In fact, the tendency to marry within group is so revealing of the underlying importance of dimensions for structuring our society that tracking the rise or decline of homogamy on a characteristic is an interesting, complex sociological question (see the debates in Raymo & Xie 2000 and Smits et al 2000).

While the fact that family ties have a somewhat different structure than the more voluntary, less intense social ties of co-employment, co-membership, or friendship is interesting, it should not hide the fundamental similarity: (*a*) family ties are homophilous on most characteristics, and (*b*) strong, homophilous ties on one characteristic may act to induce heterophily on other characteristics. Family ties, because of their strong affective bonds and slow decay, often allow for much greater value, attitudinal, and behavioral heterophily than would be common in more voluntary, easier to dissolve ties formed in the foci discussed below.

Organizational Foci

School, work, and voluntary organizational foci provide the great majority of ties that are not kin (Louch 2000, p. 53), supporting Feld's (1981, 1982, 1984) argument that focused activity puts people into contact with one another to foster the formation of personal relationships. After the propinquity created by neighborhood play groups, schools are the next major focus of tie formation across the life course. Shrum et al (1988) found that 88% of all third graders' friendship ties are formed in their own grade at school. Tracking within schools assures that children of similar backgrounds, abilities, and achievement levels are grouped into the same classes, where homophilous ties can form (Kubitschek & Hallinan 1998, Hartup & Stevens 1997). Indeed, Neckerman (1996) found that children's friendships are quite unstable without organizational support. School organizations help not only to breed ties, but also to maintain them. Some of the homophily in age and

behavioral characteristics induced by school structures survives into adulthood, as childhood friendships occasionally are maintained in spite of few other connections. Fischer (1977) found that 20% of Detroit men's (nonkin) friendships were formed in childhood.

After school, most people move into a work environment that also segregates their opportunities for tie formation. The general literature on organizational demography has been reviewed elsewhere (Pfeffer 1983, Reskin et al 1999). Here, we simply note that a large number of both strong and weak ties are formed at work [809 out of 4423 close confiding relationships in the General Social Survey, roughly half of the nonkin ties (Marks 1994)], and that the composition of these ties is strongly influenced by the composition of the work establishment (Ibarra 1992, 1995, Brass 1985, Feld 1982, see review in Reskin et al 1999). In general, ties formed among co-workers tend to be more heterogeneous in race and religion than ties formed elsewhere, and more homogeneous on sex and education because of the highly segregated character of the workplace on these two dimensions (Marsden 1990, pp. 402–3).

Recent research has concentrated attention on the role of voluntary associations in creating interpersonal ties (McPherson & Smith-Lovin 1986, 1987, McPherson et al 1992). While voluntary groups are probably less important sources of ties than school or work, they are important because they operate over the entire life course, from childhood to death, and because they represent a unique arena for watching the strong interplay of structurally induced and choice-produced homophily. Since voluntary groups are, by definition, less constrained than family, school, or work (which may be biologically or legally mandated), they represent an excellent opportunity to examine the co-evolution of groups, ties, and memberships.

There is a structural duality of persons and groups: The fact that groups are made up of people means that every group creates a set of co-membership ties among its members (Breiger 1974), and these connections can be used to sample groups by sampling from their members in a population of individuals (McPherson 1982). Larger organizations create proportionally more co-membership ties than smaller ones, of course, because the number of potential interpersonal relationships is $(n(n-1)/2)$, where n is the number of members in the group (McPherson 1983a, McPherson & Smith-Lovin 1982). Since higher SES people join more groups and leave them less frequently, they experience more voluntary organizations over their life course and have more co-memberships (McPherson 1981, pp. 718–20). Men also gain more ties from their voluntary organization memberships than women because they belong to larger groups, on average (McPherson & Smith-Lovin 1982). The extreme gender segregation of the voluntary system leads most co-membership ties to be sex-homogeneous (McPherson & Smith-Lovin 1986); the average male membership generates 37 co-membership ties, eight of which are female, whereas the average female membership generates 29 ties, only 4 of which are male. All-female groups, in particular, lead women into relationships that are highly homophilous on age, education, religion, marital status, and work status (Popielarz 1999a).

When we look at ties closer than mere co-membership, we find that many friendships, confiding relations, and social support ties are formed within voluntary groups. Close confiding relations are about as likely to be embedded in voluntary groups as they are to be found at work (Marsden 1990, p. 403).[14] Feld (1982) found that 68% of the relationships in Fischer's (1982) Northern California Community Study were formed in some type of foci of activity, with roughly a third of those formed in work and voluntary organizations.

The social homogeneity of most organizational foci creates a strong baseline homophily in networks that are formed there. Feld (1982) found that organizational foci produced ties that were twice as homogeneous as would be expected by chance. More specifically, Marsden (1990) found that co-membership sources reduced age, race, and especially religious diversity of confiding relations. McPherson & Smith-Lovin (1987) showed that the composition of voluntary groups induces strong homophily in the ties that are formed there, with group size, consolidation of dimensions, and social diversity within organizations all affecting the extent to which ties were formed with similar others. In particular, the voluntary groups induced strong homophily in sex, age, and occupational prestige; Peoples' choices of close associates *within* the groups (inbreeding, in our classification here) were more important in creating educational homophily. McPherson (1983b) noted that different types of voluntary groups have specialized demographic structures, with church, youth, and elderly groups tending to specialize in the age dimension (and therefore inducing age homophilous co-membership ties), while professional groups induce educational homophily. Civic groups integrate different age groups, and groups serving the elderly integrate those with different educational backgrounds. Hobby groups are the most generalist overall, integrating a wide array of characteristics (especially occupational statuses).

Researchers have also examined the impact of organizational foci within more specific institutional domains. Caldeira & Patterson (1987) found that joint committee memberships had powerful effects inducing friendship, shared attitudes and information, shared understandings of the legislative role, and behavioral homophily (voting together) in a state legislature. Cook (2000) found that the same key variable—shared committee membership—was the most important predictor of bill co-sponsorship in the United States Congress, even when controlling for a large number of individual and district characteristics.

Voluntary organizations can also be important in reinforcing the effects of other types of ties. Galazkiewicz (1985) found that nonprofit officers that belonged to the same professional organizations ended up more proximate in personal networks and more similar in their evaluation of prospective donors (attitudinal homophily). Knoke (1990) found that discussing politics with at least one other member of a voluntary organization strongly boosted a person's political mobilization both inside the organization and in the larger community. Davis & Aldrich (2000) found

[14]These co-membership confidants are more likely to be kin than co-worker confidants, however.

that co-membership in instrumental organizations (especially when coupled with intensive organization activity) increased entrepreneur's odds of gaining access to resources like expert advice. This was especially true for women entrepreneurs. The fact that the effect operated more strongly for women may be created by the fact that women often were seeking help from men with greater experience. Beggs & Hurlbert (1997) found that female seeker/male contact ties were less effective than same sex ties in providing support during a job search, *unless* the sex heterogeneous tie was reinforced by a shared voluntary organization membership. If reinforced by the organizational context, the nonhomophilous ties were as effective as same-sex contacts in providing support. Therefore, it appears that organizational co-membership is capable of reinforcing nonhomophilous ties, to allow them to operate as homophilous ones would.

Isomorphic Sources: Occupational, Family, and Informal Roles

Early in the modern era of social network analysis, Burt (1982) made the point that people who occupy similar positions (i.e., have the same role relationships to similar others) often influence each other in the adoption of innovations. Such equivalent actors are often linked by direct ties, of course, although Burt argued that the influence could occur even when they were not. If we accept the proposition that role occupants are more likely to be similar than randomly chosen people, the connections between people who occupy equivalent roles will induce homophily in the system of network ties. Studies illustrating this point have concentrated in three domains. The most common, by far, are the detailed studies of connections within the workplace. There also has been some attention to the effect of family roles and the more intricate study of structurally equivalent actors within informal networks.

Many studies of the workplace, for example, find that the advice, respect, and support networks formed there are shaped not just by the composition of the work establishment as a whole, but even more strongly by the organizational demography at a person's own level or job title (Ibarra 1992, 1995, Brass 1985). Employees are especially likely to have ties to others who occupy their same job, and occupational sex segregation induces strong baseline homophily. Lazega & Van Duijin (1997) found that position in the formal structure of a workplace (including status, seniority, and the functional division of work) influenced the choice of advisors. Several studies have examined detailed networks of communications among scientists (perhaps because we know more about the dimensions of their work). Fuchs (1995) found that status organizes gossip among scientists into a core-periphery pattern. Judith Blau (1974) found that local contacts among high energy physicists were strongly structured by whether or not they shared a similar role within the academy (teaching versus other research roles). Such contacts also were structured by research accomplishments and specialty even within this small, elite subfield. Because we know that such stratification in the academy has demographic parallels, structuring of ties by any of these positional factors will induce demographic homophily as well.

In the world of family life, Fischer & Oliker (1983) found that friendship contacts are likely to be created as a result of one's role as spouse. Women's networks, in particular, were formed with the other wives that they met through their husbands. Given significant homogamy in marriage, and the tendency of men's friendships to form at work (Marks (1994), friendships formed through this spousal role are likely to induce considerable levels of homophily. Munch-Rotolo (2000) showed that the onset of parenthood induced considerable similarity in the networks of men and women, as they both became more tied to female kin and other parents with children in their immediate geographic area. Given the tendency of kin and neighborhoods to stratify contacts in terms of a variety of social dimensions (see above), this increasing concentration on the two sources of ties will create substantial racial, ethnic, religious, and class homophily.

A smaller number of researchers have examined the extent to which structural equivalence in more informal networks induces behavioral or attitudinal homophily. Calderia & Patterson (1987) found that political leadership roles and friendship patterns in a state legislature induced considerable homophily of attitudes and beliefs. Galaskiewicz (1985) found that similar network positions induced considerable levels of agreement about potential donors to nonprofits that he studied.

Cognitive Processes

We have focused overwhelmingly on the structural sources of homophily in our discussion above because the literature routinely shows the potency of such forces when compared directly with some type of personal choice or selection (e.g., McPherson & Smith-Lovin 1987). Here, we briefly note the processes that have historically dominated the research on homophily: the tendency of people to choose to interact with similar others. The psychology literature has demonstrated experimentally that attraction is affected by perceived similarity (Huston & Levinger 1978). Carley (1991) has developed a sociological approach called *constructuralism* that has at its core the assumption that people who share knowledge with one another are more likely to interact (and, we might extrapolate, form ties). If demographic similarity tends to indicate shared knowledge (see this argument developed in Mayhew et al 1995), we would expect people to associate with similar others for ease of communication, shared cultural tastes (Mark 1999), and other features that smooth the coordination of activity and communication. Researchers often have studied this process within adolescent subcultures, where selection of association among similar others is found to be a much more potent force than socialization within the group (Cohen 1977, Kaplan et al 1987, Billy et al 1984).

Selective Tie Dissolution

Most of the review above on sources of homophily has implicitly concentrated on the creation of ties. Clearly, social ties are usually created in segregated foci of

activity, which induces homogeneous personal networks. Researchers less often study the process of tie dissolution, since this requires data on associations over time (see review in Burt 2000).

Hallinan and her colleagues have assembled one of the most impressive sets of dynamic data, on schoolchildren's friendship ties over the course of school years. They find consistently that ties that are cross-sex or cross-race are more likely to be dropped than ties among demographically similar friends (Hallinan & Williams 1989, Tuma & Hallinan 1979). These nonhomophilous ties are especially likely to be dropped when they are involved in intransitive friendship patterns. Basically, homophilous relations help friendships survive other structural challenges. This pattern parallels the findings among adults that homophily becomes more important to tie activation during times of crisis or trouble (Galaskiewicz & Shatin 1981, Hurlbert et al 2000).

McPherson and his colleagues have studied how ties of co-membership are affected by similarity to other members of a group. Both strong and weak ties to others in the group, which are likely to be among similar others, tend to increase the duration of memberships (McPherson et al 1992). More direct evidence comes from Popielarz & McPherson (1995), which showed that the closer a member is to the edge of a group's niche (i.e., the more s/he is unlike the other members of the group), the more likely s/he is to leave the group.

Burt (2000) has done a detailed study of tie decay across four years in the investment banking division of a large financial organization; In this case, a tie was being involved in regular business dealings with another. He finds that ties among bankers survive much longer than ties between bankers and those outside the banker role. There is also a clear core-periphery pattern, such that ties with the people who are highly ranked in both the formal and informal hierarchy last longer than those with and among those lower in the hierarchies. Age homophily also decreased the probability that a tie would dissolve, with this effect being especially strong for those who are either unusually young or unusually old within their occupational structures.[15]

In general, we find that the patterns of tie dissolution mimic those of tie formation, but perhaps in a somewhat weaker manner. While there is much less evidence here, homophily seems to affect the probability that a tie will dissolve or decay, net of other factors (like the liability of newness, embeddedness, structural supports, etc.). The relative strength of homophily in tie formation and tie dissolution may be a function of the preeminent importance of structural foci in the tie formation process. Once ties have been formed in highly segregated organizational and role foci, their dissolution may be shaped primarily by changes in these supportive structures or by cognitive/communication processes. These may be somewhat

[15]Burt did not find similar gender homophily effects. Instead, women seemed to dissolve contacts with both men and women at a very high rate. This pattern probably has more to do with the position of women within this fairly male occupational environment than of homophily, per se.

more idiosyncratic than the highly structured world of tie formation. But, given the paucity of evidence on tie dissolution, this conclusion may be premature. We therefore turn now to our recommendations for future research on homophily in networks.

IMPLICATIONS FOR FUTURE RESEARCH

Need for Studies of Multiplexity

It is striking that 20 years after Fischer's (1982) classic study of networks in North California communities, so few large-scale studies investigate the multiple, overlapping networks of different types of relationships that his research so admirably chronicled. If different types of relations are structured by different levels of homophily on different dimensions, then multiplex relations among individuals may create systematic, important patterns of cross-cutting social circles. Attention to this complexity may produce findings as important for the larger issue of the integration of society as did Peter Blau's (1977) groundbreaking insights about the impact of consolidated (correlated) dimensions.

An analogous concern is the operation of overlapping, cross-cutting foci that may shape tie formation. Since we find that geographic, organizational and role foci are powerful structural forces inducing homophily, it makes sense that studying how these foci interrelate would be important for examining community structure more generally. Popielarz (1999b), for example, has developed a propositional theory of how memberships in multiple voluntary organizations can influence the homophily of networks formed in this domain. The attempts of McPherson and his colleagues to trace the flow of co-membership ties within a community of competing voluntary organizations has developed a similar theme at the organizational level (McPherson 1983a, McPherson et al 1992, McPherson & Rotolo 1996). If foci are where homophilous ties form, it is important to understand in more specific terms how the organizational structure relates to the personal networks of the individuals that make up those organizations.

Need for Dynamic Data

Burt (2000) has pointed to the very limited evidence that we have on the dynamics of networks over time. As with the multiplexity issue above, collecting measures of even *one* type of network tie at *one* point in time for a large, loosely bounded system is an onerous task;[16] this fact limits our ability to study networks over time. Still, cross-sectional data on networks can never answer the important questions about the extent to which network patterns, including homophily, are created by

[16]The social network module of the General Social Survey took approximately 15 minutes of survey time to elicit information on up to five network alters with one network relation, with minimal information about the context in which the relationships were formed.

selective tie formation or selective tie dissolution. While we have evidence that both processes are important, we have little comprehensive information of how the two processes interrelate[17] or about their relative strength of the two processes are highly tentative.

Several studies have shown that the effects of organizational composition can last far beyond the actual embeddedness of the individual (Sorenson 2000, Sparrowe & Popielarz 1995). Only by tracking both the organizational and role history of the individual along with their personal networks can we see the full impact of such factors. Analyses of cross-sectional data often leave such long-term effects of organizational environments misclassified as individual choice or (more appropriately) as unexplained variance, when in fact they are the systematic residues of past foci.

Need for Study of the Co-evolution of Foci and Networks

Our final suggestion is, in actuality, a combination of the two themes that we discuss above' the need for expanded consideration of multiplexity of both networks and foci, and the need for dynamic data on changes over time in networks. Carley (1999) recently has called for an ecology of how social networks evolve, a "socio-cognitive physics." While the powerful law-like pattern of homophily in networks encourages such a call, we argue that the structural sources of homophily will most likely require a consideration of the co-evolution of social entities like voluntary organizations, employment establishments, and other social entities that breed ties along with the study of network change. Focusing more on the organizational levels, researchers have used network homophily in combination with an ecological model to predict changes over time in the composition of voluntary organizations and occupations (McPherson & Ranger-Moore 1991, McPherson & Rotolo 1996, Rotolo & McPherson 2001). We now argue for attention to the analogous problem on the network side: The ways in which networks evolve over time through cumulative processes of tie creation and dissolution as they are embedded in a changing community of multiplex relations spawned by multiple organizational affiliations. While the need to layer multiple relations over time in connection with a system of organizations and other foci is a tall order, we have a much more solid base of empirical knowledge and theory in this domain than in most substantive areas. Further, we have ample evidence that the network phenomena that we hope to explain are more systematic and orderly than some other areas of social life. Therefore, Carley's call for a sociophysics of network ecology may not be farfetched.

[17]Even the path-breaking studies that examine dynamic data often look at only one direction of influence. For example, van Duijn et al (1999) found if homogeneity of friends in terms of age, marital status or work rose over time, the stability of the relationship rose as well. They don't examine whether relationships have a corresponding influence on changes in work or marital status.

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