

THE OXFORD HANDBOOK OF

ANALYTICAL
SOCIOLOGY

Edited by

PETER HEDSTRÖM

and

PETER BEARMAN

OXFORD
UNIVERSITY PRESS

2009

CHAPTER 22

HOMOPHILY AND THE FOCUSED ORGANIZATION OF TIES*

SCOTT FELD
BERNARD GROFMAN

INTRODUCTION

It is a well-known and well-documented fact of social life that people tend to interact with others like themselves more often than one would expect from random association among people (McPherson, Smith-Lovin, and Cook 2001). However, the finding of greater similarity than would be expected by chance may not be nearly as surprising as the finding that there is a lot *less* similarity among people who interact than one might expect to arise from the powerful social processes of social influence and selective attraction. We suggest that it is important to understand structures and processes that encourage similar people to interact and interacting

* The first author wishes to acknowledge support for the community-parenting study from a postdoctoral fellowship from NIMH to the Family Violence Research Program at the University of New Hampshire (Murray A. Straus, PI), 1987. We also want to acknowledge thoughtful comments on earlier drafts of this chapter by Peter Hedstrom, Robert Mare, and Min Yimm.

people to be similar; *and* that it is important to understand structures and processes that limit and constrain this type of consistency in social life.

'Homophily' is a term that has been often used to describe the tendencies for people with similar characteristics to interact with one another (see McPherson, Smith-Lovin, and Cook 2001). According to Kandel (1978), 'Lazarsfeld and Merton (1954) first proposed the term "homophily" to refer to the tendency for similarity on various attributes among persons who affiliate with each other (427).' However, the term 'homophily' prejudges the source of such correlations to be in the liking (phily) of similarity (homo). Preference for interacting with similar others is certainly a factor that contributes to the positive correlation between similarity and interaction, as people both choose to interact with others like themselves, and change themselves to become more similar to their interaction partners (see Kandel, 1978; McPherson, Smith-Lovin, and Cook 2001). Although some analysts may reserve the term homophily to describe either 'selective attachment' (changing interactions) or 'influence' (changing behaviors), we want to be clear that we use the term homophily as motivation for both types of individual changes.

Nevertheless, to the extent that other factors affect how people both behave and interact, one cannot necessarily infer homophily (personal *preferences* for interacting with similar others) from the empirical findings of correlations. For example, McPherson and Smith-Lovin (1987) found that the correlation could be produced by the 'restricted opportunity structure' offered by groups.

Consequently, we are careful to use the word *homophily* specifically for the personal preferences for interacting with similar others, and we use the term *network autocorrelation* to describe the correlation between similarities and interaction, irrespective of the processes that underly that correlation. *Network autocorrelation* is defined as the 'linking among similars' as a descriptive term for the tendency for similar people to be linked and linked people to be similar. Recognizing the possibility of other sources of network autocorrelation will allow us to more objectively examine various processes, including but not limited to the exercise of personal preferences, that encourage or discourage network autocorrelation in particular respects.

Before proceeding any further in our analysis of these structures and processes, it is useful to recognize (as Davis 1963 emphasized nearly fifty years ago) that strict consistency at the individual level (individuals interacting only with others like themselves) implies strict clustering at the aggregate level (completely disconnected homogeneous clusters of people). The only way that similar individuals interact and dissimilar individuals do not interact is for all of the individuals with the same characteristic to form their own cluster such that individuals interact within clusters and not across clusters. The fact that societies are not so segmented is the most obvious indication that many people must be interacting with others different from themselves.

In addition to examining network autocorrelation with respect to various individual traits/characteristics, we will also consider one specific type of behavioral network autocorrelation that has received a great deal of attention, autocorrelation with regard to interactions with other people. If individuals interact with others who have the same set of social relations to further others, then people are friends with their friends' friends. The words 'transitivity' and 'balance' have been often used to describe this type of internal consistency among sets of social relations. Researchers have repeatedly found a disproportionate amount of this particular form of consistency over a broad array of conditions. However, as with network autocorrelation more generally, complete transitivity and balance implies complete clustering. The only way for each person to be friends with all the friends' friends is for the person and those friends to be contained within a separate complete cluster.

As mentioned above, the absence of such stark separation into cliques indicates that there is far from complete transitivity and balance in society. In fact, we suggest that even though people are much more likely to be friends with their friends' friends than would be expected by chance, people are still very *unlikely* to be friends with most of their friends' friends. The great number of intransitivities indicates that whatever pressures may exist toward transitivity must be relatively weak and/or counteracted by other factors.

22.1 INDIVIDUAL ACTIONS INCREASING LOCAL CONSISTENCY AND GLOBAL SEGMENTATION

There are two distinct processes by which network autocorrelation can arise from people acting consistently with homophily, their preferences to interact with people like themselves. They can change themselves or they can change their interaction partners. Individuals can come to behave more like those with whom they interact (the effect of differential association/influence), and individuals can selectively interact with people who are already similar to themselves (selective attachment). Both of these processes lead to distinct homogeneous clusters within particular social networks and in society.

22.1.1 Changing to be similar to one's associates

We can begin by considering the effects of differential association/influence: people coming to behave like those particular others with whom they are interacting.

The overall effect of such social influence is a tendency toward homogenization of behavior, as increasing numbers of people come to behave like most people in the population. However, it is common to find that the homogenization is less than complete, as there come to be pockets of deviance from the overall norm. If people who begin with the minority behavior happen to be in contact with a majority of others with the minority behavior who are in contact with a majority of others with the minority behavior, then those minority behaviors tend to be stable. In fact, those who are surrounded by those with minority behavior may be converted in that direction. If everyone has a large number of relatively random ties, then it is unlikely that anyone would be surrounded by a majority of minority behaviors. However, many people do not have large numbers of ties, and it is likely that many people have ties to a set of alters that is very unrepresentative of the overall population, especially when that set of alters is small. Also, ties are disproportionately local, so the ties of one's alters are disproportionately likely to be redundant. If there is this type of redundancy, then if a minority-behaving person has other minority-behaving people nearby, that increases the chances of them sharing the same minority-behaving neighbors and so supporting and maintaining the minority behaviors of one another.

The 'Morals' module of Bainbridge's *Sociology Laboratory* (1986) produces a simple but powerful visual simulation that provides a clear illustration of the effects of influence through differential association. In that simulation there are 190 individuals arranged in 10 rows of 19 each. Each may be tied to any or all of 6 neighbors (2 each above and below, and 1 on each side). Beginning with a random distribution of ties among their neighbors, and with a minority of individuals randomly assigned to using drugs, individuals are assumed to change to/from drug use to be consistent with a majority of their associates. Figure 22.1 shows results of the effects of differential association that are typical of these types of effects: the drug users become highly clustered.

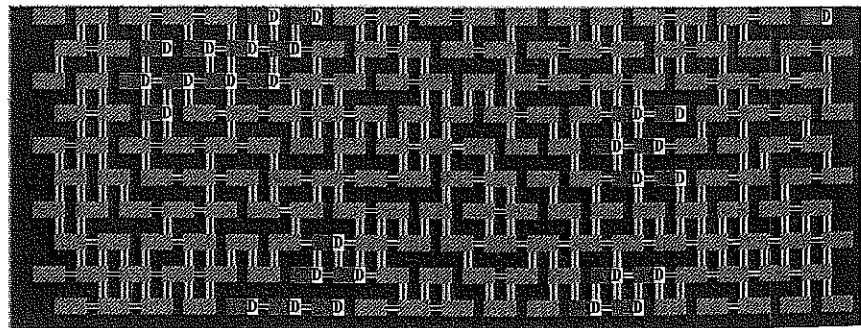


Fig. 22.1 Equilibrium resulting from differential association

Thus, the effect of these individual consistency processes is not the elimination of deviance as much as its reduction and segregation. Deviance can flourish under these conditions, but the deviants tend to have little or no contact with the conformists.

22.1.2 Choosing to associate with similar others

Individuals can increase the extent to which they interact with people behaving similarly to themselves both by (a) changing their behavior to become similar to their associates (as discussed and illustrated above), and by (b) changing their interactions by increasing their interactions with those who behave like them and decreasing their interactions with those who behave differently. This latter phenomenon is often referred to as *selective attachment*.

Bainbridge (1986) incorporated the possibility for selective attachment into his 'Morals' simulation described above. When the selective-attachment process is activated, people drop those ties to dissimilar neighbors and pick up ties to similar neighbors over time. The effect of this process can be seen in Figure 22.2, containing a random assignment of a minority of people to using drugs. The results are separate clusters of drug users and nonusers that arise entirely from selective attachment. Selective attachment alone produces no change in the drug-use behavior of any individuals, but the drug users are segregated into multiple clusters separate from the rest of the population.

One consequence of selective attachment is the protection of deviance from social pressures toward conformity that would otherwise be produced by social-influence processes. Although it is relatively easy to describe and illustrate this abstract process, as shown above, observers may overlook one or the other of these important processes in analyzing particular situations. Specifically, one of the

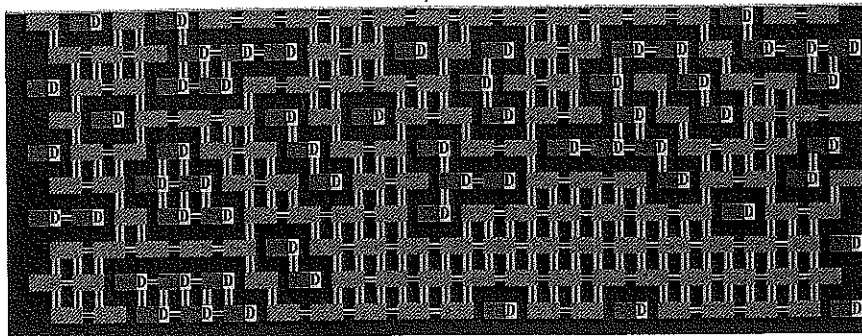


Fig. 22.2 Equilibrium resulting from selective ties

authors conducted a study several years ago for the specific purpose of demonstrating the effects of conformity processes within a community, but he had not anticipated that the powerful effects of selective attachment would subvert the homogenizing effects of social influence.

22.1.3 An empirical example: child-rearing in one small, dense student community

Based upon Festinger, Schachter, and Back's classic theory of *Social Pressures in Informal Groups* (1950), Feld (1988) hypothesized that young parents living in a spatially dense student family-housing community of other young parents would come to follow a community norm concerning parenting, and corporal punishment in particular. After interviewing about thirty mothers of young children, he realized that no such conformity process was occurring. He could find no indication of an overall norm. Rather, there were different types of people with different beliefs, and those people tended to interact with similar others who shared and reinforced their beliefs.

Specifically, there were three distinct groups of mothers. There were undergraduate-student single mothers who tended to engage in relatively low levels of child supervision consistent with their demanding lifestyles as single mothers and full-time students themselves. They were generally not punitive and especially tended not to use corporal punishment. They tended to interact largely with other single mothers and their children in the little free time they had.

In the strongest contrast, there were the conservative religious mothers married to student husbands who believed in the strictest parenting, often explicitly requiring frequent corporal punishment. They tended to belong to a particular local fundamentalist Christian church and spend time with other members of their church who had similar beliefs and practices to themselves. They had little reason to question their own beliefs and practices, and may not have even been aware that their beliefs and practices were in a relatively small minority in their community.

There was also a group of mothers married to student husbands who were not involved with that particular church. They tended to believe in a much more involved parenting style than the single mothers, with strict supervision but relatively little punishment. To the extent that they interacted with others in the community, it would mostly not be with single mothers, who were often busy students, or with the members of the fundamentalist church, who were heavily involved in that church, but more likely with others like themselves with time and interest in spending time with their children out in this neighborhood. Because they were the ones most often out and about in the community, they sometimes observed unsupervised children that seemed to them to indicate negligent parenting, but they were aware that they were not in any position to affect it.

It was clear that everyone in this community took parenting very seriously and had strong views about it, but everyone was pretty well protected from social pressures to change their own points of view. Many seemed to be relatively unaware of others' points of view and/or did not care. To the extent that some became aware of behavior that they did not approve, they were generally in no position to affect it. To the extent that some were concerned that their behaviors might be disapproved by others, they tended to avoid being observed rather than modifying their behaviors. For example, one single mother explained that she 'yelled quietly' at her daughter to avoid being monitored by some married parents in an adjacent apartment with whom she otherwise had little interaction.

So the individual beliefs and behaviors within this one small, dense community managed to avoid social pressures. The effects of social networks in this community were not to create community conformity, but rather to protect against it.

Notice that the interactions among the women in this community did seem to fall in relatively distinct clusters, but the separation did not arise either from choices to interact with others with similar parenting behaviors, or from choices to adopt parenting behaviors similar to those of interaction partners. The church group definitely had other origins, and undoubtedly had the effect of protecting its members from pressures from outsiders regarding many values and behaviors that were not necessarily popular in the larger community. The single mothers tended to have lifestyles in common (largely being students in the same programs) that made them especially likely to interact. They also experienced common circumstances as single parents and students that led them to have similar needs, values, and behaviors of various types. Given their availability to one another, they also had a tendency to rely more on one another than on others. The married mothers not involved in the fundamentalist church generally shared common circumstances of a two-parent family with the husband being a student, but they did not have any particular context (like a church or common classes) that brought them into regular contact with one another. Nevertheless, they probably ran into one another (e.g. at a local playground or market) more than they encountered the other two types of mothers, who were heavily involved elsewhere (e.g. in their classes or their church).

22.2 THE SOCIAL-STRUCTURAL INFRASTRUCTURE OF CONFORMITY—FOCI OF ACTIVITY

The community study described above illustrates how separation into homogeneous clusters can protect people against social influence. People did not either

choose their associates on the basis of their parenting attitudes and behaviors, or change their behaviors to be like their associates. Rather, their friendships were based upon pre-existing foci of activity (Feld 1981). The most obvious example was the fundamentalist church. The parents in the study community that were members of that church came into repeated contact with one another in the context of church activities. They developed friendships with one another (and with other church members outside of this community) as a result of the repeated interaction. The parenting attitudes were among their shared similarities but were neither causes nor effects of the interactions among these people.

In general, foci of activity (Feld 1981) bring people together in repeated interactions that tend to create personal relationships and further interaction between the individuals involved. The effect is that there is a 'group' composed of the people who share a particular focus of activity. Selection into association with that focus of activity leads to certain types of homogeneity within the group (Feld 1982). Focused groups are important sources of network autocorrelation, because they foster interaction among a set of people who are homogeneous in particular ways. Pairs of individuals who share participation in a focus of activity will tend to both be similar in certain respects and interact with one another, even if the individuals involved do not necessarily prefer to interact with people who are similar to themselves in these respects and are not influenced by the people with whom they interact.

In fact, in the context of larger groups, the process of dyadic choice and dyadic influence may be considerably less important than the selection into the group, interaction fostered by the group, and conformity to larger-group norms. Kurt Lewin's famous statement (as paraphrased by Festinger, Schachter and Back: 1950: 6) that 'it should be easier to change a whole group at once than to change one individual and leave the rest of the group unchanged' should apply well to dyads acting and interacting within the context of a group. Action and interaction within the context of a group are guided by the nature of selection into the group, by the group activities, and by the group norms. Pairs of people within a group tend to share group behaviors with the group as a whole and therefore also with one another, and often find it more difficult to avoid interaction with others in the group than to interact with one another.

Thus, shared foci of activity are the cause of much interaction and similarity and much of the association between the two. However, foci of activity in modern society are increasingly specialized, and their impact is not in terms of linking people who are similar in all respects, but in terms of linking people who are similar in the particular respects that characterizes the particular focus. At the same time, individuals generally participate in many different foci of activity that may not overlap very much if at all in terms of membership or types of homogeneity. As Simmel (1955) argued half a century ago, the multiplicity of groups facilitates individual freedom, as the groups are homogeneous in different respects, and an

individual has some freedom to choose the nature and extent of participation in the different foci of activity.

The similarity of behavior between interacting individuals that arises from an underlying focus of activity is likely to be largely confined to the context in which both the interaction and the behavior take place; and the nature of the similar behavior is likely to be that which is most relevant to that context. Tied individuals who also participate in different other contexts are likely to feel relatively few pressures to reconcile their different behaviors in those other outside contexts. Thus, people can live or work together or be in the same family and still have very different preferences for ethnic food, dance styles, or sports teams, unless the neighborhood, work, or family activities specifically come to involve shared food, dance, or sports enthusiasm.

The fact that much network autocorrelation originates within foci of activity has the implication that many of the tendencies toward consistency are conditional. For example, in terms of friends of friends, it is usually true that you are friends of your friends' friends within the same context, but not necessarily so when your friends' relations with their friends are from a different focus of activity than that underlying your friendship. For example, you probably don't even know most of your neighbors' coworkers or your cousin's fraternity brothers. There is almost no transitivity there, even though you know most of your coworkers' coworkers and your neighbors' neighbors.

Network autocorrelation is conditional with respect to other types of behavior as well. Your lawn-cutting behavior may conform to that of your neighbors but not to that of your coworkers, and your working behaviors may conform more to those of your coworkers than to those of your kin.

The importance of the focused origins of network autocorrelation is that its nature, presence, and absence is often predictable based upon understanding the focused sources. To the extent that network autocorrelation is based upon homophily, preferences for interacting with similar others, and choices of behavior or attachments based upon such preferences, one would expect a general diffuse undifferentiated tendency for people to act similarly to their interaction partners. However, to the extent that network autocorrelation is based upon the underlying structures of foci of activity, one can predict the nature of the similarities—for example, that people will have similar religious beliefs and behaviors to their families, similar work behaviors to their work associates, and similar yard maintenance to their neighbors.

At the same time, the origins of ties also have implications for encouraging interaction with others with certain differences. Specifically, heterogeneity of people associated with a focus of activity leads us to expect particular differences within those contexts; for example, the multiple generations included in families lead people to interact with family members of very different ages from themselves.

22.2.1 Some principles of focused organization of local consistency

The focused organization of social ties has the following salient characteristics:

- (1) Individuals associated with the same focus of activity tend to interact with one another.
- (2) People associated with a particular focus of activity tend to have certain traits, values, and behaviors associated with that focus of activity.
- (3) Each individual tends to draw associates from several different foci of activity.

These characteristics of foci of activity lead to network autocorrelation of particular limited and predictable forms. Specifically, network autocorrelation means that people who are tied to one another will tend to behave similarly to one another and have ties to others in common. The focused organization as a source of network autocorrelation implies that the source of the tie between two individuals is an important determinant of and guide to which behaviors they are likely to share, and which ties to others they are likely to have in common.

- (4) Two people whose relationship originated within a particular focus of activity tend to have similar traits, values, and behaviors to the extent that those traits, values, and behaviors are associated with that focus of activity.
- (5) Two people whose relationship originated within a particular focus of activity tend to know, interact with, and have close relationships with several of the same others also associated with that focus of activity.
- (6) Two interacting people whose relationship originated with a particular focus of activity and who are also associated with other separate foci of activity are likely to have different traits, values, and behaviors associated with those other foci and likely to have ties to others from those other foci that they do not share.

22.2.2 Visualizing the limited segmentation of focused organization

The Bainbridge simulations illustrated above show influence processes and selective attachment in the absence of foci of activity. The activating mechanism for influence with regard to any behavior is for each individual to take all alters equally into account. We suggest it is more reasonable that when people are determining behavior within a context they take account of the behaviors within that context but generally do not consider the behaviors of alters from other contexts. Thus, an individual will use fellow church members for guidance on religious practice, but not be influenced much by neighbors' religious practices.

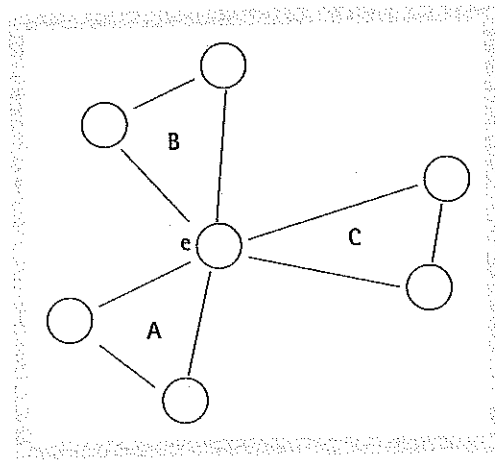


Fig. 22.3 An individual (*e*) participating in three foci (A, B, C) with other people

And an individual will use neighbors for guidance on landscaping, but not be influenced much by fellow church members for that purpose. Also, the person may especially use church members for guidance in choosing to interact with further church members, and neighbors for guidance in choosing to interact with further neighbors. At the individual level, this may look as shown in Figure 22.3.

Person *e* may have all the critical characteristics associated with foci A, B, and C, and *e* undoubtedly has associations with some others from A, some from B, and some from C. There is generally no compelling reason to bring individuals from these different contexts together or to try to make them 'consistent' in any way. If every one of those other individuals is also associated with multiple foci, it becomes difficult to represent these connections. However, as shown in Figure 22.4, (which illustrates the duality of people and groups—Breiger 1974; Feld 1981; McPherson 1982—that constitutes the structure of people interacting through foci of activity) the visual representation can be somewhat simplified by representing foci of activity (dark ovals) as well as individuals (small circles), and then indicating ties between individuals and foci. Individuals tied to the same focus are likely to be tied to one another and share the particular focus characteristics; for example, *g* and *c* are tied to one another and share many things associated with their common focus. However, *g* also is tied to *h* and *i* through a different focus and shares other characteristics with them; and *c* is tied to *d*, *a*, and *h* through another focus, and to *a* and *b* through still another focus. Consequently, we expect *g* and *c* to have some ties to others in common and to be similar in some regards, but we also expect that they each have many ties to others not in common, and are likely to be different from one another in many ways.

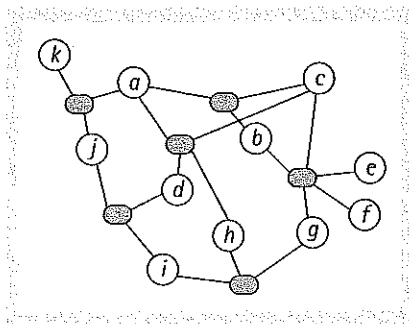


Fig. 22.4 Individuals *a* through *k* connected to one another through foci (Note that a more complete image would include many different foci for each individual, with some of those foci bridging long physical and/or social distances)

22.3 REPRESENTING THE TRIPLEXITY OF SOCIAL STRUCTURE

Milgram's often-cited conclusion in 'The Small World Problem' (1967) was that every individual is within six steps of every other individual. However, it may be more important to show that every individual is within a much shorter distance of *some* individual with most any specified trait. This could be tested by modifying Milgram's study to have targets of 'a lawyer' or 'a pot smoker' or 'a Catholic.' We should note, however, that this modified small-world technique will only be able to find the short paths for relatively visible traits, because individuals will generally need to identify the social location of people with the target traits to effectively choose paths to those targets.

Milgram's original study was about people, and their connections to one another. Feld (1981) suggested including foci of activity as intermediaries between the people, such that individuals are associated with foci of activity which are associated with other people, and consequently people are associated with other people through foci.

We can now explicitly add traits to this model to represent the triplex structure of people, foci, and traits; and then more explicitly show how this triplex structure creates a structural basis for network autocorrelation. People are associated with traits. People are associated with foci. Therefore foci are associated with traits through their people. The traits are associated with other traits because they are attached to people who are linked to people through foci.

Abstractly, the matrix of associations between people and foci can be called F , with p rows (number of people) and g columns (number of groups). The matrix of associations between people and traits can be called T , with c rows (number of characteristics) and p columns. Then, the association between traits and foci is just H (indicating the homogeneity and heterogeneity of the foci in each respect), where

$$H = T^*F.$$

The extent of network autocorrelation due to the focused organization of ties is the extent to which a particular trait is associated with itself through individuals associated with foci. The network autocorrelation matrix indicating the similarities, matrix S , is just

$$S = H^t H.$$

The main diagonal of this network-autocorrelation matrix indicates the extent to which a trait is associated with itself through individuals being associated with foci. For example, consider race. It might be represented by the three specific characteristics of white, black, other race. The main diagonal of the S matrix would show the number of whites associated with other whites, blacks associated with other blacks, and other races associated with other races, through people associated with common foci. We might also want to examine the entry s_{wb} to indicate the association of whites with blacks to contrast with the association among whites and among blacks to quantify the extent of disproportionate network autocorrelation through foci.

Note that the critical structural basis of network autocorrelation through foci is the H matrix, and one might even analyze the structural bases of network autocorrelation through foci by examining the mix of traits associated with foci of activity even without breaking it down through people. This is a mere introduction to the idea and representation of triplexity of people, groups, and traits, leaving much room for further development of both theory and application.

22.3.1 A hypothetical illustration of the triplexity of social structure

With many individuals, many foci, and many traits, the structure of interrelations can readily get complex. Nevertheless, a relatively simple example can illustrate how the specific types of homogeneity of sets associated with foci lead to particular types and amounts of network autocorrelation.

Figure 22.5 shows individuals a through f with a variety of traits represented by different colors and connected to one another through three foci ($F1$, $F2$, and $F3$).

Focus 1 connects three individuals, abc , who are all alike in their yellowness. They also share some green and some orange, but that is all. Focus 2 connects three individuals, bcd , who are all alike in their orangeness, and share some yellow, but

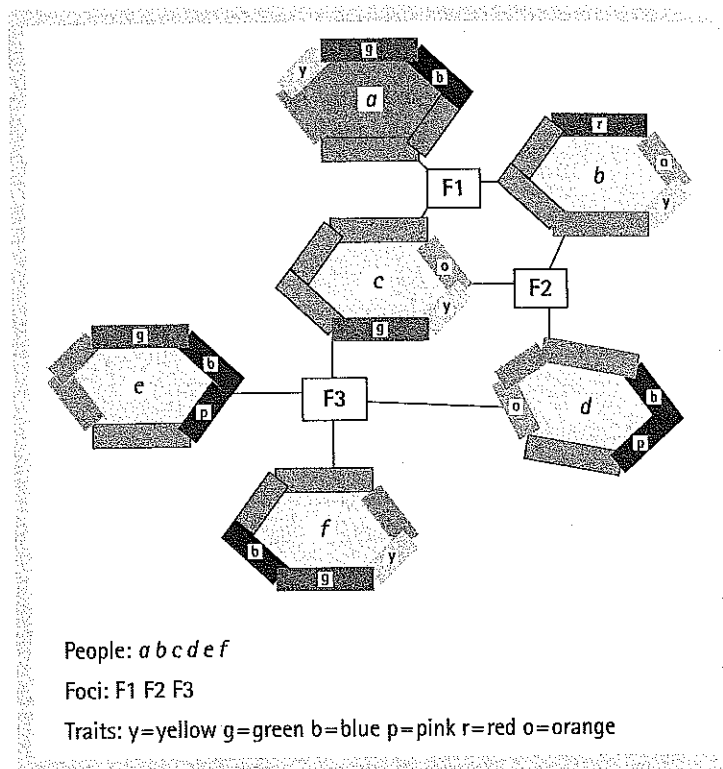


Fig. 22.5 Six individuals with combinations of six traits connected by three foci

are otherwise quite different from one another. Focus 3 connects four individuals who are mostly alike in their greenness and blueness, and have a little pinkness, orangeness, and yellowness in common.

The Appendix to this chapter presents the details of the relationships between individuals and foci (the F matrix) and traits of individuals (the T matrix), and calculates the distribution of the various traits of people associated with each of the foci (the H matrix). Then we also show how the homo-/heterogeneity of the foci determines various numbers of contacts within traits and across different combinations of traits (the S matrix). These calculations include self-contacts (i.e. contacts of people with themselves), which are not of any substantive interest and should be counted and removed as described in the Appendix. The resulting adjusted matrix (the S^a matrix) indicates the numbers of structurally-induced contacts between different people with particular traits. For example, it indicates the number of yellows with contacts with blues through foci. It also shows the number of yellows with contacts with other yellows, and all contacts between people with the same traits, which is of primary interest when examining the extent of network autocorrelation through foci.

The extent to which the structures facilitate disproportionate network autocorrelation is indicated by the extent to which there is greater structurally induced contact than would have been expected from random contact. Actual interaction may not correspond perfectly with the interaction that is anticipated from these foci. It is possible that not all individuals associated with a focus actually interact with one another, and it is possible for individuals who do not share any of these foci to nevertheless interact. Any more network autocorrelation than would have been expected by this structurally induced contact indicates some combination of effects of other unmeasured structures (e.g. homogeneous blocks within neighborhoods, or homogeneous work groups within classrooms) and personal choices based upon homophily that lead people to choose to disproportionately associate with similar others and/or to become similar to those with whom they interact.

22.4 HETEROGENEITY WITHIN AND AMONG AN INDIVIDUAL'S FOCI OF ACTIVITY

The argument above indicates how network autocorrelation depends upon the homogeneity within foci of activity. It is useful to consider how contact between people with particular different traits can also arise from the focused organization of interactions.

First, as discussed earlier, people associated with the same focus may vary widely on traits that are not core to the activities of the focus. For example, church members can have widely varying occupations, and members of professional organizations can have widely varied places of residence and ages. Traits not central to the focus will not necessarily vary widely, but there is often little that precludes such wide variation.

Second, variation in certain types of characteristics can even be inherent in particular types of foci. As previously noted, variation in gender and age are integral to families. Workplaces typically (but not always) involve varieties of complementary jobs (e.g. executives, managers, secretaries, factory workers). Voluntary organizations may seek out members with particular skills and resources (e.g. some who can provide work hours, others that can provide money, and still others that can provide particular types of expertise, products, or services). Professional organizations bring together people in different locations with potentially complementary information. Legislatures intentionally represent at least geographical diversity among the citizenry, and often intentionally represent ideological and other types of diversity. The United Nations was created to bring together representatives of all nations; the diversity is essential to its mission of facilitating coordination and reducing conflict and war among nations.

Third, the people associated with one focus of activity are pulled in various directions by the different other foci with which they are associated. This was even apparent in Festinger, Schachter, and Back's study (1950), that was intended to show the homogenizing effects of groups. Their finding that people in residences at the edges in residential groupings were more likely to be deviant from the group norm than others could well indicate that those people in those end residences were more likely to also be effective members of other outside groupings pulling them in other directions. In general, an awareness of the multiple focus sources of each individual's ties would lead us to expect that some apparent 'deviance' within a group would be a result of conformity to norms of other groups to which these individuals belong.

Fourth, the above three reasons lead us to expect that people are exposed to variation in many traits even within their focused sets. Even with some tendency *toward* homogeneity in certain central respects, there is still variation; and in less central respects people may be exposed to even more variation. In addition, since each individual is typically associated with many different foci, that individual may be exposed to different types of variation from each different focus of activity.

22.4.1 Individuals choose bundles of individuals and bundles of traits

We have been emphasizing the fact that much network autocorrelation arises from the foci of activities constraining the interactions. However, we should recognize that people do make choices to associate with particular foci of activity; and some of those choices of contexts are made specifically to facilitate interaction with certain types of people. That does not mean that they necessarily get what they want. They can generally choose from among a relatively small set of alternative foci that are available to them. They may well have to settle for more or less homogeneity on particular characteristics than they would prefer.

Ironically, there are several processes that lead to more homogeneity than many people would prefer. For example, people in a life stage often have a preference to live among people in the same life stage. People with children tend to want other children nearby, and people without children might well want not to have too many children nearby. However, as Schelling (1978) famously showed, even weak preferences for some similarity can lead to neighborhoods that are much more homogeneous than most of the people prefer. The simple process is that families with children will tend to move out of neighborhoods with few children, leaving those neighborhoods with even fewer children. People without children tend to move out of neighborhoods with too many children, leaving those neighborhoods with even more children. Thus, there tend to be two distinct types of neighborhoods, those with lots of children, and those with very few. The effect is that settings gravitate toward being more homogeneous than individuals prefer, and individuals

choosing neighborhoods only have choices between extremes on these types of traits, either those homogeneously similar to them or those homogeneously different from them. Given such a stark choice, most people choose the neighborhood composed of people like themselves, even if they would prefer less homogeneity.

An individual who enters a group is confronted with the whole set of people and their whole set of social characteristics. Even as the individual maintains some freedom of choice of interaction partners and behavioral options within a group, those options are severely constrained. Thus, when people move into a neighborhood, they get all the neighbors, not just the ones they would prefer, and all the local customs. In fact, it seems that people often select into groups on the basis of only a few primary features (e.g. join a workplace primarily for the content of the job and the pay) and accept the bundle of other people and norms that are part of the package.

Thus, even as we acknowledge that individuals do make homophilous choices both in terms of choosing particular foci of activity and choosing to associate with certain individuals within those contexts, the present emphasis remains upon the structural features that affect the extent of network autocorrelation (consistency between social relations and behavior).

22.4.2 Data on individuals, foci, traits, and interpersonal relations

The most common type of social-science data includes information about traits of *individuals*. In contrast, social-network analysts generally collect data on relations between *pairs of individuals*. Despite the challenges that confront collecting both types of data, many analysts of homophily have found ways to collect and combine data on interpersonal relations and individual traits in ways that allow them to examine the nature and extent of network autocorrelation. Including information on the foci of activity that organize social interaction and underlie these network autocorrelations presents further challenges.

There are various ways to organize such data. The simplest starting point using standard software like SPSS would be to create two data files. The first file would include a record for each individual person with (1) a variable for each trait (e.g. race with its categories, political preference with its categories, etc.), and (2) an index variable (no/yes) for each potential focus of activity. These data can be used to construct the matrix relating individuals to traits, and the matrix relating each individual to foci of activity. These together are sufficient to determine the extent to which one should expect network autocorrelation with respect to each of the trait variables resulting from the pattern of shared participation in these foci of activity.

The second file would include a record for each pairwise relationship identified by ID numbers of the two participants, and a variable characterizing each aspect

of the relationship between the individual and the alter (e.g. frequency of face-to-face contact, whether the person is a family member, subjective 'closeness' from the perspective of each individual). For the present purposes, this second file is to be used to determine which pairs of people have a particular type of relationship.

22.4.3 Increasing consistency over time?

Theorists focusing on personal consistency often suggest that cognitive pressures toward consistency lead all individuals to act to increase the consistency of their own relations over time (see Davis 1963; Hallinan 1974). The implication would seem to be the expectation that relations should become more consistent over time for the individuals and for society as a whole.

In fact, much of classical sociology is built upon the observation that the overall trend for modern societies is in the opposite direction, moving away from the narrow similarity-based interpersonal interaction of mechanical solidarity and toward more complementarity-based interpersonal interaction of organic solidarity (Durkheim 1933). It would seem that foci of activity are generally becoming more heterogeneous, and that individuals are increasingly involved in more different foci of activity that overlap less with one another.

There have been some times and places where nearly all foci of activity have been homogeneous in the same particular respect. For example, racial homogeneity has pervaded families, workplaces, neighborhoods, and voluntary organizations for hundreds of years in the USA in particular. Under those conditions a society becomes effectively segmented by race. However, even in that case the direction of recent change in America has certainly been away from this extreme form of local network autocorrelation and global segmentation on race. As long as there are multiple forces that bring people together in various foci of activity, there is no reason to expect any general tendency toward increasing overall network autocorrelation and segmentation over time.

So when we recognize that there is more network autocorrelation in social life than one would expect by chance, we should focus more attention on the fact that there is much less than one might expect from individual preferences for interacting with similar others. We do not observe any general tendencies toward increasing overall consistency over time that would seem to be predicted by consistency theorists (see Davis 1963; Hallinan 1974). Rather, increases and decreases in the extent of particular types of consistency reflect all of the forces that create foci of activity, determine their selection processes and relevant norms and conformity processes, and determine people's associations with them.

It may be fortunate for society that there has not been more network autocorrelation and segmentation, especially that which might foster large-scale costly social conflict between segments. Sociological theorists from Simmel (1955) through

Coser (1956), Coleman (1957), and Blau (1977) have recognized the societal benefits of crosscutting dimensions that involve major social inconsistencies. Social processes that create crosscutting ties and limit the extent of network autocorrelation may be both common and beneficial, and as worthy of our attention as processes that encourage network autocorrelation and segmentation.

APPENDIX: DETAILED ANALYSIS OF THE TRIPLEXITY OF PERSONS, FOCI, AND TRAITS

Figure 22.5 presents one hypothetical example containing six individuals, three foci, and six personal characteristics. Here we show how we can determine the extent of structurally-induced opportunities for semilinking and for other contact between people with particular traits.

The relationships between the people and the foci can be represented by the focus matrix, F (Table 22.1).

Table 22.1 Matrix F

		People					
		a	b	c	d	e	f
Foci	F1	1	1	1			
	F2		1	1	1		
	F3			1	1	1	1

The characteristics of the individuals can be represented by the trait matrix, T (Table 22.2).

Table 22.2 Matrix T

		Personal characteristics					
		Yellow	Green	Blue	Pink	Red	Orange
People	a	1	1	1			
	b	1				1	1
	c	1	1				1
	d			1	1		1
	e		1	1	1		
	f	1	1	1			

The distribution of the personal characteristics within each of the foci of activity can be represented by the homo-/heterogeneity matrix, H (Table 22.3), which is determined by multiplying the F matrix by the T matrix. The H matrix is shown below.

Table 22.3 Matrix H

		Personal characteristics					
		Yellow	Green	Blue	Pink	Red	Orange
Foci	F1	3	2	1	0	1	2
	F2	2	1	1	1	1	3
	F3	2	3	3	2	0	2

This matrix indicates, among other things, that there are concentrations of yellows in F_1 , concentrations of oranges in F_2 , and especially both greens and blues in F_3 . The H transpose matrix, H^t (not shown), obtained by flipping this matrix over, shows how many of each color are located in each focus. Multiplying H^t by H shows the number of different ways that a person with each trait is put into contact with a person of another specific trait through all of the different foci together. For example, the 2 greens in F_1 are in contact with 3 yellows in F_1 giving $2 \times 3 = 6$ green-yellow contacts there, and $1 \times 2 = 2$ such-contacts through F_2 , and $3 \times 2 = 6$ such contacts in F_3 , making a total of 14 such green-yellow contacts through all three foci. The S matrix shows the total intertrait contacts through all of the foci together: Matrix $S = H^t * H$ (Table 22.4).

Table 22.4 Matrix S

		Personal characteristics					
		Yellow	Green	Blue	Pink	Red	Orange
Personal characteristics	Yellow	17	14	11	6	5	16
	Green	14	14	12	7	3	13
	Blue	11	12	11	7	2	11
	Pink	6	7	7	5	1	7
	Red	5	3	2	1	2	5
	Orange	16	13	11	7	5	17

However, this matrix includes contacts of people with themselves within these foci, which are not the type of encounters that concern us. In a very large system these types of self-contacts would be such a small portion of the contacts that they could easily be ignored. However, in this small-play system they can severely distort the picture of contacts between different people. This problem can be addressed by simply computing the numbers of self-contacts of each type by computing the number of meaningless trait contacts between individuals and themselves. Thus, if person a is a yellow-green (among other things), then person 1 would create one yellow-green contact for every focus that contains person a . For all, the total number of meaningless self-trait contacts is: $M = T^t * N * T$ where N is a vector

indicating the number of foci in which each individual participates. The N vector (Table 22.5) here is just:

Table 22.5 N vector

	<i>a</i>	1
	<i>b</i>	2
People	<i>c</i>	3
	<i>d</i>	2
	<i>e</i>	1
	<i>f</i>	1

The number of meaningless self-trait contacts is indicated as matrix $M = T^{t*}N^*T$ (Table 22.6).

Table 22.6 Matrix M

		Personal characteristics					
		Yellow	Green	Blue	Pink	Red	Orange
Personal characteristics	Yellow	7	4	2	0	2	4
	Green	4	6	3	1	0	3
	Blue	2	3	5	3	0	2
	Pink	0	1	3	3	0	2
	Red	2	0	0	0	2	2
	Orange	4	2	2	2	1	7

Table 22.7 Matrix S^a

		Personal characteristics					
		Yellow	Green	Blue	Pink	Red	Orange
Personal characteristics	Yellow	10	10	9	6	3	11
	Green	10	8	9	6	3	10
	Blue	9	9	6	4	2	9
	Pink	6	6	4	2	1	5
	Red	3	3	2	1	0	3
	Orange	12	11	9	5	3	10

Consequently, the number of interpersonal contacts with the pairs of traits excluding the meaningless self-contacts is the adjusted S matrix $S^a = S - M$. (Table 22.7).

We should note that the structurally induced contact calculated here includes multiple contacts between the same people if they share more than one focus. We think that is appropriate for indicating the amount of contact that is facilitated by the structure. In this particular situation, the three orange people are each in multiple foci with one another, and the structure especially facilitates disproportionate network autocorrelation among them.

There are many ways to use this information. As a start, we suggest that one can compare the amounts of structurally induced contacts between people with particular traits with both the amounts that would be expected in the absence of the foci, and with the actual amounts of observed social interaction.

One can determine whether the foci of activity are disproportionately providing contact opportunities between people with particular traits, by comparing the amount of structurally induced contact between people with particular traits as calculated above with the amounts of contact that would be expected in a random network with this same distribution of traits among individuals but no foci structuring the interaction.

One could also determine the extent to which people are choosing interaction with disproportionately similar others among the contact opportunities available, by measuring the actual amount of interaction among individuals with particular traits, and comparing that with the amount of structurally induced contacts computed above.

This is a three-mode network, based upon persons, foci, and traits. Analysts have been increasingly developing ways to consider two-mode networks—for example, of corporations and individuals on their boards of directors. This theoretical approach provides reason to extend these developments to facilitate further consideration of three-mode networks.

REFERENCES

- BAINBRIDGE, W. S. (1986), *Sociological Laboratory* (Belmont, Calif.: Wadsworth).
- BLAU, P. M. (1977), *Inequality and Heterogeneity* (New York: Free Press).
- BREIGER, R. L. (1974), 'Duality of Persons and Groups', *Social Forces*, 53: 181-90.
- COLEMAN, J. S. (1957), *Community Conflict* (Glencoe: Free Press).
- COSER, L. A. (1956), *Functions of Social Conflict* (Glencoe: Free Press).
- DAVIS, J. A. (1963), 'Structural Balance, Mechanical Solidarity, and Interpersonal Relations', *American Journal of Sociology*, 68: 444-62.
- DURKHEIM, E. (1933), *The Division of Labor in Society* (New York: Free Press).
- FELD, S. L. (1981), 'The Focused Organization of Social Ties', *American Journal of Sociology*, 86: 1015-35.
- (1982), 'Social Structural Determinants of Similarity Among Associates', *American Sociological Review*, 47: 797-801.
- (1988), 'Social Pressures on Parenting in a Small Community', paper presented at the Sunbelt Social Networks Conference, San Diego.
- FESTINGER, L., SCHACHTER, S., and BACK, K. (1950), *Social Pressures in Informal Groups* (Stanford, Calif.: Stanford University Press).
- HALLINAN, M. (1974), *The Structure of Positive Sentiment* (New York: Elsevier).
- KANDEL, D. B. (1978), 'Homophily, Selection, and Socialization in Adolescent Friendship', *American Journal of Sociology*, 84: 427-36.
- LAZARSFELD, P. F., and MERTON, R. K. (1954), 'Friendship as a Social Process', in M. Berger, T. Abel, and C. H. Page (eds.), *Freedom and Control in Modern Society* (Princeton, N.J.: Van Nostrand).
- McPHERSON, J. M. (1982), 'Hypernetwork Sampling: Duality and Differentiation Among Voluntary Organizations', *Social Networks*, 3: 225-49.

- and SMITH-LOVIN, L. (1987), 'Homophily in Voluntary Organizations: Status Distance and the Composition of Face-to-face Groups', *American Sociological Review*, 52: 370-9.
- and COOK, J. M. (2001), 'Birds of a Feather: Homophily in Social Networks', *Annual Review of Sociology*, 27: 415-44.
- MILGRAM, S. (1967), 'The Small World Problem', *Psychology Today*, 1: 61-7.
- SCHELLING, T. C. (1978), *Micromotives and Macrobehavior* (New York: Norton).
- SIMMEL, G. (1955), *Conflict and the Web of Group Affiliations*, trans. K. H. Wolff and R. Bendix (Glencoe: Free Press).