MULTIPLE NETWORKS AND MOBILIZATION IN THE PARIS COMMUNE, 1871*

ROGER V. GOULD
University of Chicago

Although sociologists increasingly recognize the importance of networks in social movement mobilization, efforts to understand network factors have been hampered by the operationalization of network factors as individual-level variables. I argue that disaggregating relational data into individual-level counts of social ties obscures the crucial issues of network structure and multiplexity. I analyze data on insurgency in the Paris Commune of 1871 and show that organizational networks and pre-existing informal networks interacted in the mobilization process, even in the final moments of the insurrection. Network autocorrelation models reveal that enlistment patterns in the Paris National Guard created organizational linkages among residential areas that contributed to solidarity in the insurgent effort, but the efficacy of these linkages depended on the presence of informal social ties rooted in Parisian neighborhoods. Thus the role of network factors can only be understood by studying the joint influence of formal and informal social structures on the mobilization process.

A decade ago, Snow, Zurcher, and Ekland-Olson (1980) pointed to the importance of social networks for understanding the mobilization of social movements, but the state of research in this area is still best described as inchoate. Despite widespread acceptance of the idea that "network" or "structural" factors play a role in mobilization or recruitment, only a handful of studies have made genuine progress toward understanding the significance of these factors.

A principal reason for this state of affairs is that — often because of data considerations — researchers have typically used purely scalar variables to measure networks of social relations. "Network effects" are examined by simply counting social ties and using these counts as interval variables in regression equations, so that the process by which social ties influence mobilization is analyzed as though it operates exclusively on the individual level. This in turn means that two key issues — network structure and multiplexity — have received insufficient consideration in theory and research.

My goal is to demonstrate that the effect of social relations on the mobilization of collective action depends on the way in which these relations are structured and, more precisely, on the correspondence between *organizational* and *informal* networks. I use data on patterns of insurgency during the Paris Commune of 1871 to show that successful mobilization depended not on the sheer number of ties, but on the interplay between social ties created by insurgent organizations and pre-existing social networks rooted in Parisian neighborhoods. Organizational networks maintained solidarity because they were structured along neighborhood lines. Paradoxically, neighborhood ties even determined the importance of organizational links that cut *across* neighborhoods.

Previous studies have rarely demonstrated that structural properties of relational systems are important for social movements, and there is no discussion in the literature of the ways in which formal and informal networks interact in the mobilization process. In the conclusion, I argue that these issues are best addressed through data collection procedures and analytic strategies that respect the structure of networks rather than reducing networks to individual-level counts of social ties.

* Direct all correspondence to Roger V. Gould, Department of Sociology, University of Chicago, 1126 East 59th Street, Chicago, IL 60637. This research was supported by a National Science Foundation Graduate Fellowship, a Krupp Foundation Fellowship in European Studies, and a Chateaubriand Fellowship in the Social Sciences. I thank Roberto Fernandez, Patrice Higonnet, Doug McAdam, Amy McCready, Peter Marsden, Joel Podolny, Theda Skocpol and the editor and reviewers for their helpful comments and suggestions.

NETWORK FACTORS IN MOBILIZATION

The notion of social structure, in various guises, has played a role in theories of collective action for a long time (Smelser 1963; Oberschall 1973). However, it was only with the publication of Snow, Zurcher, and Ekland-Olson's (1980) seminal article that a specifically network-based conceptualization of structure gained currency in social movement research. Reacting to the undersocialized view of human behavior characteristic of early versions of the resource mobilization perspective (McCarthy and Zald 1973, 1977; Gamson 1975), Snow and his colleagues demonstrated that social ties to members of Nichiren Shoshu of America were instrumental in drawing new members into the organization. This was a significant finding because it focused attention on the "microstructural" bases of social movement recruitment.

Subsequent research has yielded similar results, most notably in McAdam's (1986, 1988) study of recruitment to the 1964 Mississippi Freedom Summer project. But in each case, supposedly "structural" factors in recruitment are measured as individual-level variables: Ties between participants and movement activists that predate recruitment are counted and the resulting number used as an independent variable in a regression equation. In some cases, organizational affiliations or respondents' subjective evaluations about how integrated they are have been substituted for network data (see, e.g., Cable, Walsh, and Warland 1988).

While the difficulty of collecting and analyzing true network data make this a practical approach, it masks the complexity inherent in social networks and does not permit inquiry into the possibility that network influences on mobilization operate on a supra-individual level. The effect on A of a social tie to B may depend on whether A is also tied to C, but this kind of interlock disappears when networks are reduced to numerical counts of ties.

Recently, researchers have begun to address this issue by exploring the effects of specifically structural aspects of social networks. In a later study of the Freedom Summer project, Fernandez and McAdam (1988) analyzed the effect on participation of an individual's network prominence — a measure of centrality that uses the first eigenvector of the network matrix to weight each person's ties by the centrality of the people to whom he or she is tied. This specification of network effects permits an individual's *position* in a social structure to play a role in movement recruitment. A simulation study by Marwell, Oliver, and Prahl (1988) explored the effect of group-level variables — network centralization and resource heterogeneity — on aggregate contributions to a collective good.

While these research efforts represent an important advance inasmuch as they refuse to treat social ties in piecemeal fashion and place an emphasis on networks as such, they focus on single networks and thus neglect the second key issue, network multiplexity.[1] Yet one of the key reasons network structure is significant is that mobilization typically creates organizational networks that overlay and interact with pre-existing informal networks. Thus, a focus on network structure entails a simultaneous examination of formal and informal networks.

There are three principal reasons why the Paris Commune of 1871 is an especially useful setting for an investigation into the problem of social networks and social movements. First, insurgent mobilization was effected through a highly visible formal organization, the Paris National Guard, so that it is possible to make precise statements about how participants were recruited to the uprising. Second, National Guard units were generally organized along neighborhood lines, with the important exception of 35 volunteer battalions. This means that mobilization outcomes across units can be compared with respect to a critical variable: the availability of neighborhood social ties as a source of solidarity. Finally, the connection between the *organizational* structure of the insurgent effort and the *social* structure of neighborhoods permits an examination of the extent to which social networks and organizational networks interact in affecting social movement mobilization.

THE COMMUNAL REVOLUTION OF 1871

The late 1860s were a period of social and political ferment in Paris as well as the rest of urban France.[2] In part because of an 1864 law legaliz-

[1] In Marwell, Oliver, and Prahl's (1988) simulation study, only one kind of relation is assumed to exist: Individuals are either tied to each other or not, and there is no provision for multiple social ties. Similarly, Fernandez and McAdam (1988) restricted their attention to the network of social ties generated by joint membership in activist organizations, thus neglecting the effects of any social ties not specifically connected with the mobilization of activism.

[2] This historical account is necessarily brief. De-

ing strikes and an 1868 law liberalizing controls on the press and public meetings, but also because of growing discontent with the regime of Emperor Louis Napoleon, strikes became more frequent throughout France's industrial regions and calls for social and political reforms became more vociferous. Although France's economy had grown and industrialized since the declaration of the Second Empire in Bonaparte's "Eighteenth Brumaire" of 1851, the growing prosperity had chiefly benefitted propertied classes and finance capitalists at the expense of the working population, which included proletarianized industrial workers as well as artisans (Edwards 1971).

Unlike the revolutions of 1789 and 1848, the events of 1871 were not preceded by a nationwide agricultural crisis. The combination of an economic recession and a misguided war with Prussia over the succession of a Hohenzollern prince to the Spanish throne were sufficient to sweep away the Empire without a shot being fired. A series of embarrassing defeats of France's armies, including the encirclement of one force at Metz and the capture of a second — along with the Emperor himself — at Sedan, led to the proclamation of a Republic in Paris on September 4, 1870.

The defeats continued, however, and Paris was subjected to a four-month winter siege by the Prussian army. In January 1871, the rural population of France elected a National Assembly determined to sign a peace treaty with Bismarck, the Prussian Chancellor. The radical deputies from Paris, who wanted to continue the war rather than surrender, were outvoted, and the capital was ceded to the Prussian army (although the victorious forces were permitted only to march through, not occupy, the city). A struggle ensued between the conservative government of Adolphe Thiers and the people of Paris over the disposition of the artillery of the Paris National Guard, the popular militia force of 300,000 men that had been armed during the Prussian siege. A poorly planned attempt by the French army to seize the cannon on March 18 became a complete fiasco when the troops refused to fire on the crowds protecting the artillery parks. Thiers ordered the army to retreat to Versailles, leaving Paris by default in the hands of the Central Committee of the National Guard, a largely radical group elected by the working-class battalions of the Guard in February 1871. The next day, the Committee announced elections to the Commune, simultaneously invoking the revolutionary Commune of 1789 and the tradition of municipal independence favored nineteenth-century socialists like Proudhon (Greenberg 1973).

The proclamation of the Commune on March 26 initiated a two-month experiment in democratic socialism. The Commune established workers' cooperative enterprises throughout the city, instituted universal free education, declared the separation of church and state, and passed resolutions on specific economic issues such as the abolition of night work for bakers. But as Marx (1940), noted, "The greatest social measure of the Commune was its own working existence. Its special measures could but betoken the tendency of a government of the people by the people" (p. 65).

Although the Commune was not a class war in the sense of a proletarian revolt against capitalism, its suppression was every bit as brutal as if it had been motivated by the class hatred Marx attributed to the French bourgeoisie. From the first hostilities between the Paris National Guard and the government on March 30, the Versailles forces chose to execute rather than detain many of the insurgents they captured. The fighting increasingly absorbed the Commune's attention, until the Versailles army re-entered Paris on May 21. In a re-enactment of the June Days of 1848, the people of Paris tore up cobblestones, gratings, and anything else that was available to build barricades and defend the city against the government troops. Officers and soldiers of the French army continued to execute those they captured at each barricade, prompting the massacre by Parisians of dozens of hostages taken by the Commune. At the end of the *semaine sanglante* (or "bloody week") of May 21 to 28 when the city had finally been subdued, about 25,000 Parisians were dead, most of them shot after surrendering to the army. In contrast, of the 15,000 Communards actually tried for their role in the insurrection (about 40,000 were arrested, but most of these were dismissed after a preliminary interrogation), only 23 were executed by the military courts (Appert 1875). About one-fifth of those tried were acquitted; the rest were either deported to the French penal colonies in New Caledonia or imprisoned in France for periods ranging from one to 20 years.

In the short term, the upheaval of 1871 imperiled the infant French republic by reinforcing Bourbon and Bonapartist calls for the mainte-

tailed histories in English may be found in Horne (1965) and Edwards (1971); Tombs (1981) focussed on the military aspects of the uprising. The classic account in French is Lissagaray [1876] (1969); Serman (1986) provided a recent synthesis.

nance of social order through a strong monarchy. But in 1879, after nearly a decade of right-wing reaction under the presidency of Marshal MacMahon, the monarchist general who had engineered the crushing of the Commune, Republicans finally gained a majority in both houses of the legislature. Less than a year later, a general amnesty was approved for all those still imprisoned for participating in the 1871 uprising. In the ensuing months, thousands of convicted insurgents returned to France — leaving behind hundreds who had died serving their sentences.

SOCIAL NETWORKS AND SOCIAL MOVEMENT MOBILIZATION

Mobilization does not just depend on social ties; it also creates them. Although members of a protest organization may have joined because of a pre-existing social tie to an activist, they also form new social relations while participating in collective protest (for a discussion of some of the long-term effects of such ties, see McAdam 1988). Without addressing the matter directly, the current view of how social networks influence mobilization implies that pre-existing ties do not matter once someone has been recruited. For example, Marwell, Oliver, and Prahl's (1988) simulation treated an actor's contribution to a collective good as unproblematic once he or she had been contacted by a movement organizer. Fernandez and McAdam (1988) argued that their focus on the organizational affiliations of applicants to the Freedom Summer project was "ideally suited for studying the network or other factors that maintain commitment to the project among the set of applicants" (p. 360). These approaches implicitly presuppose that the ties established during the process of mobilization tell us everything we need to know about continued participation; pre-existing ties may have helped create these new ties by facilitating initial recruitment, but they have no further influence.

Evidence from the final week of the Paris Commune strongly suggests that this view is incorrect. The residential recruitment system of the National Guard, which assigned people to battalions on the basis of the neighborhood in which they lived, provided more than an organizational framework for the insurgent effort.[3] Rather, the policy of recruitment along residential lines was crucial for mobilization until the last moments of fighting because it linked the informal social networks defined by neighborhoods to the formal network generated among insurgents by joint membership in the National Guard. Members of each battalion were tied to each other not only through their shared organizational affiliation, but also by the fact that they were neighbors.

The importance of neighborhood solidarity in maintaining the cohesiveness of residentially organized units was clearly evident in the persistence with which rank-and-file National Guardsmen associated their participation in the insurgent effort with a neighborhood-based identity. One group of Guardsmen in the second battalion, which was recruited primarily in the eighth Paris *arrondissement*, protested their inclusion in a Guard unit from another neighborhood:

> The undersigned National Guards, inhabitants of the chaussée d'Antin in the ninth *arrondissement*, forming part of the 2nd battalion of which four companies reside in the eighth *arrondissement*;
>
> Request that the companies residing in the ninth be turned over to one of the battalions of the ninth *arrondissement*, or any other assignment deemed useful for the communal defense. (Archives Historiques de l'Armée de Terre, Series Ly, carton 35)[4]

Similarly, a group of officers of the 148th battalion expressed their desire "to perform no service but that of their own *arrondissement*," arguing that this was the only way to ensure the protection of their neighborhood from reactionary forces. Moreover, they viewed the deployment of an outside battalion in their *arrondissement* as "a sign of mistrust, and consequently as an insult to their republican patriotism" (Archives Historiques de l'Armée de Terre, Series Ly, carton 44).

Petitions and letters were not the only means by which insurgents expressed their neighborhood loyalty. The localism of National Guard battalions is a recurrent theme in historical treatments of barricade fighting during the *semaine*

[3] The Paris National Guard was divided into 20 legions, each corresponding to one of the city's 20 *arrondissements*, or administrative districts. Each legion was subdivided into battalions drawn from particular neighborhoods within the *arrondissement*. The statement that insurgents belonged to the same unit as their neighbors should therefore be taken literally: Participants in the insurrection routinely fought beside people who lived on the same street, even in the same building.

[4] As this example makes clear, the continual reshuffling of National Guard companies in the early weeks of the Commune resulted in numerous organizational anomalies, so that most battalions included some Guardsmen who lived outside the appropriate neighborhood. The implication of these enlistment overlaps is dealt with in detail below.

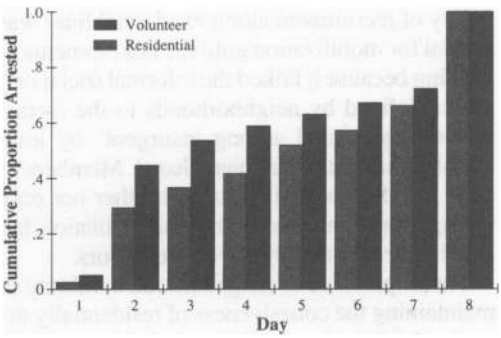

Figure 1. Cumulative Distribution of Arrests of National Guardsmen by Day, for Volunteer Battalions and Residential Battalions: Paris Commune, May 21-28, 1871

sanglante. According to numerous accounts, the central obstacle to a concerted defense of the city against the Versailles army was the obstinate refusal of Guardsmen to fight outside their residential areas. Rougerie (1971) argued that the final call to the barricades issued by the Commune's War Delegate, Charles Delescluze, served to "dismantle what was left of the organized Communard troops, each one running to the defense of its *quartier* [neighborhood] rather than forming a front" (p. 252). Edwards (1971) reported that Jean Allemane, a battalion commander in the fifth *arrondissement* who rose to prominence as a labor leader in the 1880s, was unable to prevent two units from the eleventh and twelfth *arrondissements* from going home to fight during the final week. Clifford (1975) reported a similar incident in which Guardsmen from the Right Bank abandoned a large barricade they were defending on the Left Bank, saying they were going to protect their own areas from the army. Clearly, neighborhood social structure left its imprint on the behavior of insurgents long after the initial stages of recruitment.

Historical accounts of the Commune have consistently pointed to the damaging effects of neighborhood loyalty on efforts to mount a coordinated military struggle against the Versailles army. But this emphasis on *strategy* misses the crucial sociological point that the mapping of National Guard units onto residential areas had unmistakably positive effects on *mobilization*. In fact, neighborhood social structure was the principal source of commitment to the insurgent effort. This is evident when the arrest patterns of residentially recruited battalions are compared with the patterns for the 35 volunteer units. Aside from the fact that Guards in volunteer units were recruited without regard to residence, differences between these two types of battalions were minimal. While volunteer battalions remained independent of the administrative apparatus of the National Guard Federation, even this distinction became irrelevant as all traces of central control vanished in the last week of fighting.

Figure 1 reveals critical differences between the two groups with respect to the cumulative distribution of arrests across the eight days of the *semaine sanglante*. Raw data for this figure are drawn from the army's official report to the National Assembly (Appert 1875). For the volunteer battalions, nearly half (45.2 percent) of all those arrested during the fighting had already been detained by the second day. In contrast, the proportion for residentially based units at this point was a little over one-fourth (26.4 percent). The insurgents' typical approach to resistance during the "bloody week" was to defend each barricade until it was overcome and then either to surrender or, if they were not trapped, to retreat to another barricade (Edwards 1971; Tombs 1981). Thus this difference in the timing of arrests appears to reflect a higher level of solidarity in residential battalions than in volunteer units. The pattern for the first two days is particularly striking in light of the fact that there was very little serious fighting during this period; most arrests at this point were the result of surrender rather than capture. For example, on the morning of May 22, the second day of the *semaine sanglante*, 1,500 National Guards from several battalions surrendered when an army regiment entered the city gates at the Porte Maillot and overran the battery of cannon in the Parc Monceau (Clifford 1975; Edwards 1971). Given that this incident accounted for half of the 3,000 arrests reported for that day (Appert 1875), it is clear that at this stage the army had not yet encountered much resistance.

For battalions recruited along neighborhood lines, 42.7 percent of the total arrests for the week were made in the last two days, compared with 31.9 percent for Guardsmen in volunteer battalions. In general, insurgents in neighborhood-based units were arrested at considerably later stages in the fighting, indicating that these battalions were more cohesive than those that were not organized residentially.

It is apparent from these data that informal social networks are implicated in social movement mobilization well past the initial stages of recruitment. Pre-existing social ties helped to maintain solidarity in the 1871 insurrection even after par-

ticipants were firmly embedded in organizational networks because National Guard battalions tied people together in ways that mirrored the division of the Parisian social world into well-defined neighborhoods. Thus, neighborhood social structure contributed not only to the *formation* of insurgent organizations, but also to their *effectiveness* as tools for mounting collective protest.

Solidarity and Structure

These findings could be interpreted as showing only that social ties need to be counted more accurately, i.e., network multiplexity might only imply that different kinds of ties contribute additively to mobilization and the maintenance of solidarity. If this were true, sociologists would still not need to consider structure: they would simply need to remember that pairs of people can be tied in more than one way and that multiple ties (friendship, shared organizational membership, and so on) can exert simultaneous but independent effects on mobilization.

But this is not the whole story. Neighborhood ties and organizational ties created by the National Guard acted *jointly* to maintain solidarity in the ranks of Parisian insurgents; and it is because of this interaction between the two networks that their structure must be taken into account.

Despite the general policy of residential recruitment, a substantial number of Guardsmen were enlisted in battalions outside their own neighborhoods. Thus, they were linked by the insurgent *organization* to people who were not tied to them as neighbors; conversely, they were linked as *neighbors* to other insurgents with whom they did not have organizational ties. In other words, these insurgents constituted organizational links across neighborhoods and neighborhood links across organizations.

The analysis presented below shows that the network of social ties created by overlapping enlistments had important consequences for the insurgent effort. These overlaps made levels of commitment to the insurrection interdependent across residential areas: the degree to which each neighborhood was successful in mounting resistance to the Versailles army depended on levels of resistance in the other neighborhoods to which it was linked.

DATA AND METHODS

The most effective test of the claim that resistance levels are interdependent is a regression model that explicitly takes enlistment overlaps into account by means of a term for network autocorrelation. The model takes the following form:

$$\mathbf{y} = \rho\mathbf{W}\mathbf{y} + \mathbf{X}\beta + \mathbf{e},$$

where $\mathbf{W}$ is a matrix of weights representing network links among the 20 *arrondissements* of Paris, ρ is a coefficient representing the degree of interdependence among the observations, $\mathbf{y}$ is a vector of outcomes on the dependent variable, and the remainder of the equation is the standard linear regression model. This model posits an influence process in which a district's resistance level is a function of a set of exogenous variables *and of the resistance levels of all the other districts*, weighted by the strength of its links with them. This specification implies that each district simultaneously influences and is influenced by each other district in the network, resulting in "endogenous feedback" (Erbring and Young 1979) that operates through network ties. Moreover, because the entire network is taken into account, neighborhoods are hypothesized to influence each other directly, through their ties to each other, and indirectly, through their ties to other neighborhoods. My arguments imply that we should observe positive values of ρ resulting from the network of overlapping enlistments. Estimation of the model is accomplished through maximum-likelihood techniques (Doreian 1981; Odland 1988).

Data are drawn from both archival and published sources. Because variation in levels of resistance is difficult to capture with a single variable, two dependent measures are used. The first is the average battalion size for each *arrondissement*. The number of battalions formed in each *arrondissement* was based on the number of adult males living there, and in principle each battalion should have consisted of 1,500 men. Despite a series of decrees issued by the Commune's War Delegates to the effect that men who failed to perform their Guard service would be disarmed and imprisoned, the exigencies of the war effort and the inefficiency of the organization made enforcement impracticable. Consequently, the number of Guardsmen actually reporting for duty varied considerably and usually fell well below the target. Since these shortfalls presumably resulted from apathy or a lack of resolve on the part of recruits, the average battalion size measures each district's success in mobilizing its male population during the insurrection.

Battalion commanders filed daily dispatches to the Commune's War Ministry reporting on

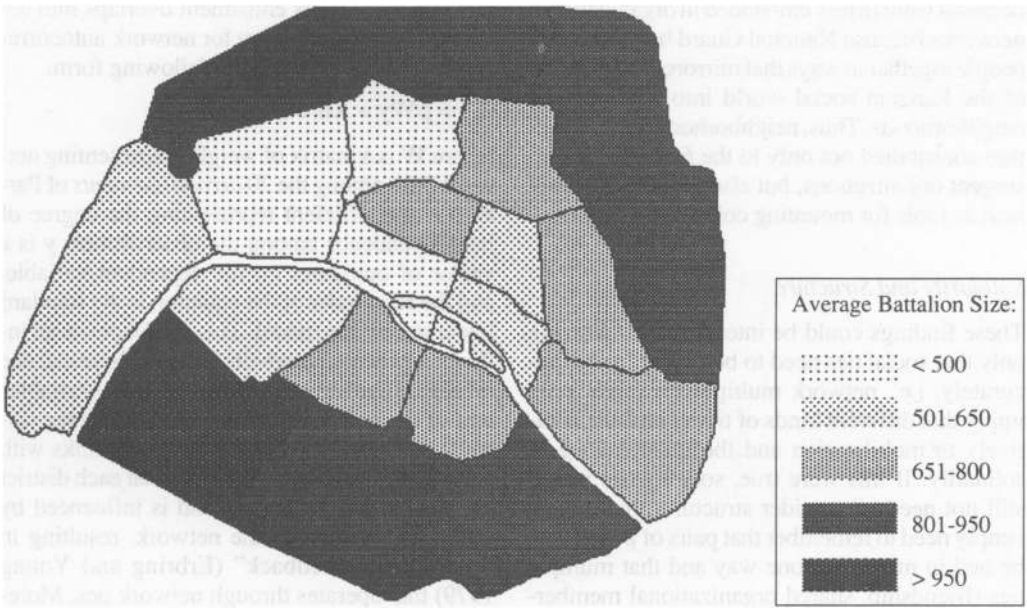

Figure 2. Average Battalion Size in Late May, by *Arrondissement*: Paris Commune, 1871

Note: Although battalion sizes vary from early to late May, the differences are not noticeable in this form of presentation.

the discipline and morale of their units and on the number of men actually serving. These dispatches were seized by the army during the final week of fighting and are preserved in the Archives Historiques de l'Armée de Terre at Vincennes (Series Ly, cartons 37 through 123). Although these records are incomplete, reports are available for 176 of the 215 battalions active under the Commune. For this study, battalion size was recorded at two time points: The first week in May, after enlistment lists were closed and disloyal or "recalcitrant" battalions had been dissolved or reorganized; and the end of the third week in May, on the eve of the Versailles army's final assault on the capital. This makes it possible to determine if the extent of interdependence among neighborhoods changed in the course of the uprising. Figure 2 depicts average battalion size in late May. Not surprisingly, there are no reports dated after May 21, the day the army entered the city's western gates.

The second dependent variable is the number of deaths per 1,000 inhabitants for each *arrondissement* during the month of May. Ideally, deaths from natural causes should be subtracted from *arrondissement* totals, but this information is unavailable. Given the large increase in the number of deaths during the insurrection, however, it is likely that most of the variation in this variable is attributable to differential rates of participation in the fighting rather than to variation in the death rates from other causes. There is one other source of measurement error: the dozens of wounded insurgents who died in military hospitals during the *semaine sanglante* tend to inflate the totals for *arrondissements* containing large hospitals.[5] Consequently, the analyses of death rates include a term for the number of deaths from military injuries that occurred in each district in February 1871. Since fighting with the Prussians ceased in January, any military deaths in February presumably occurred in hospitals; this variable should therefore correct for distortions in the death rates for May 1871 that result from the presence of large hospitals. Data for these measures come from the city's monthly bulletin of vital statistics (Ville de Paris 1872). Figure 3 shows death rates by *arrondissement*.

W is a 20×20 matrix in which each element, w_{ij}, is the number of Guards living in the *i*th *arrondissement* who served in the *j*th legion, divided by the total number of that district's Guards who served in other legions (each legion corresponds to a particular *arrondissement*). Thus **W**

[5] For example, the Hôpital des Invalides in the upper-class, politically conservative seventh *arrondissement* probably explains many more of the deaths that occurred there in May 1871 than insurgency could.

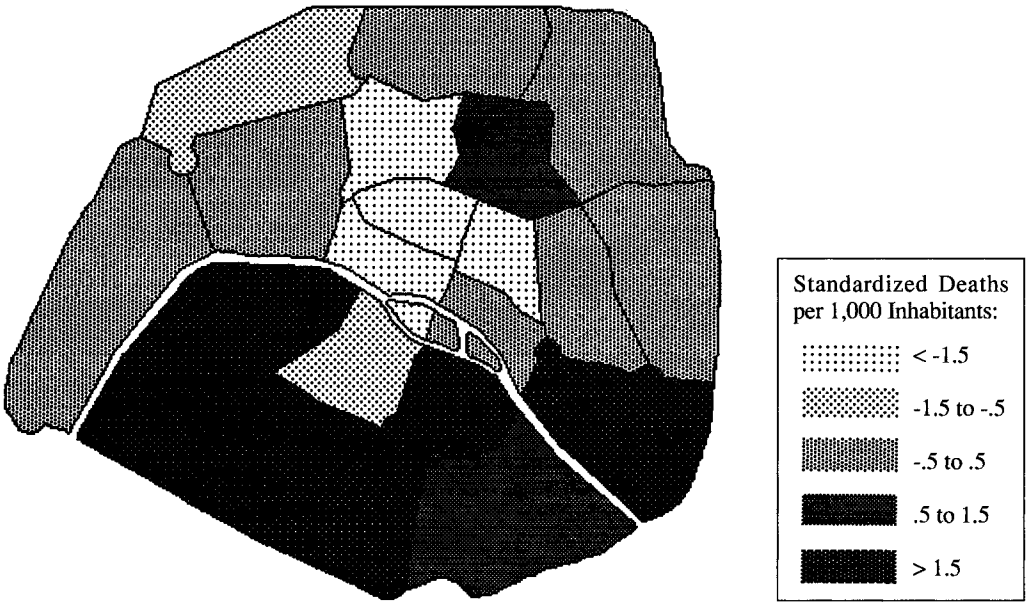

Figure 3. Standardized Deaths per 1,000 Inhabitants, by *Arrondissement*: Paris Commune, May 1871

Note: Since death rates are confounded by the presence of military hospitals in some neighborhoods, these data represent deaths net of this confounding factor. These rates are standardized residuals form an OLS regression of raw death rates on deaths from military injuries in February 1871 (see text).

is a non-symmetric, row-normalized matrix of weights in which the diagonal elements are set to zero.[6] Raw data for this matrix are drawn from the official military report on the insurrection and its repression (Appert 1875). Figure 4 shows these enlistment overlaps for each *arrondissement*.

The exogenous variables measure aspects of each *arrondissement's* social composition that may have influenced resistance levels: the number of poor people per 1,000 inhabitants; the percentage of the population classified in the 1872 census as skilled salaried workers; the percentage classified as unskilled (day-laborers); and the percentage who were white-collar employees (Loua 1873). The contrast category consists of people with bourgeois or professional occupations.

Poverty is hypothesized to have contributed positively to resistance levels for two reasons. First, the poor people of Paris had suffered the greatest hardship during the four-month Prussian siege and were therefore most likely to be hostile toward the French government for having surrendered. Second, National Guardsmen were paid a small daily indemnity (1 franc 50 centimes) under the Commune. This incentive to

[6] Row-normalization of **W** is required for the estimation procedure used here. The likelihood function for the estimates of ρ and the other coefficients is in general undefined when any of the eigenvalues of **W** exceeds 1; consequently, the rows of **W** must sum to unity to ensure that the largest eigenvalue of **W** equals 1.

Although row-normalization is a technical necessity, it also has substantive implications. Forcing all the rows of **W** to sum to 1.0 means that the effect on A of a network tie to B can only be modeled *relative to* the total number of ties A has to other nodes. Thus, the model is insensitive to variation in degree (number of ties) across nodes in the network: A node with 1,000 ties is assumed to be subject to the same amount of network influence as a node with 2,000 ties. This situation could be rectified if the model permitted the value of ρ to vary across nodes, but techniques to estimate such a model have not been developed.

If the absolute number of ties were the key determinant of the magnitude of network influence, it would be undesirable to make this assumption. In the present case, however, this limitation of the model does not pose a problem. Indeed, row-normalization provides a necessary control for variation in population size across *arrondissements*. For each *arrondissement*, the total number of Guardsmen enlisted in outside legions is roughly proportional to the size of the adult male population ($r = .78$). Row-normalization permits the model to reflect the theoretical supposition that 1,000 cross-enlisted insurgents from a district with 40,000 men would have about the same effect as 2,000 insurgents from a district with 80,000 men.

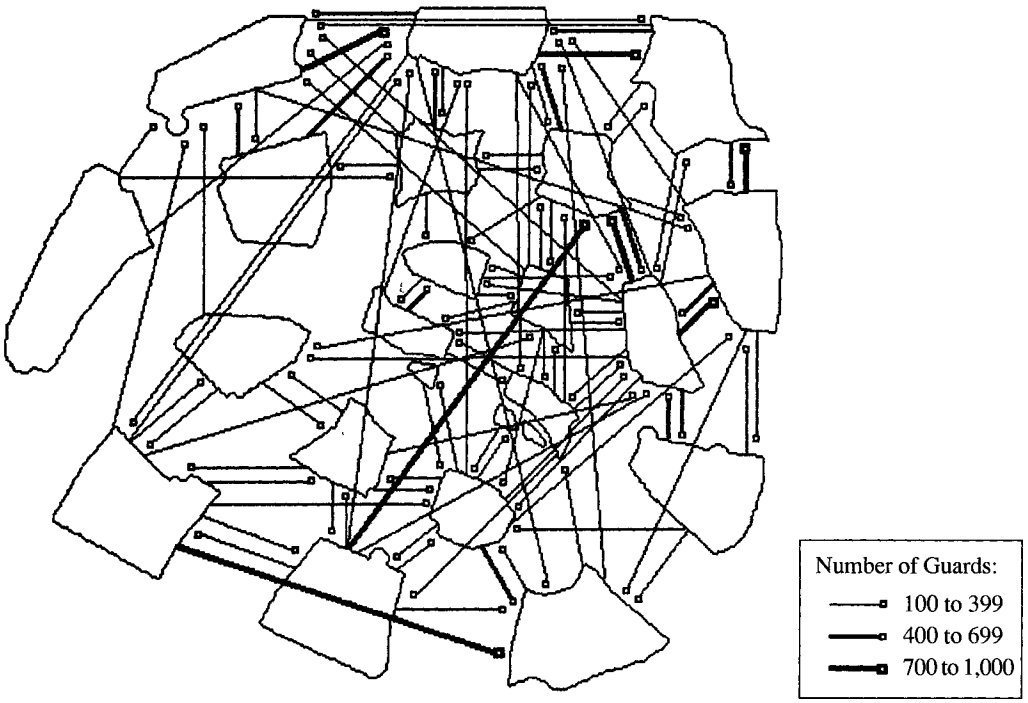

Figure 4. Numbers of National Guardsmen Serving in Legions Outside Their *Arrondissement* of Residence, by *Arrondissement*: Paris Commune, 1871

Note: Enlistment overlaps of fewer than 100 National Guardsmen are not shown; inclusion of such links would connect each *arrondissement* with nearly every other. Directionality is indicated by a hollow square, i.e., if 150 inhabitants of District A serve in a National Guard battalion from District B, this would appear as a thin line from A ending in a square near B.

participate in the insurrection probably had the greatest effect among the poorest segments of the population.

Following similar reasoning, the percentage of each district's population with a working-class occupation is expected to exert a positive effect on resistance levels because the openly pro-labor policies of the Commune's elected government presumably generated greater support in working-class sections of the city and greater hostility in bourgeois areas. Voting records for the March 26 elections to the Communal Council demonstrated a clear relationship between class composition and support for radical and socialist candidates (for election data, see Rougerie 1971). At the same time, however, it is important to distinguish white-collar workers, who often came from middle-class families, from salaried artisanal workers with a tradition of activism (Moss 1976; Sewell 1980). Likewise, unskilled day-laborers were more marginal and geographically mobile than skilled artisanal workers and consequently less likely to participate in an insurrection that depended on the social integration of urban neighborhoods. For this reason, my analyses separate the working population of each district into skilled, unskilled, and white-collar workers.

Since my hypotheses are directional, all of the statistical tests are one-tailed. Thus, estimates of ρ and of coefficients for the exogenous variables are treated as statistically significant only if they deviate from chance levels in the predicted direction.

RESULTS

The first four columns of Table 1 present estimates for the models predicting battalion size in both early May and late May; columns 5 and 6 report results for the models predicting death rates during the month of May. To test whether autocorrelation is a result of cross-district enlistments rather than simple geographical diffusion, two versions of the model are estimated. The "spatial model" substitutes a spatial adjacency matrix for the enlistment network used in the "network

Table 1. Coefficient Estimates for Average Battalion Size and Death Rate on Selected Independent Variables: Paris Commune, 1871

	Battalion Size					
	Early May		Late May		Death Rate, May 1871	
Independent Variable	Network Model (1)	Spatial Model (2)	Network Model (3)	Spatial Model (4)	Network Model (5)	Spatial Model (6)
Autocorrelation (ρ)	.289*	-.118	.477**	.038	.487*	.030
February military deaths	—	—	—	—	.076**	.068**
Poverty rate	2.217	2.419	2.217	2.320	16.818	18.103
Percent skilled workers	9.163*	9.311**	8.040*	8.164**	.064	.054
Percent unskilled workers	7.671	7.743	8.523	7.765	.081	.068
Percent white-collar employees	8.438	6.667	12.074	10.869	.066	.036
Constant	-148.918	180.656	-347.618	8.597	-4.650	-1.715
Fit[a]	.728	.722	.703	.674	.471	.441
Number of *arrondissements*	20	20	20	20	20	20

*$p < .05$ (one-tailed) **$p < .01$ (one-tailed)

[a] "Fit" is the square of the correlation between the observed and predicted values of the dependent variable. While it corresponds roughly to R^2 in standard regression analysis, it is not strictly comparable and should not be interpreted as the percentage of variance explained.

model." The hypothesis is that autocorrelation through the enlistment network is larger (more positive) than autocorrelation through spatial contiguity. In the spatial model, w_{ij} is coded as 1 if district *i* borders on district *j*, and 0 otherwise; the **W** matrix is then row-normalized as with the network model. Because sampling logic is inappropriate for these data, standard significance tests are not used. The significance levels reported are based on a null model of "randomization" of the observed values of **y** with respect to the **W** and **X** matrices (Odland 1988). The estimates of ρ and ß are compared with the distribution of the estimates that would result from a random assignment of the observed values of **y** to the 20 cases.[7] Coefficient estimates are statistically significant at the .05 level if fewer than 5 percent of random assignments produce estimates of equal or greater value.

As predicted, all of the exogenous variables contribute positively to battalion size and death rates in all models, although the only statistically significant effect is that for percentage salaried workers. Since the reference category for the occupational composition variables is bourgeois/professional, the coefficients confirm the hypothesis that resistance was stronger in areas that were poor and working-class. The expectation that white-collar and unskilled workers would play less prominent roles in the insurrection is not supported.

The most important finding is that the autocorrelation term, ρ, is positive and significant in the network models for battalion size in early May and late May. A significant autocorrelation effect is observed only when **W** represents cross-district enlistments; there is no evidence of autocorrelation through spatial adjacency in either early or late May. In addition, the estimate of ρ in the network model for late May is significantly larger ($p < .05$) than the estimate in the spatial model.[8] Similar results obtain for the number of deaths per 1,000 inhabitants (columns 5 and 6). The network of militia enrollments made levels

[7] Doreian (1981) provides formulae for computing standard errors based on the assumption of sampling observations from a normally distributed population. Because the 20 *arrondissements* analyzed here constitute the population in question, the randomization model is more appropriate. The distributions of ρ and ß are generated through simulation in which the model is repeatedly estimated with randomly generated permutations of the values of **y** with respect to the 20 *arrondissements*.

[8] Tests for differences in ρ between the two equations are performed in a manner analogous to those for the point estimates within each equation. Estimates are iteratively calculated for random assignments of the values of **y** to the observations, and for each iteration the estimate of ρ is computed once for each specification of the **W** matrix. This procedure generates a distribution of differences between estimates of ρ for a given set of data and two networks.

Table 2. Coefficient Estimates for the Network Model Using the Transpose of the Enlistment Network: Paris Commune, 1871

Independent Variable	Battalion Size		Death Rate,
	Early May	Late May	May 1871
Autocorrelation (ρ)	-.271	-.017	.268
February military deaths	—	—	.072*
Poverty rate	2.617	2.371	16.177
Percent skilled workers	9.063*	8.162**	.058
Percent unskilled workers	7.446	7.868	.079
Percent white-collar employees	6.827	10.576	.044
Constant	302.492	47.489	-3.070
Fit	.724	.673	.441
Number of *arrondissements*	20	20	20

*$p < .05$ (one-tailed) **$p < .01$ (one-tailed)

of insurgency significantly interdependent across districts, whereas spatial proximity did not.[9] The fit of the models predicting late May battalion size and death rates improves when the enlistment network rather than spatial adjacency is used.

These findings show that insurgents in different neighborhoods influenced each other's degree of commitment to the insurrection through the network of links created by overlapping enlistments. High levels of commitment in one area enhanced commitment elsewhere when enlistment patterns provided a conduit for communication and interaction. This effect cannot be explained in terms of purely spatial diffusion, demonstrating that resistance levels were rendered interdependent across districts through a fundamentally social network.

Even more intriguing is the fact that this influence process worked in one direction only: Neighborhoods responded to events in other areas where their residents served in National Guard units. For instance, resistance in the fifth *arrondissement* was positively affected by the fact that many of its residents served in the thirteenth legion, whose members demonstrated a strong commitment to the insurgent effort. However, this does not imply that resistance in the thirteenth *arrondissement* was affected by the presence of Guardsmen from the fifth.[10]

Indeed, Table 2 shows that this was not the case by estimating the network models using the transpose of the enlistment matrix **W** (written **W'**). Here, each element (w'_{ij}) represents the number of Guards serving in the *i*th legion who live in the *j*th district, divided by the total number of Guards in the *i*th legion who live outside the *i*th district. Under this model, each district is influenced by other districts through the Guardsmen who lived in these other areas, not by its own residents serving as Guardsmen in other areas.[11]

Using **W'** instead of **W**, the coefficient estimate for autocorrelation through the enlistment network is not significant for any of the dependent variables. Furthermore, the model for battalion size in early May yields an estimate of ρ that is significantly lower ($p < .05$) than the estimate using **W**. The fit for the equation predicting battalion size in late May drops from .703 in the model using **W** to .673 in the model using **W'**; the fit for the model predicting death rates drops from .471 to .441.

This analysis indicates that levels of resistance in each *arrondissement* were affected by the experiences of its own residents serving in the National Guard in other districts, but not by the

[9] This result could reflect a causal relationship in which battalion size influenced the pattern of enlistment overlaps rather than the reverse. For instance, if neighborhoods with extremely high enlistment rates sent their overflows to other neighborhoods, but not to neighborhoods with very low rates, a positive autocorrelation effect would be observed. Three considerations militate against this interpretation, however. First, it seems unlikely that cross-district enlistments were the result of oversubscription in some areas because battalion sizes nowhere reached the target level of 1,500 men: The largest average battalion size was 1,155 for the fifteenth *arrondissement* (1,287 in early May). Second, enlistment rolls were closed at the end of April, so if autocorrelation were the result of the restructuring of battalions in response to disparities in enlistment rates, a stronger effect would have been observed in early May rather than in late May. Finally, the fact that the analysis of death rates produces the same result suggests that the autocorrelation in Table 1 is not an artifact of the way resistance levels are measured.

[10] Table 1 does indicate, however, that commitment to the insurrection in the thirteenth *arrondissement* was influenced by the enlistment of some of *its* residents in the fifth legion.

[11] The spatial adjacency matrix is by definition symmetric, so that for spatial data, **W** = **W'**. Consequently, it would be redundant to re-estimate the spatial models for Table 2.

experiences of Guardsmen who lived in other districts. On an individual level, then, the influence process occurred because insurgents serving away from home had an impact on the behavior of their neighbors serving at home; but these insurgents did not affect the behavior of the Guardsmen with whom they served.

This finding provides strong evidence that formal and informal networks do not affect mobilization independently. The organizational links the National Guard generated through overlapping enlistments established a kind of cross-neighborhood solidarity in the form of interdependent levels of resistance, but this interdependence only emerged because the insurgents whose battalion memberships constituted these organizational ties also had informal ties to people in their own neighborhoods. Thus, the influence of formal and informal networks on mobilization cannot be described in additive terms; rather, neighborhood and organizational ties interacted to forge and maintain solidarity among insurgents.

DISCUSSION

The reductionist treatment of network factors in social movement research has obscured important aspects of their effects on mobilization. Sociologists have typically treated network data as they would any other variable: Information on social ties among movement participants has been collected and analyzed at the individual level. A few scholars (Fernandez and McAdam 1988; Marwell, Oliver, and Prahl 1988) have pointed to the advantages of an approach that is more sensitive to structural properties of networks, but the issue of network multiplexity has not been studied until now.

This study demonstrates not only that multiplexity and structure are both central to an understanding of network effects on mobilization, but that the impact of structure cannot even be appreciated without taking multiplexity into account. The importance of neighborhood identity and the pattern of arrests showed that pre-existing social ties among neighbors and organizational ties formed by the National Guard worked together to maintain solidarity in the insurgent ranks. Formal ties alone cannot explain the localistic behavior of residentially recruited battalions or the fact that they were more cohesive during the final week of fighting than volunteer battalions. Thus, it is inappropriate to focus exclusively on networks created by formal movement organizations, even when discussing the latest phases of mobilization.[12]

But it is precisely because mobilization is simultaneously affected by more than one network that network structure cannot be ignored.[13] The cross-district influence process uncovered in the Paris Commune resulted from the *interaction* of informal neighborhood networks with the organizational network of the Paris National Guard. Cross-neighborhood solidarity could not have emerged in the absence of enlistment overlaps that linked each residential area with Guard units in other areas; but these overlaps only made resistance levels interdependent across areas because mobilization was rooted in social ties among neighbors.

The interaction of multiple networks demonstrates the importance of structure in two ways. First, the notion of a network of overlapping enlistments presupposes that informal ties grouped people into neighborhoods and organizational ties grouped people into residentially based National Guard units. That is, it is not even possible to *discuss* enlistment overlaps without first recognizing that residential areas linked people informally as neighbors, and that National Guard battalions linked people formally as members of an insurgent organization. To recognize that formal and informal ties clustered people into neighborhoods and organizational units is to recognize that these ties exhibit a structure.

Second, the process by which neighborhoods influenced each other through these overlapping enlistments can only be analyzed by considering the entire network of overlaps. Each neighborhood simultaneously affected and was affected by the levels of resistance in other neighborhoods, both directly (to the extent that it was directly

[12] Fernandez and McAdam (1988) noted that their data permit a discussion only of the later stages of mobilization, and acknowledge that other (unobserved) networks may have played significant roles earlier in the recruitment process. But they do not consider the possibility that informal relationships may continue to affect recruitment late in the mobilization process. Effects of prior networks are thus implicitly assumed to be mediated by, rather than interacting with, the network of organizational affiliations.

[13] There is nothing particularly original in the claim that structure is closely related to network multiplexity. White, Boorman and Breiger (1976) made multiple networks a pivotal component of the blockmodelling approach to social structure. Still, this issue has not come up in social movement research despite increasing interest in network factors.

linked to each of these neighborhoods) and indirectly (to the extent that each of these other neighborhoods was itself influenced by still other neighborhoods, and so on). In other words, the influence process occurred not just between isolated pairs of neighborhoods, but through chains of neighborhoods linked directly and at various removes. The interdependence of resistance levels across residential areas was thus intimately tied not only to the quantity, but also to the structure of overlapping enlistments. This intricate pattern would be obscured in an analysis that disaggregated networks into scalar counts of ties.

I have concentrated on the interplay between two specific social networks: one consisting of neighborhood ties, and the other defined by membership in a military organization. This focus derives from the nature of the event because mobilization in the 1871 uprising revolved around the construction and defense of barricades — a distinctly neighborhood-oriented revolutionary tactic — by a militia recruited along residential lines.

But this study's findings have implications for social movement research that go beyond the roles of neighborhoods and militias. Mobilization itself creates new social ties, even as it relies on pre-existing ties as a source of solidarity. In general, then, it should be possible to characterize any mobilization in terms of a mapping of formal organizational ties onto an indigenous network of informal ties — a mapping that can be quantified using techniques for comparing adjacency matrices. Where social movement organizations are isomorphic to pre-existing social structure (e.g., if National Guard enlistments had mirrored neighborhood boundaries perfectly, with no cross-district enrollments), formal networks should have minimal effects on solidarity. In such a situation, formal organization might make social protest more effective by rationalizing participation, but not by inducing greater commitment. On the other hand, formal organizations that mobilize people in ways that completely cut across pre-existing networks, as in the volunteer Guard units, should experience considerable difficulty in sustaining commitment unless they manage to supplant such networks by creating total institutions (see, e.g., Walzer's [1980] discussion of revolutionary vanguards and Kuhn's [1971] treatment of the role of Triad societies in the Taiping Rebellion).[14]

The intermediate case, in which mobilization groups people in ways that largely follow the contours of indigenous social structure but also generates some interaction across pre-existing boundaries, provides the greatest potential for formal and informal networks to jointly influence solidarity and commitment to social movements. Most instances of social movement mobilization, like the present one, fall into this middle category. Consequently, future research should focus on informal and organizational ties concurrently rather than individually. This shift in focus will make discussion of the structure rather than the number of network ties indispensable.

ROGER V. GOULD is Assistant Professor in the Department of Sociology at the University of Chicago. His research interests include social movements, social networks, and historical sociology. He is currently working on a book about class consciousness and labor protest in nineteenth-century Paris.

REFERENCES

Appert, Félix Antoine. 1875. *Rapport d'ensemble de M. le Général Appert sur les opérations de la justice militaire relatives à l'insurrection de 1871* (Summary Report of General Appert on the Military Justice Proceedings Regarding the Insurrection of 1871). Paris: Imprimerie Nationale.

Archives Historiques de l'Armée de Terre. (Historical Archives of the Army). Vincennes, France.

Cable, Sherry, Edward J. Walsh, and Rex H. Warland. 1988. "Differential Paths to Political Activism: Comparisons of Four Mobilization Processes after the Three Mile Island Accident." *Social Forces* 66:951-69.

Chorley, Katherine. 1943. *Armies and the Art of Revolution*. London: Faber and Faber.

Clifford, Dale L. 1975. "Aux Armes Citoyens! The National Guard in the Paris Commune of 1871." Ph.D dissertation, Department of History, University of Tennessee, Knoxville.

Doreian, Patrick. 1981. "Estimating Linear Models With Spatially Distributed Data." Pp. 359-88 in *Sociological Methodology 1981*, edited by S. Leinhardt. San Francisco: Jossey-Bass.

Edwards, Stewart. 1971. *The Paris Commune 1871*.

[14] On the other side of the barricades, history has repeatedly shown how difficult it is for elites to make effective use of military organizations whose members interact regularly with the population they are supposed to control. This is the central theme of Traugott's (1985) study of the Parisian insurrection of 1848, and is echoed in most work on the February Revolution in Russia (Chorley 1943; Fitzpatrick 1982). Indeed, fraternization between the French army and the people of Paris was a key factor in the government's embarrassing defeat on March 18, 1871.

London: Eyre and Spottiswoode.

Erbring, Lutz and Alice A. Young. 1979. "Individuals and Social Structure: Contextual Effects as Endogenous Feedback." *Sociological Methods and Research* 7:396-430.

Fernandez, Roberto M. and Doug McAdam. 1988. "Social Networks and Social Movements: Multiorganizational Fields and Recruitment to Mississippi Freedom Summer." *Sociological Forum* 3:441-60.

Fitzpatrick, Sheila. 1982. *The Russian Revolution.* New York: Oxford University Press.

Gamson, William A. 1975. *The Strategy of Social Protest.* Homewood, IL: Dorsey Press.

Greenberg, Louis. 1973. *Sisters of Liberty: Paris, Marseille, Toulouse and the Reaction to the Centralized State.* Cambridge: Harvard University Press.

Horne, Alistair. 1965. *The Fall of Paris: The Siege and the Commune 1870-1.* London: Macmillan.

Kuhn, Philip S. 1971. *Rebellion and its Enemies in Late Imperial China: Militarization and Social Structure.* Cambridge: Harvard University Press.

Lissagaray, Prosper-Oliver. [1876] 1969. *Histoire de la Commune de 1871* (History of the Commune of 1871). 2 vols. Paris: Maspero.

Loua, Toussaint. 1873. *Atlas statistique de la population de Paris* (Statistical Atlas of the Population of Paris). Paris: J. Dejey.

McAdam, Doug. 1986. "Recruitment to High-Risk Activism: The Case of Freedom Summer." *American Journal of Sociology* 92:64-90.

_____. 1988. "Micromobilization Contexts and Recruitment to Activism." *International Social Movement Research* 1:125-154.

McCarthy, John D. and Mayer N. Zald. 1973. *The Trend of Social Movements in America: Professionalization and Resource Mobilization.* Morristown, NJ: General Learning Press.

_____. 1977. "Resource Mobilization and Social Movements: A Partial Theory." *American Journal of Sociology* 82:1212-41.

Marwell, Gerald, Pamela Oliver, and Ralph Prahl. 1988. "Social Networks and Collective Action: A Theory of the Critical Mass. III." *American Journal of Sociology* 94:502-34.

Marx, Karl. [1871] 1940. *The Civil War in France.* New York: International Publishers.

Moss, Bernard. 1976. *The Origins of the French Labor Movement: The Socialism of Skilled Workers.* Berkeley: University of California Press.

Oberschall, Anthony. 1973. *Social Conflict and Social Movements.* Englewood Cliffs, NJ: Prentice-Hall.

Odland, John. 1988. *Spatial Autocorrelation.* Newbury Park, CA: Sage Publications.

Rougerie, Jacques. 1971. *Paris Libre 1871* (Free Paris 1871). Paris: Editions du Seuil.

Serman, William. 1986. *La Commune de Paris (1871)* (The Commune of Paris [1871]). Paris: Fayard.

Sewell, William H., Jr. 1980. *Work and Revolution in France: The Language of Labor from the Old Regime to 1848.* New York: Cambridge University Press.

Smelser, Neil. 1963. *Theory of Collective Behavior.* New York: Free Press.

Snow, David A., Louis A. Zurcher, and Sheldon Ekland-Olson. 1980. "Social Networks and Social Movements: A Microstructural Approach to Differential Recruitment." *American Sociological Review* 45:787-801.

Tombs, Robert. 1981. *The War Against Paris, 1871.* London: Cambridge University Press.

Traugott, Mark. 1985. *Armies of the Poor: Determinants of Political Orientation in the Parisian Insurrection of June 1848.* Princeton: Princeton University Press.

Ville de Paris. 1872. *Bulletin de statistique municipale, 1871* (Bulletin of Municipal Statistics, 1871). Paris: Imprimerie Municipale.

Walzer, Michael. 1980. *Radical Principles: Reflections of an Unreconstructed Democrat.* New York: Basic Books.

White, Harrison C., Scott A. Boorman, and Ronald L. Breiger. 1976. "Social Structure from Multiple Networks. I. Blockmodels of Roles and Positions." *American Journal of Sociology* 81:730-80.