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WOMEN IN COMMUNICATION NETWORKS:

OPENING UP THE SMALL WORLD

by

MARTHA ANN CAREY

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1987

This manuscript has been read and accepted by the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

Women in Communication Networks:

Opening Up the Small World

by

Martha Ann Carey

Adviser: Professor Florence L. Denmark

The social structure of the professions has been pressured to adapt to the marked increase in women entering the professions. Changes in the social structure in psychology were examined by analyzing informal communication network data collected in 1977 and in 1986, using the Small World technique. Results indicate that women have not been well integrated into the dominant networks, as indicated by their position in chains and the status of the chain target. Important gender differences in professional connections were observed in the relationships between sender and receiver. Women continue to use social ties while men use collegial ties for this task in a professional context. In selecting a person with the best connections for this task, women select other women far more often than their ratio in psychology. Gender differences were also noted in career stage effects as males disproportionately chose females newer to the profession, and females disproportionately chose males who had been in the profession longer. Though men and women were equally effective in completing this networking task, the task itself may not be sophisticated enough to assess all relevant network qualities.

Acknowledgements

I am very grateful to my dissertation committee: Florence L. Denmark, David Rindskopf, and Charles Kadushin for their advice, encouragement, and support. Vita Rabinovitz and Kathleen Christensen were helpful as outside readers. I want to thank my immediate "network" of colleagues and friends: Helen Dermatis, Jeanine Low-Beer, Meryl Sufian, and Stacy Lonstein. Most of all I am grateful to my husband Bob Juliano and my children Rob, Ann, Mary Catherine, and Maggy for listening and trying to understand.

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In the last two decades there have been extensive changes in perceptions of women's roles, expansion of social and political rights, and pressure for occupational equality. Although women's participation in the permanent labor force has risen dramatically (Ahern and Scott, 1981), access to prestigious professions and higher levels within these professions has remained severely limited (Nivea and Gutek, 1981; Coser, 1981). Women's advancement has not been commensurate with their abilities and credentials (Kaufman and Richardson, 1982). This under utilization of women has been criticized not only as an equity issue, but also as a waste of human resources (Pfafflin, 1984).

There is evidence that women do not have access to channels of recruitment and advancement comparable to those available to men (McKenna and Denmark, 1981). When network access is limited by factors other than professional competence, the resulting discrimination adversely affects not only individuals, but also places constraints on potential contributors which limit the development of the profession as a whole.

Women are at a disadvantage professionally when gender status leads to barriers in communication among colleagues (Kaufman, 1978). The importance of professional contacts has been described in the art world (Becker, 1982), in publishing (Coser, Kadushin, and Powell, 1982), and in medicine (Lorber, 1981). This process would be expected in any field which requires a collegial interdependence based on trust and loyalty. A shared characteristic such as gender, race, or social status may be used as a substitute for an established trust relationship (Kanter, 1977). Understanding the complexity of behavior in modern society requires considering the larger social context of social stratification, as well as the microstructure of networks.

THEORETICAL AND RESEARCH BACKGROUND

SOCIAL STRATIFICATION

The persisting pattern of social relationships gives rise to a system of social stratification in which structured inequalities provide differential access to resources and distribution of rewards. Within the stratification system, positions are allocated or assigned through two fundamental mechanisms, ascribed status and acquired status (Lenski, 1984). Ascribed status refers to assignment based on a quality or characteristic which a person possesses by virtue of birth. Acquired status is gained through personal achievement based on relevant performance. The complex interplay of these two mechanisms of privilege and merit results in the accumulation of advantages to those in the dominant groups (Merton, 1973; Zuckerman, 1977).

In complex societies there are several dimensions of stratification. An individual's social position in an achievement based, socioeconomic structure does not necessarily coincide with the multidimensional, ascriptive based structure. A person with a lower ascribed position may elevate his or her achieved position through education and occupational attainment. It is assumed that such a person would define his or her social position in terms of the higher status and expect social interactions to reflect this achieved status. However, other people may define the "status inconsistent" person (Merton, 1973) either in terms of the lower status, or some midpoint lower than the person desires. Such situations lead to stress in personal encounters and difficulty in obtaining rewarding patterns of social interaction (Epstein,1970). For example, a woman who has attained some measure of professional success may find her (ascribed) gender status compromises her (achieved)

professional status, and that this adversely affects her professional relationships, and the evaluation of her professional performance.

Behavior within a stratified system is viewed by exchange theory (Blau,1964; Homans, 1960; Parsons, 1960) as the exchange of resources such as support, information, emotions, or alliances, which results in a dynamic equilibrium. Each person attempts to acquire something of greater value than he or she has given. The social stratification system can be thought of as an opportunity structure within which exchange relations can exist (Cook, 1982) .

Constraints arising from social stratification produce restricted access in social relations. Emerson (1962) formulated a model in which dependency is inversely related to the number of alternative exchange relationships available. Marsden (1983) added the concept of centrality to this model; that is, a person's accessibility and centrality of location in a network structure directly affects his or her power dependence. A person favorably situated can enhance the exchange value of his or her resources compared to more peripheral others. Other possible outcomes of restricted access are (1) some exchanges will not take place, and (2) lower system efficacy will occur with lower satisfaction for some. Experimental evidence indicates that most people will engage in inequitable exchanges rather than withhold their resources when alternatives are not available (Marsden).

The social stratification system is the outcome of ongoing processes. A dynamic theory of social stratification includes two general types of processes: morphostatic which tend to maintain characteristic structures, and morphogenic which tend to change the structural basis (Baumgartner, Buckley, Burns, and Schuster, 1976). The

stratification system functions so as to maintain the status quo, and thereby resists pressures from changes in cultural values. In the past, status characteristics, such as lower socioeconomic class or female gender which had been culturally defined as inappropriate to succeeding in a profession, impeded professional performance (Epstein, 1970) . Professional standards and advancement opportunities are determined by an established, inner circle whose members are drawn from the dominant status group. Although there has been expansion in the perception of women's roles in the past two decades, women may be at a disadvantage for career advancement due to the impact of the established system.

The social stratification system has undergone some changes related to gender structuring. Interacting trends of decreased mortality and increased education for women helped bring about decreased fertility. These factors led to massive increases in labor force participation of women (Huber and Spitze, 1983). These variables affect, and are effected by, sex role attitudes and behaviors (Reskin, 1984).

GENDER STRATIFICATION

Cultural definitions of masculinity and femininity play an important role in gender differentiation in the occupational structure (Stewart, 1982). Gender role ideology, reflecting the expected behavior of the sexes, has been important in creating and maintaining inequities structured by gender. Many of the early studies have been criticized for attributing inequities to gender discrimination without examining appropriate, relevant variables. For example, in early studies differences in salary were not interpreted in relation to fulltime work versus part time (Deaux, 1985). More recently a large body of empirical

research has demonstrated gender inequities through numerous, well designed experimental laboratory studies as well as field studies (see Lott, 1985). Taken together, these two types of studies make a strong case for gender based discrimination.

Gender inequalities have been documented in the following, often cited studies: employee selection (Fidell, 1970); income (Astin and Bayer, 1972; Terborg and Ilgen, 1975); and promotions and career development (Rosen and Jerdee, 1974; Ahern and Scott, 1981). In a simulated hiring situation, Fidell found evidence that females were evaluated lower than males by chairmen of psychology departments. Males received more desirable ratings than females, based on resumes which were identical except for first names. Evidence of adverse impact of gender status on income was found by Terborg and Ilgen using a small sample of undergraduates (n=36) in an experimental simulation involving case studies with first names changed to denote gender. Initial salary and subsequent salary increases were significantly lower for females. In both of these experimental studies, research participants evaluated only one case at a time, so that they did not choose between a male and a female. Therefore, unobtrusive measures of the impact of gender on evaluations were obtained. In an actual setting where one has to choose between a male and a female, one might try to be fair minded. However, this type of research paradigm assessed a situation where gender is not made salient. Gender bias in salaries was also found by Astin and Bayer in academic settings. Using a large sample (N=600,000) of college and university faculty, the authors found a partial correlation of - .16 between gender (coded 1=male, 2=female) and salary after controlling for all variables found to be significant predictors.

Gender inequities in career advancement have also been demonstrated both in laboratory and field studies. The gender bias found by Rosen and Jerdee (1974) in a simulated personnel decision study of bank supervisors was associated with a measure of traditional gender stereotypes. Females were assigned fewer promotions and fewer opportunities for training and supervision. In a large study (n=50,000) of scientists and humanists matched for prestige of degree granting institution, type of employment, education, years of experience, and race, Ahern and Scott (1981) found females to be involuntarily unemployed and underemployed more often than males, careers of females were less advanced, and their salary was lower.

The general statement of gender inequities needs to be examined in light of specific conditions or variables which may affect this process. Although gender bias may be pervasive, it may not be homogeneous. In general, empirical studies report a negative impact of female gender on attitudes, beliefs, and behaviors regarding the evaluation of women's competence and performance. However, in reviewing the vast body of empirical literature, Lott (1985) identified a few studies which showed no adverse impact of female gender, or demonstrated a favorable evaluation of women in relation to comparable men.

Lott (1985) described conditions under which gender prejudice is most likely to be observed. Her analysis provides some sociopsychological insight into understanding and predicting gender bias. Comparing studies using college students as research participants with studies using employers or potential employers as participants, Lott found the latter paradigm to almost consistently reveal gender bias as contrasted with the less significant and consequential, simulation studies using college students.

A second important aspect of gender bias identified by Lott (1985) is the salience of gender to the setting. In situations where persons are evaluating the competence or performance of someone whom they know, gender is less salient and bias is less likely to be reported. Nivea and Gutek (1980) propose that less bias occurs in a relatively unambiguous, evaluative setting because fewer inferences are made.

This evidence of gender inequities conflicts with the norm of universalism (Merton, 1957) which requires that rewards be based on achievements rather than characteristics due to birth. In spite of a trend in American society in the last two decades to question traditional gender role stereotypes, empirical studies (Deaux and Lewis, 1984; Eagly and Steffen, 1984) have demonstrated the persistence of traditional stereotypic role behaviors.

Further evidence of the impact of cultural definitions in the opportunity structure is found in the work of Epstein and Coser (1981). Examining women's access to education, occupational opportunities, and monetary resources across cultures, the authors found that women cluster either in gender role appropriate activities related to health, welfare or culture, or at the bottom in other activities. Two factors important in this process are the cultural mandate for women to have the care of the family as a primary responsibility, and employers' perception of women as potential disrupters of the occupational structure (Coser and Rokoff, 1971).

The relegation by gender to separate work spheres or to separate functions in the same work place results in differential access to authority, unequal wages, separate job ladders, and exclusionary practices restricting mobility between gender typed positions (Reskin,

1984). Though gender segregation of occupations has been somewhat modified, it still exists to an extreme degree. Recent research has found that most organizations in the United States are almost as segregated as is possible (Bielby and Baron, 1984). Occupational segregation is unlikely to lessen appreciably without major revisions in gender role ideology and in the division of labor (Mason, 1984).

The pervasiveness of gender segregation in occupations promotes and sustains inequalities of opportunity in the workplace (Blumenrosen, 1979). Some progress has been made in addressing this problem through affirmative action (Beller, 1984). However, when recruitment, hiring, and training issues are addressed, the critical issue of career advancement remains (O'Farrell and Harlan, 1984).

CAREER DEVELOPMENT

The importance of the opportunity structure as a major explanatory factor in women's career achievement is stressed by Kaufman and Richardson (1982) who presented data which demonstrated that years of education, of professional training, and of experience bring fewer economic rewards for women than for comparable men. (See also Featherman and Hauser, 1976).

In the interplay of personal and social resources with occupational structure, initial position is an important determinant of later advancement. In Spilerman's (1977) conceptualization of career lines as a trajectory, the launching point is critical. Lin, Ensel, and Vaughn (1981) also emphasized the initial importance of personal (ascribed) resources in accumulating social (achieved) resources, which later become more important than personal resources for advancement. Advantageous

initial position in the social stratification system leads to an improved probability of future success. Merton (1973) described the continuing impact of "accumulated advantages," i.e. students who are admitted to prestigious graduate schools have a better chance of getting better jobs, which in turn leads to an increased probability of a high level of research productivity, etc.

Initial social position is related to ascribed status such as gender. The informal structure of social relationships provides opportunities for some initially advantaged people to work at more elite levels with more access to resources (Cole and Cole, 1973), and this enhances their probability of future success. Zuckerman (1977) noted this process in the advantage of ascribed statuses differentially providing access to resources in the formative stages of future Nobel laureates. Because women and other minorities have a devalued ascribed status, they are disadvantaged in this process, and it is harder for them to succeed. This is an aspect of "unfair science" (Reskin, 1980) which helps to maintain the status quo in the social stratification of science.

Studies of women's position in psychology date back to the forties. Bryan and Boring's (1944, 1946, 1947) studies of the American Psychological Association (APA) revealed that women had lower salaries, lower promotion rates, and were employed in lower status positions. Examining women's status in the APA, Mitchell (1951) found that women were not serving in high level positions as would be expected in proportion to their numbers and qualifications. Simon, Clark, and Galway (1967) found the gender differences in academic tenure and salary were less for women who had received PhDs in the early 1960's contrasted with the 1950's. More than a decade later, Denmark (1979) noted that the

percentage of women had increased only slightly in the APA in the past 25 years and women were still clustered in a few divisions. Denmark also noted that while women had increased their participation in APA governance markedly since Mitchell's study, the employment pattern was similar to Bryan and Boring's early findings of women underemployed or unemployed more than men. A pattern of income more equitable for recent PhDs, and consistent gender differences for earlier degree recipients, was found by Russo et al. (1981) and Ahern and Scott (1981) .

The studies described above portray gender differences which are in accord with a model of gender discrimination. While these studies, with the exception of Byran and Boring's research (1947), are descriptive and predictive as contrasted with the causal research of Ahern and Scott (1981), they portray the realities of gender differences in the profession of psychology.

Evidence of differential academic career development for males and females is compelling. Women's professional advancement has not been comparable to men with comparable characteristics. Despite the marked increase in numbers of women in the professions, the expansion of gender roles, and some decrease in gender segregation of occupations, there is no evidence that there has been a change in the opportunity structure which constrains women's professional advancement. The stratification system which governs women's professional opportunities can be studied through the examination of networks and communication patterns.

PROFESSIONS AND PROFESSIONAL ASSOCIATIONS

Study of opportunity structures in a profession requires an understanding of the structure of professions and professional

associations. There is a vast body of literature on the development of professions and the sociology of occupations (see Smith, 1975; Smith and Macauley, 1980; Salisbury, 1975). Only a brief review will be presented here.

The definition of a profession was explored by Friedson (1983) as a part of the historical development of social structure and the sociology of occupations. Friedson surveyed the range of occupations and located professions within the overall structure. The features of professions he identified as most characteristic are expertise, credentialism, and autonomy.

There are two broad, theoretical paradigms used in understanding professions and their development. Friedson (1984) viewed professionals as experts who, because they possess skills and knowledge, have acquired power and authority. This is the functionalist model (Parsons, 1968). A contrasting theoretical approach, the conflict model, is espoused by Larson (1977) who sees professionals as persons who have acquired expert skills and knowledge by virtue of belonging to a class which is favored in society's stratification system. In this model, race, religion, and sex are superimposed on the educational system which is stratified based on individual merit.

Both approaches can make distinct, complementary contributions to our understanding of the relationship between social differentiation and social inequalities in professions (Heinz and Laumann, 1983). From the functionalist school, we see that social values influence professional roles and differential rewards. From the conflict school, we note that power differences based on role position permit differing rewards for comparable work.

With changes in gender roles in society, pressure for changes in stratification within professions is expected. However, those persons already in powerful positions would resist such changes. This dynamic has implications for gender differences in career development, as noted earlier.

A distinct characteristic of professions is the process of establishing performance standards and enforcing a code of ethics. These functions are carried out through the preeminent professional association. Though professionals may belong to several professional associations, the preeminent organization serves these unique purposes.

Preeminent associations such as the American Psychological Association, the American Sociological Association, the American Medical Association, and the American Bar Association consist of (1) a central headquarters which functions as a formal organization, and (2) a network of loose ties between individuals who generally have a home base with another organization such as a university, hospital, or law firm. This second type of organizational structure will be the focus of this study.

Individuals in a professional association share a common professional culture and understanding. Professional associations address an individual's needs for professional recognition and a frame of comparison (Van de Ven, 1984). This need for collegial comparison is especially true when one is working without frequent contact with professional colleagues. Hansmann (1985) points out that in addition to making contacts which will likely prove useful in the future, being associated with a prestigious group can be a benefit in itself, as the relationship is often perceived as conferring prestige.

A professional association may be thought of as a "linking pin"

(Aldrich and Whetten, 1981). This type of organization is a loosely connected network of ties to many organizations, and functions as a communication channel transferring information and resources between organizations.

In the general field of research on associations, there is no general metatheory or overarching paradigm (Knoke, 1986). This area of research draws from many diverse disciplines: sociology, social psychology, organizational behavior, law, political science, and economics. While research has grown significantly in the past decade, the field remains "a largely unintegrated set of disparate findings" (Knoke). There is little research on the adaptation of professional association to environmental changes. Research on voluntary associations (Palisi and Jacobsen, 1977; McPherson, 1980) has little relevance for the evolution of professional associations. Therefore research in organizational behavior will be used to further develop the conceptual framework for this study.

Organizational structures develop within the constraints of structural differentiation in society (Eisenstadt, 1965). Using historical analysis, Stewart (1982) illustrates the impact of social stratification on the development and evolution of occupations. Changes in overall stratification in society would be expected to result in changes in structure of occupations and in organizations involving occupations. Cross cultural evidence supports the relationship between cultural orientation and institutional structures (Eisenstadt, 1981). Organizational characteristics such as formalization, specialization, and stratification are related to systems of stratification found in different societies.

Organizational adaptation incorporates both deterministic and voluntaristic processes. The deterministic approach is espoused by population ecologists (Hannan and Freeman, 1977; Aldrich, 1979) who argue that organizational changes occur largely as a result of reaction to environmental forces. The variety and evolution of organizational structures are determined by the environmental context. This perspective focuses on selection processes and not on causal mechanisms. This model of population ecology is the basis for McPherson's (1981, 1983) work on organizational characteristics, such as size, stability, position in interorganizational networks, and macrosocial forces such as population distributions of age, gender, occupation and education.

The second major theoretical explanation of organizational adaptation is resource dependence which emphasizes choice and strategic decision making within an organization. Management of an organization seeks to maintain control through strategies which alter the environmental situation or the organizational)environmental interdependence in order to make compliance less necessary (Pfeffer, 1985).

Both theoretical orientations emphasize the need to examine environmental constraints, and may be viewed as complementary dimensions (Hrebiniak and Joyce, 1985; Pfeffer, 1985). Pfeffer suggests the two theories are applicable at different levels of analysis, with resource dependence operating at the level of individual organizations and population ecology at a more macro level. Hrebiniak and Joyce argue that both are independent and necessary.

As society has changed perceptions and expectations associated with gender, the professions and organizations which house the professions

will be pressured to respond. Adaptation is not likely to be homogenous across all areas within a profession or professional association. Rather it would be expected that areas which previously had a greater percentage of women would experience greater increases in women than areas which traditionally had fewer women. Also increases would be expected in professional areas similar to changes in areas in society which have seen expansion in women's roles and culturally defined appropriate behaviors.

The system of stratification within a profession is reflected in communication patterns. By studying changes in communication networks, the evolution of structure in a profession may be examined.

COMMUNICATION NETWORKS

The profession of psychology and the professional association of the APA is the context for this study of communication networks. Informal communication patterns are a measure of professional ties which reflect the effects of social stratification in the profession and in the larger social context. Ties between individuals provide data which reflect the larger social structures. Data are observed at the individual level, and will be analyzed as relations between individuals as well as at the individual level (Tichy, 1981). By studying both aspects, insight can be gained into the structure of the profession of psychology and the functioning of the professional association of the APA. Adaptation to changes of gender stratification will be explored by comparing communication patterns over time.

Communication networks reflect social networks. The concept of a social network refers to sets of direct and indirect social relationships which arise from the links of acquaintance and kinship (Knoke and

Kulinski, 1981), and from the instrumental attempts by individuals to manage and control their environments (Mitchell, 1969). Not all possible linkages in a system are actually present. The patterns of existing links can explain some aspects of individual level behavior (Mitchell). By reducing the number of possible linkages in a system, network structures aid in reaching the system's goals, and differentially affect individuals within the system. Networks facilitate as well as constrain access to members, and consequently to resources.

As Aldrich and Whetten (1981) point out, an operationally defined network is basically a construct created by the researcher to aid in studying relationships. Multiple network type systems exist simultaneously to serve different purposes, ie work flow, communication, friendship. The observed data are measures of one network which allow inferences to be made to the larger system.

As a research approach, social network analysis has been a versatile tool useful in diverse areas of research. Among the early studies of social networks are Moreno's (1934) research in school classrooms, Bavelas' (1950) examination of communication patterns, research in anthropology focusing on Norwegian fishing villages (Barnes, 1954), and marital friendship networks (Bott, 1971). Among the more recent applications of social network analyses are studies of social support and mental health (Boulanger and Kadushin, 1986; Kadushin, 1982), and of elite networks (Alba and Moore, 1978; Kadushin, 1974).

Network analysis examines the emergent properties of relations between actors at the micro level and between collective groups at the macro level. Social relationships are reflected in the system of communication behaviors (Rogers and Kincaid, 1981). By examining

communication networks as one type of social network, the otherwise invisible effects of social stratification can be assessed through measuring the connectedness of a system.

Communication network patterns are a product of both formal and informal flows of communications. Organizations provide formal structures which gives some stability to relationships (Rogers and Agarwala)Rogers, 1976). Formal communications arise from instituted role requirements of an organization. Informal communication networks are initiated by individuals to meet the day today communication needs. They are more amenable to individual influence and less predictable. Communications networks, as a measure of connectedness in society, are a product of the interdependence of formal and informal communications. The informal patterns are "hung on the pegs" of the formal (Tichy and Fombrum, 1979); that is, the informal evolves around the formal structure.

Communication and exchange of information are intrinsic in science (Griffith and Mullins, 1972). Several studies (Griffth and Miller, 1970; Mullins, 1968; Crane, 1972; Price and Beaver, 1966) have examined the communication and organizational patterns in science, and found that many effective, loose networks characterize most fields. Very cohesive networks are usually associated with quickly developing areas, major reconceptualization of an area, or strong competition for research resources.

The importance of informal communications and connections in social structure for resources, information and support as well as job performance and career development has been demonstrated in several studies (Griffith and Miller, 1970; Granovetter, 1974; Kessler, McKenna,

Russell, Stang, and Sweet, 1976). This effect is particularly important in the initial stage of career development. The number and quality of contacts as well as socioeconomic standing of the contacts has direct effect on job satisfaction and prestige (Lin, Vaughn, and Ensel, 1981; Granovetter, 1974).

Some empirical support has been found for the importance of informal communication networks in research. Griffith and Miller (1970) reported a small core of highly productive scientists belonged to an informal communication network, while the majority of researchers had relatively lower productivity and generally were not part of that network. In similar research, Parker, Linwood, and Paisley (1968, cited in Crane, 1972) found a modest correlation (r=.31) between access to the informal communication network and research productivity for behavioral science researchers. The authors caution that this association cannot be interpreted as a causal relationship.

A characteristic pattern of communication described by Price (1963) and further studied by Crane (1972) is the concept of "invisible colleges." The pattern of invisible colleges is described as a productive researcher surrounded by a cohesive cluster of colleagues of lesser academic status. Clusters interact with each other through their "stars." In this way invisible colleges exist at a local level, and at a second, elite level (Kadushin, 1976).

The concept of using informal communication patterns to study social stratification was formulated by Pool and Kochen (originally unpublished and undated; and later published, 1978). They examined the random chance of any two people knowing each other as contrasted with the effects of social stratification. The probability of having a common acquaintance

is dependent on the size of the total population, the number of acquaintances each person has, and the stratification of the society. The effects of social stratification increase the number of people needed for any person to communicate with any other person, and decrease the likelihood of actually reaching the second person across different social strata. Within the same social strata, the likelihood of contacting the second person is increased and the number of people needed is decreased.

The clustering of a society into cliques of similar individuals results in the differential probability of two people meeting. The more stratified asocial system is, the more information paths are constrained compared to random. The more contacts one has, especially higher level contacts, the more influence one has in seeking a new job or obtaining information crucial to advancement.

A technique was developed by Milgram and associates (Milgram, 1967; Travers and Milgram, 1969; Korte and Milgram, 1970) to empirically test this type of social network structure. A "starter" is given a booklet within instructions to send the booklet to a designated target. If the target is not known on a first name basis by the starter, the booklet is to be sent to an acquaintance known on a first name basis, who is chosen as best able to get the booklet to the target. This technique is referred to as the Small World technique of data collection and is unique in providing information on the way people use social stratification in large networks. The length of communication chains and chain completion rates provide measures of the effects of social stratification.

The usual research methods of communication network analysis are not applicable to Small World data. The two broad approaches in network analysis are graph theoretic and block modeling. The relational approach

of graph theory is based on the mathematical theory of graphs and directed graphs (Harary, Norman, and Cartwright, 1965). Concepts of paths, distance, reachability, and clique identification can be examined with this technique. The positional approach of block modeling was developed more recently (White, Boorman, and Breiger, 1976; Boorman and White, 1976), and is based on the assumption of structural equivalence, which is the partitioning into sets which are homogenous in their patterns of links with other sets. These methods are not applicable for data collected from Small World chains because they require sampling total networks for small target populations, or a representative sample for large target populations.

Informal communication chains obtained with Small World technique reflect social stratification in that such structure limits the paths possible. Erickson (1979) described some limitations of Small World data, namely (1) the possibility of a biased sample of very cooperative subjects since the experimental task is somewhat burdensome, (2) the inherent ambiguity between network structure and the process of choosing the next person in the chain, and (3) nonresponse bias toward shorter chains. Despite these concerns, the Small World method of obtaining data is valuable as it is a measure of large scale network stratification.

Previous Small World studies have focused on the effects of race, geographic distance, and formality of organizational structure. In a review of the literature, Bernard and Killworth (1978) emphasized the advantage of Small World studies on behavioral data in view of the documented inaccuracy of self report. Travers and Milgram (1969) reported geographic distance was associated with longer chains. Lundberg (1975) found that in more formal business organizations, chains were

longer and fewer were completed, in contrast with chains in less formal businesses. However, formal business organization chains were not as long nor broken as often as the general population sample studied by Travers and Milgram.

GENDER DIFFERENCES IN NETWORKS

Gender effects have been found consistently in empirical research on networks. The tendency for network ties to occur between persons of the same gender has been found by Milgram (1967) in a general population sample, Lincoln and Miller (1979) in a professional organization sample, and Brass (1985) in a nonsupervisory sample from an organization.

The relation between gender and network inclusion is not a simple one. For example, Lincoln and Miller (1979) found gender (and race) had a greater impact on social ties than on work centered ties. In a company with equal numbers of men and women, Brass (1985) found gender segregated networks as well as integrated networks. Membership in men's networks as well as in the dominant coalition were important predictors of influence.

Studies in academe provide similar results. Examining collegial ties among professors, Kaufman (1982) found both women and men had predominantly same gender colleagues, with married women having more men colleagues than unmarried women. In a more recent study of junior faculty in psychology, Rose(1985) found women had more women colleagues and rated their networks, overall, as less effective in their career development.

Gender effects in informal communication chains were studied by McKenna and Denmark (1981) who examined communication patterns in the American Psychological Association (APA). This organization was chosen

as one of many organizations described as male dominated based on the gender ratio of its membership: 1 female to 3 males. Using the Small World technique developed by Milgram (1967), McKenna and Denmark found the gender of "starters" and the status and gender of targets were strongly related to chain completion and chain length. Chains from women starters and chains to women targets were longer and not completed as often, especially chains to low status, women targets. Within a chain, the relationship between persons was found to be significantly affected by gender as well as target status. A teacher)student relationship was described much more frequently as the rationale for selecting a male as next in the chain, especially in chains leading to a high status target. Relationships which were formed during graduate school and which crossed status levels were observed to be important network connections for males, but not for females.

Using network analysis to explore the system level properties of the McKenna and Denmark (1981) data, Carey (1985) also found strong gender effects. Communication chains consisting of only males were more likely to be completed than chains which were all female, though mixed gender chains had the highest completion rates. In addition, women were found to send the booklet to other women twice as often as would be expected based on the female to male membership, while males chose other males in approximate relationship to the membership ratio. Carey also examined the gender differences in the interconnections of communication chains and the impact of this on target accessibility. Examining the indirect links among members of communication chains which have a member in common, one large interconnected network of 400 observations emerged from the 1900 observations in 550 chains. Carey found being part of this

network was a very important predictor in reaching the targets, and women were not as well integrated in this network as men were.

The effects of gender stratification are evident in informal communication network research described above. These findings on women's network participation are based on data collected in 1977-1978. Affirmative action programs and Equal Opportunity legislation had been in effect only a few years. The modification of culturally defined appropriate behaviors and the adaptation of the profession of psychology to the great increase of women could only come about slowly. It is important to examine the possible changes in communication patterns as the gender ratio changes.

Problem Statement

There has been a marked expansion in women's roles in society and in women's participation in the labor force. These changes give rise to pressure for occupational equality and adaptation of the gender structuring of the profession. As the number of professional women increases, and as women advance in careers, it is expected that the opportunity structure will be more open, though it will tend to resist changes. Structure is reflected in informal communication networks, and adaptation of structure may be examined by comparing changes in communication patterns over time.

It is expected that women's participation in communication networks, though increased from 1977 to 1986, will not be equivalent to men's participation. In accord with the concept of accumulated advantages and male gender as favored over female, it is expected that males will develop better network connections, compared to females, as careers progress. Gender differences are also expected in the relationship between professionals as represented by the link between adjacent members of a communication chain. As more women enter the professional field and as they advance in careers, gender may be less salient and gender differences in professional relationships may be less in 1986 than in 1977. It is important to monitor changes in the opportunity structure of a profession as the profession encounters societal changes.

HYPOTHESES

Network analysis of communication chains is a complex approach to research. To help understand the following hypotheses, a description of communication chains and the relevant variables is given below.

Examples of communication chains are presented in Figure 1. The first person in each chain is the starter. Chain length is measured by the number of completed links in each chain. Chain #1 has a chain length of three because it has three completed links between the starter and the target. The third person in this chain sent the Small World booklet directly to the designated target. This person is referred as the PENULTIMATE LINK, and he or she is a distance of one link from the target. The starter is a distance of three links from the target. In chain #2 the second person did not forward the Small World booklet and therefore this chain is broken. The last person in this chain is referred to as a CHAIN BREAKER. In broken chains, none of the members are linked to the target. This chain has a chain length of one since it has only one completed link.

CHAIN #1 starter-->intermediary-->intermediary-->target

CHAIN #2 starter-->intermediary- target

FIGURE 1. Small World Communication Chains

The network analyses employed in this study use three levels of data: (1) the individual, (2) the chain, and (3) the link between adjacent chain members. At the level of the individual respondent, the variables of interest are DISTANCE from the target, GENDER, and STAGE of CAREER. At the chain level, variables of interest are CHAIN COMPLETION, and GENDER COMPOSITION of the chain. At the third level of data, the link between adjacent chain members reveals information on the following: the four possible GENDER COMBINATIONs of sender and receiver of the booklet, CAREER STAGE CROSSING of sender and receiver, and the RELATIONSHIP between sender and receiver as described by the sender. The link to the target is not included in the analysis because the PENULTIMATE LINK does not choose the target. The target is fixed by the research design. DATA YEAR, TARGET GENDER and STATUS are variables which follow from the research design, and are mapped onto all three levels of the data.

Hypotheses are organized around the three levels of data. In general, at each level the analysis will (1) begin by examining the relationship between gender and network participation, (2) then examine changes in this relationship from 1977 to 1986, (3) next examine the impact of career stage on the relationship, and (4) then examine the effect of status and gender of communication chain target.

ANALYSIS I: Individual level

H_1: There may be gender differences in the last person in a broken chain (CHAIN BREAKER), as well as the last person before the target in a completed chain (PENULTIMATE LINK). Demographic variables for these two types of respondents will be compared with the sample respondents.

H_2: Males are more likely to be in completed chains and be closer to the target than females.

H_3: This effect will be less in 1986 than in 1977.

H_4: The gender effect on target distance will be greater at middle and later stages of career, though it may not change from 1977 to 1986.

H_5: Target status and gender may interact with the relationship of respondent gender, target distance, and data year.

ANALYSIS II: Chain level

H_6: Chain completion rates will be affected by gender composition of the chains in the following manner: (1) chains consisting of both males and females will have the highest completion rates, (2) all male chains will have the next highest completion rates, and (3) all female chains will have the lowest completion rates.

H_7: This effect will be less in 1986 than in 1977.

ANALYSIS III : Link between chain members

H_8: The gender combination of sender and receiver will demonstrate more cross gender sending (male to female, and female to male) in completed chains than in broken chains.

H_9: This effect will be greater in 1986 than in 1977.

H_{10}: The combination of career stage of sender and receiver may affect cross gender sending patterns, though this effect may be less in 1986 compared with 1977.

H_{11}: The relationship of chain completion, gender combination of chain link, data year, and career stage crossing may be affected by target status.

H_{12}: The relationship between sender and receiver may differ with the four possible gender combinations of sender and receiver, and may vary with chain completion.

H_{13}: These effects may be different in 1986 and in 1977.

H_{14}: Target status may affect the relationships examined in the above analysis.

METHODOLOGY

PARTICIPANTS

Participants were drawn from the Denmark and McKenna (1976) study, and a recent Small World study (Denmark and Carey, 1986). For both data sets, the starters were recruited by randomly drawing from APA membership lists in New York and California. The 1977 study choose the New York and California areas in order to examine the effect of geography on communication networks. The 1986 study again choose starters from these two areas in order to examine changes in communication networks. The 1977-1978 data includes 1092 respondents who were members of 334 Small World chains. The 1986 data included 496 respondents in 161 chains.

For each data set, there were 8 targets who were New York area psychologists, equally divided by gender, and by high and low professional status. High status targets were full professors and APA Fellows. Low status targets were assistant professors who were new to the profession. Targets were chosen to represent several universities in the New York area.

MATERIALS and PROCEDURE

The Small World booklet which was used to obtain the data was patterned after the booklet designed by Milgram (1967). (See Appendix.) After agreeing to participate, the first respondent in each chain received the booklet with instructions to forward it to the target who was described by name, present academic address, year degree received, institution granting degree, and present field of professional interest. Instructions in the booklet and in the accompanying letter requested that the booklet be forwarded only to someone known on a first name basis. A

log of the name and city of each chain member was included so respondents would know to whom the booklet had been sent, and also to facilitate accuracy of data management by the researcher. The respondent was instructed to enter his or her name in the log, fill in the information requested in a sequentially numbered postcard which was mailed to the researcher, and forward the booklet to the target or someone who is likely to be able to get the booklet to the target.

MEASUREMENTS

The variables of interest which were directly measured are: CHAIN COMPLETION, GENDER, RELATIONSHIP to the next in the chain, year of degree, and reason for choosing the next person in the chain. Responses to the RELATIONSHIP question were grouped into the most commonly occurring categories: friend, coworker, the combination of friend and coworker, and a category for other responses and other combinations. For broken chains, the chain includes the sender's description of last person chosen, though much data are missing for these persons who did not actually participate in the study. Variables which follow from the research design are DATA YEAR, TARGET GENDER, and TARGET STATUS.

Generated variables include DISTANCE from the target, GENDER COMPOSITION of the chain, GENDER COMBINATION of the sender and receiver for each chain link, CAREER STAGE, and CAREER STAGE CROSSING for sender and receiver. Target DISTANCE is the number of completed links from the target, with members of broken chains at zero distance since they are not connected to the targets. GENDER COMPOSITION of the chain is grouped into five categories: all male, mostly male (67% to 99% male), mixed (33% to 67% male), mostly female (67% to 99% female), and all female. GENDER

COMBINATION of the sender and receiver measures the four possible combinations of cross gender sending or same gender sending. Year degree received was grouped into five categories for CAREER STAGE: 0 to 3 years, 4 to 10, 11 to 19, and 20 or more, and missing. These categories correspond to important distinctions in career development: very early, young professional, mid career, and mature career. CAREER STAGE CROSSING is grouped into three combinations of sender and receiver (1) in the same career stage, (2) in a later career stage, and (3) in an earlier career stage.

The reason the sender chose the next person in the chain will not be used in this study. This question was asked in an open ended format in the 1977 study, while in the 1986 study the most common reasons from previous studies were listed and respondents were asked to circle their answer. (See Appendix). A comparison of data across years cannot be made because method variance is likely to account for some unknown amount of the differences in responses.

Summary of Variables

CHAIN BREAKER = last person in a broken chain

PENULTIMATE LINK = last person in a completed chain.

DISTANCE = # completed links from target grouped into 1, 2, 3 or more, with respondents in broken chains at zero distance.

GENDER = male, female

TARGET STATUS = high, low

TARGET GENDER = male, female

DATA YEAR = 1977, 1986

CAREER STAGE = # years since receipt of degree grouped into
- 0 to 3 years
- 4 to 10
- 11 to 19
- 20 or more
- missing

CHAIN COMPLETION = complete, broken

GENDER COMPOSITION of chain
- all male
- 67 to 99% male
- 33 to 67% male
- 67 to 99% female
- all female

GENDER COMBINATION of chain link
- male to male
- male to female
- female to male
- female to female

CAREER STAGE CROSSING
- send to same career stage
- send to earlier stage
- send to more advanced stage
- missing

RELATIONSHIP of sender to receiver
- friend
- coworker
- friend and coworker
- other, other combinations

RESULTS

DESCRIPTION OF SAMPLE

Due to budget constraints, the research design for 1986 planned for fewer chains than the 1977 study and the 1986 data set is smaller, as expected. For ease of comparison, variables will be reported as percentages within each data year. There were 1092 respondents in 1977, and 496 respondents in 1986, a total of 1588 respondents.

Respondents in the 1976 sample and in the 1986 sample are similar, as seen in Table 1, in terms of age, geographic area, and GENDER. The 1986 sample is more advanced professionally, and has a higher percentage of nonpsychologists. Comparing these figures to a study of APA by Stapp, Tucker, and VandenBos (1985), these samples are more advanced professionally, especially the 1986 sample. The gender ratios in the 1986 sample reflect the APA for that year, while the 1976 sample has a somewhat higher percentage of women than the APA for that year. In spite of these sampling variations, the samples are adequate representations of the target population, and the variations of the samples from the sampled population do not adversely affect the analyses, as explained later.

Year of degree is not reported, or obtainable from the APA Directory, for 16% of the sample. Therefore CAREER STAGE is missing for these respondents. This is the case more often for respondents in 1986 than in 1977. Most of the 262 respondents with missing CAREER STAGE are CHAIN BREAKERS, and not APA members. For the analyses which use CAREER STAGE, a category of missing is used in order to include these respondents. In a chain link, if either sender or receiver has a missing value, the link has a missing value. Therefore an intermediary with a missing value could affect two links.

Table 1. Characteristics of Respondents

Variables	1977	1986
Number of observations	1092	496
Age		
range	20-76	23-76
mean	43	48
median	43	45
mode	38	42
Gender		
male	62%	63%
female	38	37
	100%	100%
Geographic area		
New York City	42%	37%
New York state, not NYC	23	29
California	23	23
other	12	10
	100%	100%
Career Stage (number of years since receipt of PhD)		
0-3	19%	5%
4-10	31	24
11-19	25	31
20+	25	39
	100%	100%
Occupation		
psychologist	81%	76%
nonpsychologist	19	24
	100%	100%

The total sample of 1588 respondents represents links from APA members (starters) to APA members (targets). These links include nonpsychologists who generally are other academics or other professionals.

Communication chain characteristics are shown in Table 2. Chain length is somewhat shorter in 1986 compared to 1977. There is a marked difference in completion rates, with 1977 having a higher rate of chains completed as a percent of chains started.

Overall, the two samples are fairly similar with the 1986 respondents being slightly older, more advanced professionally, and in slightly shorter chains which are broken more often.

RESULTS OF OTHER VARIABLES USED IN ANALYSIS

Respondents in 1977 and in 1986 are generally similar as measured by other variables which were used in the analyses: DISTANCE from the target, GENDER COMPOSITION of the chain, GENDER COMBINATION of the chain link, CAREER STAGE CROSSING of the sender and receiver, and the RELATIONSHIP of the sender and receiver. As seen in Table 3, DISTANCE from the target indicated more respondents in broken chains (at zero distance from the targets) in 1986 than in 1977. At the chain level, GENDER COMPOSITION of the chain was almost identical in each year. At the level of chain link, the GENDER COMBINATION of the chain link demonstrated a small increase of CROSS GENDER SENDING in 1986, and slightly less CROSSING STAGE CROSSING. RELATIONSHIP of sender and receiver, as described by the sender, was somewhat different for the two years. Coworker was noted more in 1986, and friend)and)coworker was noted less. The question was phrased similarly in each year. (See

Table 2. Characteristics of Communication Chains

Variables	1977	1986
Number of booklets sent	480	208
Number of chains started	334	161
(percent of booklets sent)	(70%)	(77%)
Number of chains completed	205	67
(percent of booklets sent)	(43%)	(32%)
(percent of chains started)	(61%)	(42%)
Chain length		
range	1-11	1-8
mean	3.26	3.07
median	3	3

Table 3. Other Variables Used in Analysis

Variables	1977	1986
Individual level		
DISTANCE from target		
1 link	19%	14%
2 links	17	13
3 or more	25	22
Chain level		
GENDER COMPOSITION of chain		
male	34%	35%
mostly male	19	19
mixed	23	25
mostly female	13	11
female	11	10
	100%	100%
Link Level		
GENDER COMBINATION of chain link		
male to male	46%	43%
male to female	13	18
female to male	20	21
female to female	21	18
	100%	100%
CAREER STAGE CROSSING		
Send to same stage	41%	46%
Send to more advanced stage	35	32
Send to less advanced stage	24	21
	100%	100%
RELATIONSHIP of sender to receiver		
Friend	25%	25%
Coworker	23	36
Friend & coworker	29	20
Other, other combinations	19	24
	100%	100%

Appendix.) The category of "other" included many, diverse RELATIONSHIPs, including mentor, teacher, adviser, relative, neighbor, therapist, and client.

UNIQUE RESPONDENTS: CHAIN BREAKERS and PENULTIMATE LINKS

The position of the last person in a chain is of special interest. In a broken chain, information regarding these people, CHAIN BREAKERs who did not forward the booklet, was obtained from the person who sent the booklet to the CHAIN BREAKER, and from the APA Directory (1977, 1985) if the people were listed.

There is a marked increase in the percentage of CHAIN BREAKERS in 1986 compared to 1977 though the task was identical in both years. As seen in Table 4, the gender ratio was unchanged from 1977 to 1986. Geographic area, GENDER COMBINATION of sender and receiver, CAREER STAGE, and RELATIONSHIP of sender to CHAIN BREAKER are similar for CHAIN BREAKERs and the total sample. CHAIN BREAKERs appearred similar to other respondents on the variables measured.

The second type of unique respondent is the PENULTIMATE LINK, the last person in a completed chain who sent the booklet directly to the target. As seen in Table 5, women were slightly over represented in 1977 (29%) compared to the APA membership ratio of 25% women for that year. In 1986, female PENULTIMATE LINKS reflected the overall ratio in APA of 33% women. Though the proportion of females in this important position has increased, it is not a statistically significant increase.

Other variables show similar, small changes across years, and some differences between PENULITMATE LINKS and the overall samples. CAREER STAGE for these persons was more advanced compared to all respondents,

Table 4. Characteristics of CHAIN BREAKERS

Variables	1977	1986
Number of observations	129	93
(percent of year sample)	(12%)	(19%)
Gender		
male	87	62
(percent of year sample)	(8%)	(12%)
female	38	37
(percent of year sample)	(4%)	(6%)
	100%	100%
Geographic area		
New York City	49%	46%
New York state, not NYC	25	28
California	11	15
other	15	11
	100%	100%
RELATIONSHIP of sender to CHAIN BREAKER		
Friend	30%	29%
Coworker	23	32
Friend & coworker	24	23
Other, other combinations	23	15
	100%	100%

Table 5. Characteristics of PENULTIMATE LINKS

Variables	1977	1986
Number of observations	205	496
(percent of year sample)	(19%)	(13%)
Gender		
male	71%	65%
female	29	35
	100%	100%
Geographic area		
New York City	48%	53%
New York state, not NYC	27	21
California	7	5
other	17	21
	100%	100%
Career Stage		
(number of years since receipt of PhD)		
0-3	10%	0%
4-10	22	16
11-19	24	35
20+	44	49
	100%	100%
RELATIONSHIP of previous sender to PENULTIMATE LINK		
Friend	26%	19%
Coworker	21	32
Friend & coworker	36	24
Other, other combinations	17	24
	100%	100%
RELATIONSHIP of PENULTIMATE LINK TO target		
Friend	12%	16%
Coworker	31	42
Friend & coworker	21	32
Other, other combinations	35	32
	100%	100%

and PENULTIMATE LINKS in 1986 were even more advanced than the overall 1986 sample. The RELATIONSHIP categories of coworker and of "other" were used by PENULTIMATE LINKS more often than for the overall sample. The combination of coworker-and-friend was used only half as often in 1986 as in 1977, while the category of coworker was increased in 1986. The RELATIONSHIP of the previous sender to the PENULTIMATE LINK was not significantly different from the overall sample for each year. In general, PENULTIMATE LINKS are distinguished from the overall sample in each year in that they are more advanced professionally, and used more professional ties and less social ties.

LOGLINEAR ANALYSIS

The general loglinear model was used to explore the relationships between categorical variables. Since this technique may be unfamiliar to some social science researchers, an overview will be presented. Please see Knoke and Burke (1980) or Bishop, Fienberg, and Holland (1975) for a more thorough explication. In this analysis, variables are not considered as independent or dependent, but rather all variables are responses.

Odds and odds ratios are used in exploring mutual relationships among the variables. Odds are the ratio of the frequency of one category of a variable to the frequency of the other category of that variable. In this study for the variable GENDER, the odds of males to females, as seen in Figure 2, are 993 to 593, or 1.67 : 1. Conditional odds are the odds for a variable at one category of a second variable. At the completed level of chain completion, the conditional odds for the variable GENDER for males to females is 576 : 335, or 1.72 : 1. For

Figure 2. GENDER and CHAIN COMPLETION

	CHAIN COMPLETION		
	complete	broken	TOTAL
GENDER			
male	576	417	993
female	335	258	593
			1586

broken chains the conditional odds for males compared to females are 417 : 258, or 1.62 : 1. An odds ratio compares two conditional odds. When the odds ratio is 1.0, there is no association between the variables, and they are independent of each other, though one or both variables may have effects. The odds ratio for chain completion of males and females is 1.72 : 1.62, or 1.06 : 1, which is close to 1.0. This indicates that there is no association between gender and chain completion.

Odds and odds ratios are used to obtain (1) estimates of effects for variables and interactions, and (2) the expected cell frequencies. Each expected cell frequency is a product of the cell mean of the total cross tabulation table, and of all the effects which are specified. Estimates of the effects of variables or the effects of interactions of variables are called parameter estimates.

A model is a statement, or hypothesis, about the structure of the data and is composed of the effects of certain variables and interactions. A model which contains effects of all variables and all interactions would exactly reproduce the frequencies observed in the data. A model can be tested by examining the "goodness of fit" of the model in relation to the data. The term "goodness of fit" is a summary measure of the discrepancy between the observed data and the frequencies which are expected under the model. The goal of the analysis is to select a model which (a) best fits the observed data, and (b) contains the fewest parameter estimates for variables and interactions. In other words, the most parsimonious model which best reproduces the data is selected, as described below.

In order to make comparisons between models which consist of different effects, hierarchial models are used. Models are called

hierarchial if all effects of one model are contained in a second model. For example, a model which includes the interaction of DISTANCE and GENDER has to include main effects for DISTANCE and for GENDER. For a second model which included a 3 way interaction, all 2 way interactions within the 3 way interaction are included as well as the main effects of the three variables. For example, if a model included the 3 way interaction of DISTANCE, GENDER, and DATA YEAR, the following 2 way interactions would be included: (1) DISTANCE and GENDER, (2) DISTANCE and DATA YEAR, and (3) GENDER and DATA YEAR, as well as the main effects for DISTANCE, GENDER,and DATA YEAR.

Choosing the most parsimonious model which best fits the data is accomplished by comparing the maximum likelihood chi square for each model under consideration. Maximum likelihood chi square is preferable to Pearson chi square because the fit of hierarchial models can be compared. See Knoke and Burke, 1980, Chapter 3 for further description. The difference of likelihood ratio chi square between models is a test of the importance of the additional effect(s) in the less parsimonious model. If the reduction in maximum likelihood ratio chi square is found to be statistically significant in relation to the differences in degrees of freedom between the two models, then the more restrictive (less parsimonious) model is chosen as the best fitting model. For example, one could compare a model of main effects for GENDER and for DISTANCE, with a second model which included these effects and also included the interaction for these variables. If the latter model significantly reduces the likelihood ratio chi square, the second model which included the interaction is chosen, and one would conclude from the second model that there is a difference in men and women's distance from the targets.

After selecting the most parsimonious model which best fits the data, the parameter estimates of variables and interactions are examined. A 95% confidence interval for each parameter estimate can be established by examining the estimate in relation to its standard error (observed minus expected, divided by the square root of the expected). When the ratio of an estimate to its standard error is greater than 1.96, the estimate is statistically significant at a probability level greater than .05.

The magnitude of a parameter estimate is related to the odds ratio for that variable. For this study, the computer program BMDP-4F was used and the Beta (B) estimates (multiplicative parameters) are reported. A Beta of 1.00 would represent no effect; a Beta of less than 1.00 indicates fewer observations in the specified cell, and a Beta greater than 1.00 would indicate a greater number of expected observations in the specified cell than the overall mean. The product of the values of Beta for all levels within a variable is 1.0. For example, in the first analysis for GENDER the Beta for males is 1.294, and for females is .773 (the reciprocal of 1.294 is .773, and 1.294 multiplied by .773 is 1.0). These estimates are sensible since males comprise 62% of the sample.

The analyses will be done at three levels. First, the general loglinear model will be used to explore patterns between individual level variables: DISTANCE from the target, GENDER, DATA YEAR, CAREER STAGE. This analysis will explore changes from 1977 to 1986 in the position of women in relation to men in communication chains. Then DISTANCE, GENDER, and DATA YEAR will be analyzed with target STATUS and TARGET GENDER to examine effects of target characteristics.

Second, using chains as the unit of analysis, patterns of

association between CHAIN COMPLETION, GENDER COMPOSITION of the chain, and DATA YEAR will be examined. This analysis will examine possible changes from 1977 to 1986 in the association between gender of chains and chain completion.

Third, the general loglinear model will be used to examine the chain link level of the variables GENDER COMBINATION of chain link, and CAREER STAGE CROSSING with CHAIN COMPLETION, DATA YEAR, and Target STATUS. Also at this level of analysis, the RELATIONSHIP to the next person in the chain will be examined with GENDER COMBINATION of chain link, CHAIN COMPLETION, DATA YEAR, and target STATUS. This analysis will examine possible changes from 1977 to 1986 in the association between gender and types of communication chain links.

Some of the analyses encompass numerous possible models. The tables which will be presented include models which test the hypotheses, models which are relevant, or models which fit at $p>.05$.

LOGLINEAR ANALYSIS AT THE INDIVIDUAL LEVEL

Analysis at the individual level of data which examined the association of GENDER and DISTANCE demonstrated that men were not significantly closer to the target than women. As seen in Table 6, the probability that the model of main effects of DISTANCE and GENDER represented the observed data is $p=.0749$. The differences in observed and expected are nearly large enough to reject this model and conclude that there were gender differences in distance from the target. While the .05 level of significance is traditionally used in quantitative analysis, this tradition is not well established in loglinear models. Knoke and Burke, (1980) suggest .10 to .35 as an appropriate level. If

Table 6. Loglinear Analysis of GENDER and DISTANCE for the individual level of data

Model	DF	Likelihood Ratio Chi Square	Probability
D	4	108.89	.0000
G	6	270.55	.0000
D,G*	3	6.91	.0749

VARIABLES
D=DISTANCE
G=GENDER

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

the present model were rejected, one would conclude that the interaction of DISTANCE and GENDER was necessary to explain the observed frequencies. The conservative approach of not rejecting this model which fit at p= .0749 was taken here.

There are main effects for GENDER and DISTANCE, as expected from the frequency distributions seen in Tables 1 and 3. There are more males (B=1.29) than females, and there are more respondents in broken chains (B=1.84) than in anyone of the other three categories of DISTANCE from the target, namely 1 link, 2 links, or 3 or more links.

DATA YEAR was added to DISTANCE and GENDER for the next analysis. The saturated model, which includes effects for all variables and all interactions, is the model which tests the hypothesis of change in gender differences in DISTANCE from the target. The saturated model is not the best fitting model for this analysis. The best fitting model (p=.1591) included an interaction of DISTANCE and DATA YEAR, in addition to the main effects of the three variables. (See Table 7.) As noted earlier, there are more broken chains in 1977 than in 1986. Other DISTANCE categories are similar for each year.

CAREER STAGE was next added to the analysis. The model which tests the hypothesis of changes in the gender effect on DISTANCE as at varying CAREER STAGEs is not the best fitting model. The best fitting model has a marginal fit, p= .0746. CAREER STAGE is missing for 161 of the respondents. In order to include these respondents in this analysis, a fifth category of missing" was added to CAREER STAGE. As seen in Table 8, the model which the data best fit has 4, two way interactions. In addition to the estimates of the interaction of DATA YEAR and DISTANCE, and the main effects for DISTANCE, GENDER, and DATA YEAR which are

Table 7. Loglinear Analysis of GENDER, DISTANCE, and DATA YEAR for the individual level of data

Model	DF	Likelihood Ratio Chi Square	Probability
D	12	363.58	.0000
G	14	525.24	.0000
Y	14	397.66	.0000
D,G	11	261.60	.0000
G,Y	13	295.68	.0000
Y,D	11	134.02	.0000
D,G,Y	10	32.03	.0000
DG	8	254.69	.0000
DY	8	112.54	.0000
GY	12	295.63	.0000
D,GY	9	31.98	.0002
G,DY*	7	10.56	.1591
Y,DG	7	25.13	.0007
DG,GY	4	3.65	.4555
DY,GY	6	10.50	.1050
GY,DG	6	25.07	.0003
DG,DY,GY	3	3.65	.3184

VARIABLES
D=DISTANCE
G=GENDER
Y=DATA YEAR

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Table 8. Loglinear Analysis of GENDER, DISTANCE, DATA YEAR, and CAREER STAGE for the individual level of data

Model	DF	Likelihood Ratio Chi Square	Probability
D,G,Y,S	70	527.03	.0000
DY,DS,GS,YS*	47	61.62	.0746
DY,DS,GY,GS,YS	46	61.47	.0631
DG,DS,GY,GS,YS	46	68.02	.0190
DG,DY,GY,GS,YS	55	216.71	.0000
DG,DY,DS,GS,YS	44	60.65	.0485
DG,DY,DS,GY,YS	47	156.30	.0000
DG,DY,DS,GY,GS	47	226.56	.0000
DG,DY,DS,GY,GS,YS	43	60.51	.0401
DGS,Y	39	236.28	.0000
DYS,GY	37	143.61	.0000
DYS,GS	27	35.05	.1376
DYS,GY,GS	33	441.80	.1400
DYS,DG,GY,GS	30	40.84	.0896
GYS,DY	45	59.04	.0700
GYS,DY,DS	42	51.52	.1489
GYS,DG,DY,DS	30	50.52	.1023
DYS,GYS	29	31.85	.3264
DYS,GYS,DG	26	30.90	.2321
DGY,DGS,DYS,GYS	11	17.33	.0984

VARIABLES
D=DISTANCE
G=GENDER
Y=DATA YEAR
S=CAREER STAGE

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

similar to the above analysis, this model included interactions with CAREER STAGE. There are different estimates DISTANCE, GENDER, and DATA YEAR at each category of CAREER STAGE. In the category missing for CAREER STAGE, respondents are most likely to be women (B= 1.15), in broken chains (B = 2.32), and in the 1986 data set (B= 1.99). Also the early and young professional categories of CAREER STAGE are most likely to be 3 or more links from the target, to be women, and in the 1977 data set.

Target STATUS and TARGET GENDER were added to the analysis of DISTANCE, GENDER, and DATA YEAR. The model which fit the data best included the DISTANCEand DATA YEAR interaction, an interaction of GENDER and TARGET GENDER, and a three way interaction of DISTANCE and GENDER and target STATUS. TARGET GENDER and target STATUS were not significant main effects. This model fit the data well, p=.3126, as seen in Table 9. The DATA YEAR and DISTANCE interaction is similar to the effect described in the last analysis. The GENDER and DISTANCE interaction was significant only for PENULTIMATE LINKS with males more likely (B=1.165) than females (B=.858) to be in the last position in a completed chain. The other combinations of these variables were not statisticaly significant. The GENDER and target STATUS interaction was also signficant with more males in chains to high status targets, and more females in chains to low status targets. The 3 way interaction of GENDER and DISTANCE and target STATUS was also signficant. For low status targets, males were found more often in broken chains or chains with 3 or more links, while females were more often PENULTIMATE LINKS. For high status targets, this pattern was reversed. In another way of interpreting this, women were PENULTIMATE LINKS more often in chains to low status targets. There was

Table 9. Loglinear Analysis of GENDER, DISTANCE, DATA YEAR, STATUS, and TARGET GENDER for the individual level of data

Model	DF	Likelihood Ratio Chi Square	Probability
D,G,Y,U,E	56	138.37	.0000
DG,DY,DE,GE	45	74.90	.0033
DG,DY,DU,DE,GY,GU,GE,YU,YE,UE	38	68.47	.0018
DGU,DY,GU*	42	45.93	.3126
DGE,DY,GU	42	48.83	.2178
DGE,DY,GU,UE	41	46.12	.2687
DGE,YUE,DY,GU	38	34.39	.6372
DGY,DGU,DGE,DYU,DYE,DUE,GYU,GYE,YUE	16	19.97	.2217

VARIABLES
D=DISTANCE
G=GENDER
Y=DATA YEAR
U=target STATUS
E=TARGET GENDER

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

no significant effect for respondents at 2 links from the target.

Hypotheses 3 and 4 were not supported. There were no significant changes in gender differences in target distances and no changes at each level of career stage. Hypothesis 2 received some support as the interaction of DISTANCE and GENDER was significant when STATUS was in the model. Hypothesis 5 received some support as target STATUS did interact with DISTANCE and GENDER, though TARGET GENDER did not.

LOGLINEAR ANALYSIS AT THE CHAIN LEVEL

At the chain level, Hypotheses 6 and 7 were not supported. The saturated model which tests the interaction of completion and GENDER COMPOSITION is not the best fitting model. In the analysis of CHAIN COMPLETION and GENDER COMPOSITION of the chain, the model which fit the data best (Table 10) included a main effect for CHAIN COMPLETION with slightly more chains completed (B= 1.18) than broken, and a main effect for GENDER COMPOSITION. All male chains were more likely to occur (B= 1.90); mostly male chains and the mid category of GENDER COMPOSITION were somewhat more likely (B= 1.10, 1.25 respectively), while mostly female chains (B = .69), and all female chains (B = .55) occurred far less often. This model of main effects it the data (p=.1038), but only marginally. There was no difference in the frequency of CHAIN COMPLETION for each category of GENDER COMPOSITION of the chains.

For the next analysis DATA YEAR was added in order to compare effects in the 1977 and 1986. The saturated model which tests the changes in the interaction of completion and GENDER COMPOSITION is not the best fitting model. The model which fit the data best did fit very well, p=.5144, as seen in Table 11. This model specified an interaction

Table 10. Loglinear Analysis of CHAIN COMPLETION
and GENDER COMPOSITION
for chain level of data

Model	DF	Likelihood Ratio Chi Square	Probability
C	8	93.79	.0000
M	5	20.22	.0011
C,M*	4	7.68	.1039

VARIABLES
C=CHAIN COMPLETION
M=GENDER COMPOSITION of chain

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Table 11. Loglinear Analysis of CHAIN COMPLETION, GENDER COMPOSITION, and DATA YEAR for chain level of data

Model	DF	Likelihood Ratio Chi Square	Probability
C	18	182.22	.0000
M	15	110.09	.0000
Y	18	116.77	.0000
C,M	14	97.20	.0000
M,Y	14	31.75	.0044
C,Y	17	103.87	.0000
C,M,Y	13	18.85	.1277
CM	10	89.68	.0000
CY	16	96.19	.0000
MY	10	31.31	.0005
C,MY	9	18.42	.0306
M,CY*	12	11.17	.5144
Y,CM	9	11.34	.2532
CM,CY	8	3.66	.8867
CY,MY	8	10.74	.2170
CM,MY	5	10.91	.0533
CM,CY,MY	4	2.95	.5663

VARIABLES
C=CHAIN COMPLETION
M=GENDER COMPOSITION of chain
Y=DATA YEAR

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

of CHAIN COMPLETION and DATA YEAR as expected from the frequency distribution in Table 2, and main effects for each of the three variables. There were no differences in the GENDER COMPOSITION of chains in 1977 compared to 1986, nor were there differences in CHAIN COMPLETION for each category of GENDER COMPOSITION of chains.

LOGLINEAR ANALYSIS AT THE CHAIN LINK LEVEL

The next analysis examined the association between GENDER COMBINATION of chain link and CHAIN COMPLETION. The saturated model which tests the interaction of completion and GENDER COMBINATION is not the best fitting model. The best fitting model fits the data very well (p=.5839) as seen in Table 12. Chain links were likely to be in completed chains (B= 1.18). This effect was expected as broken chains tend to be shorter. Also there are many more male-to-male links (B=2.01) than male-to-female links (B= .65), female-to-female links (B= .38) or female-to male links (B= .88). This needs to be interpreted in relation to the gender ratio of APA members. Male sending approximately reflects the gender ratio in APA, while females choose other females twice as often as expected from the gender ratio.

DATA YEAR was added to the analysis. The saturated model which tests changes in the interaction of COMPLETION and GENDER COMBINATION is not the best fitting model. The model selected fit the data well (p= .4875), as seen in Table 13. This model contains the same main effects for CHAIN COMPLETION and GENDER COMBINATION of sender and receiver as in the above analysis, and the CHAIN COMPLETION and DATA YEAR interaction. More links were in completed chains in 1977 than in 1986, as expected from the frequency distributions in Table 2.

Table 12. Loglinear Analysis of CHAIN COMPLETION
and GENDER COMPOSITION
for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
C	6	228.50	.0000
X	4	32.84	.0000
C,X*	3	1.94	.5839

VARIABLES
C=CHAIN COMPLETION
X=GENDER COMBINATION of sender and receiver

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Table 13. Loglinear Analysis of CHAIN COMPLETION, GENDER COMBINATION, AND DATA YEAR for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
C	14	412.40	.0000
X	12	216.74	.0000
Y	14	272.94	.0000
C,X	11	185.84	.0000
X,Y	11	46.39	.0044
C,Y	13	242.05	.0000
C,X,Y	10	15.49	.1152
CX	8	183.90	.0000
CY	12	235.03	.0000
XY	8	41.29	.0000
C,XY	7	10.99	.1389
X,CY*	9	8.47	.4873
Y,CX	7	13.55	.0599
CX,CY	6	6.53	.3668
CY,XY	6	3.97	.6803
CX,XY	4	9.05	.0599
CX,CY,XY	3	2.16	.5395

VARIABLES
C=CHAIN COMPLETION
X=GENDER COMBINATION of sender and receiver
Y=DATA YEAR

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Next CAREER STAGE CROSSING was added to the analysis. The saturated model, which tests the effect of CAREER STAGE CROSSING on changes in the interaction of COMPLETION and GENDER COMPOSITION, is not the best fitting model. The model selected also fits the data well, (P= .3208), as seen in Table 14. This model includes three, 2 way interactions described below, and the main effects for each variable, namely CHAIN COMPLETION, GENDER COMBINATION of the link, DATA YEAR, and CAREER STAGE CROSSING. Sixteen percent of the sample had a missing value for CAREER STAGE due to a missing value for year degree received. Therefore a category of "missing" was added to the 3 categories of CAREER STAGE CROSSING. The effects for CHAIN COMPLETION, GENDER COMBINATION of sender and receiver, and DATA YEAR are similar to the above analysis. The interaction of CHAIN COMPLETION and CAREER STAGE CROSSING, and the interaction of DATA YEAR and CAREER STAGE CROSSING reveal that CAREER STAGE was more likely to be missing in 1986 (B=1.94), and in broken chains (B= 1.69).

The interaction of the GENDER COMBINATION of chain link and CAREER STAGE CROSSING was interesting as seen in Figure 3. Males were more likely to send to females when sending to a younger professional (B=1.70), and females were more likely to send to males who were more professionally advanced (B=1.43). Both females and males, when sending to the same gender, were more likely to send to the same career stage.

Target STATUS was added to the analysis of CHAIN COMPLETION, GENDER COMBINATION of the sender and receiver, DATA YEAR, and CAREER STAGE CROSSING. The saturated model, which tests the effect of STATUS on the interaction of COMPLETION, GENDER COMBINATION, DATA YEAR, and CAREER STAGE CROSSING, is not the best fitting model. The best fitting model (p=.1032) included all main effects plus 3, two way interactions, and the

Table 14. Loglinear Analysis of CHAIN COMPLETION, GENDER COMBINATION, DATA YEAR, and CAREER STAGE CROSSING for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
C,X,Y,T	55	328.72	.0000
CT,XT,Y	43	192.36	.0000
XT,YT,C	43	143.23	.0000
CT,YT,X	49	80.32	.0032
CT,XT,YT*	40	43.60	.3208
CT,XT,YT,CX	37	42.80	.2361
CT,XT,YT,CY	39	42.05	.3403
CT,XT,YT,XY	37	40.00	.3383
CY,CT,XY,XT,YT	36	38.45	.3591
CX,CT,XY,XT,YT	34	39.21	.2477
CX,CY,XY,XT,YT	36	130.81	.0000
CX,CY,CT,XT,YT	36	41.25	.2518
CX,CY,CT,XY,YT	42	72.46	.0024
CX,CY,CT,XY,XT	36	180.19	.0000
CX,CY,CT,XY,XT,YT	33	37.68	.2638
CXY,CXT,CYT,XYT	9	9.47	.3951

VARIABLES
C=CHAIN COMPLETION
X=GENDER COMBINATION of sender and receiver
Y=DATA YEAR
T=CAREER STAGE CROSSING

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Figure 3. Betas for the Interaction of CAREER STAGE CROSSING GENDER COMBINATION in Loglinear Analysis of CHAIN COMPLETION, GENDER COMBINATION, DATA YEAR, AND CAREER STAGE CROSSING

	GENDER COMBINATION			
	male to male	male to female	female to male	female to female
CAREER STAGE CROSSING				
Send to same stage	1.15	.79	1.00	1.10
Send to earlier stage	1.01	1.70	.69	.85
Send to later stage	1.01	.67	1.43	1.03
Missing	.85	1.12	1.01	1.04

three way interaction of GENDER COMBINATION and CAREER STAGE with STATUS, as seen in Table 15. The CAREER STAGE CROSSING and GENDER COMBINATION interaction was the same as in the last analysis. The missing category of CAREER STAGE CROSSING had more links in broken chains, and more in 1986.

Target STATUS was significant as a main effect, and in interactions. There were more links in chains to high status targets, and in high status, completed chains. Links in low status targeted chains were more often male-to-female, where as in high status targeted chains links were more often male-to-male, or female-to-male. Note that receivers were likely to be males in high status targeted chains.

The three way interaction of STATUS and GENDER COMBINATION and CAREER STAGE CROSSING demonstrated that the missing category of CAREER STAGE CROSSING was associated (1) with low status targeted, male-to-male chain links, and (2) with high status targeted, female-to-female chain links.

To summarize the results of the analyses thus far at the chain link level of data, hypotheses 8 and 9 were not supported as there was no association between CHAIN COMPLETION and GENDER COMBINATION, nor was there a change from 1977 to 1986. Hypothsis 10 recceived some support as CAREER STAGE CROSSING interacted with each of the variables hypothsized: CHAIN COMPLETION, GENDER COMBINATION, and DATA YEAR. However, the missing category of CAREER STAGE CROSSING was the only significant category for the interactions with CHAIN COMPLETION, and with DATA YEAR. Therefore the only substantial effect was the GENDER COMBINATION and CAREER STAGE CROSSING. Though GENDER COMBINATION and STATUS have different effects with the missing category of CAREER STAGE CROSSING,

Table 15. Loglinear Analysis of CHAIN COMPLETION, GENDER COMBINATION, DATA YEAR, CAREER STAGE CROSSING, AND STATUS for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
C,X,Y,T,U	118	433.92	.0001
CT,CU,XT,XU,YT,TU	96	121.69	.0394
CX,CY,CT,CU,XY,XT,XU,YT,YU,TU	88	114.68	.0296
XTU,CT,CU,YT*	87	104.09	.1022
XTU,CX,CT,CU,XT	84	103.70	.0714
CXU,XTU,CT,YT	81	99.90	.0757
CXY,CXT,CXU,CYT,CYU,CTU,XYT,XYU,YTU	45	59.99	.0667

VARIABLES
C=CHAIN COMPLETION
X=GENDER COMBINATION of sender and receiver
Y=DATA YEAR
T=CAREER STAGE CROSSING
U=STATUS

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

this effect is not of substantive interest. Hypothsis 11, therefore, does not substantively receive support.

Another set of analyses at the chain link level examined the association of RELATIONSHIP between the sender and receiver, GENDER COMBINATION of the link, and CHAIN COMPLETION. The saturated model, which tests the interaction of COMPLETION, GENDER COMBINATION, and RELATIONSHIP is not the best fitting model. As seen in Table 16, the model of the interaction of RELATIONSHIP with GENDER COMBINATION of link, and main effects fits very well, (p= .7457). The main effect for RELATIONSHIP has the friend category as the most often used (B= 1.20), followed by friend-and-coworker (B= 1.12). The category of coworker (B = .97) was used as often as expected. All other responses for RELATIONSHIP were grouped together, and this category was used less often (B = .77.

The RELATIONSHIP and GENDER COMBINATION interaction is particularly interesting. It was independent of CHAIN COMPLETION which means the interaction is the same for completed and broken chains. As seen in Figure 4, the link from male to male was likely to be to a coworker (B= 1.17), and not to a friend (B= .83). When males sent to females, coworker was used often (B= 1.26) and friend was almost as likely (B = 1.14) while the friend-and-coworker category was used less often (B =.72). When females sent to females, they described the receiver as a friend (B= 1.29), or a friend-and-coworker (B = 1.31), not as often as a coworker (B = .77). Females were not as likely to send to a male friend (B= .82) as to a female friend (B= 1.3).

In another way of describing this association of variables, female friends were likely to be receivers, male friends were not. This was true for both male and female senders. Also male friend-and-coworkers

Table 16. Loglinear Analysis of RELATIONSHIP, GENDER COMBINATION, and CHAIN COMPLETION for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
R	28	299.44	.0000
X	28	98.96	.0000
C	30	292.78	.0000
R,X	25	75.13	.0000
X,C	27	68.48	.0000
R,C	27	268.95	.0000
R,X,C	24	44.64	.0064
RX	16	41.56	.0005
RC	24	264.07	.0000
XC	24	66.48	.0000
R,XC	21	42.65	.0035
X,RC	21	39.77	.0079
C,RX*	15	11.08	.7468
RX,RC	12	6.20	.9055
RC,XC	18	37.77	.0042
RX,RC,XC	9	4.222	.8962

VARIABLES
R=RELATIONSHIP of sender and receiver
X=GENDER COMBINATION of sender and receiver
C=CHAIN COMPLETION

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Figure 4. Betas for the Interaction of RELATIONSHIP and GENDER COMBINATION in Loglinear Analysis of RELATIONSHIP, GENDER COMBINATION, and CHAIN COMPLETION

	RELATIONSHIP			
	friend	friend & coworker	coworker	other
GENDER COMBINATION				
male to male	.83	1.03	1.17	1.01
male to female	1.14	.72	1.26	.97
female to male	.82	1.04	.86	1.33
female to female	1.29	1.31	.77	.77

were equally likely to be receivers from either gender. As coworkers, males were likely to receive from other males, not from females. Female senders used the "other" category often when sending to males (b= .1.33), but not often when sending to females (B=.77).

Next DATA YEAR was added to this analysis. The saturated model which tests changes in the interaction of RELATIONSHIP and GENDER COMBINATION is not the best fitting model. The best fitting model included a main effect for CHAIN COMPLETION, an interaction of RELATIONSHIP and GENDER COMBINATION similar to the above analysis, and a RELATIONSHIP and DATA YEAR interaction. This model also fit the data very well (p =.7459) as seen in Table 17. The categories of RELATIONSHIP did vary from 1977 to 1986: friend-and-coworker were noted somewhat more often in 1977 (B= 1.18) than in 1986, and coworker was noted more often in 1986 (B= 1.3). This interaction and the interaction of RELATIONSHIP and GENDER COMBINATION were independent of CHAIN COMPLETION. In other words, these interactions are the same at each level of CHAIN COMPLETION.

Target STATUS was added for the next analysis. The saturated model which tests the changes in the interaction of STATUS, GENDER COMBINATION, and RELATIONSHIP is not the best fitting model. The best fitting model fits the data very well, p=.7267. As seen in Table 18, the next most parsimonious model, which does not include the three way interaction, has a significantly higher maximum likelihood chi square in relation to the degrees of freedom, and therefore the model which includes the three way interaction was chosen. In addition to main effects, significant effects in this model include the interactions of DATA YEAR and RELATIONSHIP, and DATA YEAR and CHAIN COMPLETION, as in the above analysis; the interaction of GENDER COMBINATION and STATUS with more male-to-male links in chains

Table 17. Loglinear Analysis of RELATIONSHIP, GENDER COMBINATION, CHAIN COMPLETION, and DATA YEAR for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
R,X,C,Y	55	260.22	.0000
RX,RY,C*	43	47.92	.2801
RC,RY,XY	46	71.63	.0091
RX,RY,XC	40	45.93	.2399
RX,XC,CY	42	47.92	.2801
RX,RY,XY,C	40	43.94	.3081
RX,RC,RY,XC	37	41.07	.2969
RX,RC,RY,XY	37	39.08	.3767
RX,RC,RY,CY	39	59.30	.0196
RC,RY,XC,XY	43	69.61	.0063
RC,RY,XY,CY	45	62.07	.0464
RC,RY,XC,XY,CY	36	45.51	.1331
RX,RY,XC,XY,CY	35	55.835	.0186
RX,RC,XC,XY,CY	42	100.95	.0000
RX,RC,RY,XY,CY	34	45.50	.0899
RX,RC,RY,XC,CY	36	123.90	.0000
RX,RC,RY,XC,XY	37	46.51	.1358
RX,RC,RY,XC,XY,CY	33	44.48	.0876
RXC,RXY,RCY,XCY	8	15.38	.0535

VARIABLES
R=RELATIONSHIP of sender and receiver
X=GENDER COMBINATION of sender and receiver
C=CHAIN COMPLETION
Y=DATA YEAR

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

Table 18. Loglinear Analysis of RELATIONSHIP, GENDER COMBINATION, CHAIN COMPLETION, DATA YEAR, and target STATUS for chain links

Model	DF	Likelihood Ratio Chi Square	Probability
R,X,C,Y,U	118	183.31	.0001
RX,RY,XU,CY,CU	101	96.47	.6089
RX,RY,XC,XU,CY,CU	98	95.03	.5661
RX,RC,RY,RU,XC,XY,XU,CY,CU,YU	88	81.31	.6799
XCU,RX,RY,	96	94.64	.5202
XCU,RY,CY	104	119.87	.1368
XCU,RX,RY,CY*	95	86.30	.7267
RXC,RXY,RXU,RCY,RCU,XCY,XCU,CYU	45	39.00	.7233

VARIABLES
R=RELATIONSHIP of sender and receiver
X=GENDER COMBINATION of sender and receiver
C=CHAIN COMPLETION
Y=DATA YEAR
U=STATUS

*=Most parsimonious good-fit model with the least number of terms which generates expected values not significantly different from the data.

to high status targets; and the 3 way interaction of STATUS and CHAIN COMPLETION and CAREER STAGE CROSSING. In the the 3 way interaction, only the female-to-male links are significant. For this type of link, low status chain links are associated with broken chains, and high status links with completed links. This association of CHAIN COMPLETION and target STATUS is not true overall, nor is CHAIN COMPLETION associated with GENDER COMBINATION overall, rather this is only true for the female-to-male links.

In summing the results of analyses with RELATIONSHIP, the RELATIONSHIP and GENDER COMBINATION interaction was significant in each analyses, supporting Hypothesis 12 in that there are the gender differences in relationships, but hypothesis 12 was not supported for this effect on chain completion. Hypothesis 13 was not supported because the interaction of GENDER COMBINATION of link and RELATIONSHIP did not vary from 1977 to 1986. Hypothesis 14 was supported with the effect of target STATUS on the interaction of CHAIN COMPLETION and GENDER COMBINATION.

Discussion

There were no changes in gender differences in communication networks, and the few gender differences in networks that were found were not related to completion of communication chains, contrary to predictions based on previous research with a similar population (McKenna and Denmark, 1981; Rose, 1985; Carey, 1985). There are changes in the APA and other factors which need to be addressed before discussing these results. Limitations of this study and the major findings will be discussed, followed by directions for future research.

CHANGES IN RESPONSE RATES AND IN THE APA

Two noteworthy effects, unrelated to gender and network participation, involve the change in response rates and the change in career stages of the two samples. At first these seem unlikely results using the same research paradigm. However they are quite understandable. Studies in Public Opinion Quarterly (Roper, 1985; Schleifer, 1985) report a rise in skepticism and criticism of surveys, and a concern for the increasing level of participation in multiple surveys as a cause of decreasing public support for surveys. In addition, there are more nonpsychologists in the 1986 sample and it is reasonable to assume that they would be less motivated to cooperate in this study.

The second effect involves the changes in career stages, and reflects the changes in the nature of the APA. This professional organization has undergone changes in addition to gender ratio changes. New graduates tend to be employed in applied fields more than in traditional settings. There has been a tremendous growth in the health service provider fields of clinical, counseling, and school psychology

(Howard et al., 1986), and a proportional reduction in the more research oriented fields. Affiliation and memberships in professional organizations as well as personal contacts and identification are affected by the occupational setting (Altman, 1987). Fewer recent graduates join APA and those in the more applied fields tend to join and stay as members. These processes have consequences not only for the APA, but also for the field of psychology. Practioners are less involved in research, and will contribute less to the advancement of psychology as a science. In the present study, these processes are reflected in the increase in nonpsychologists named as links from APA starters to APA targets, and in the more advanced career stages in the 1986 data sample.

LIMITATIONS OF THIS STUDY

Three general issues arise in discussing the results: the Small World task itself, this analysis of the data, and the external validity of this study. The Small world task may not fully capture the important qualities of network structure, or the range of network characteristics. While the task of forwarding a booklet appears superficial, the connections elicited are a representation of individuals' perceptions and utilization of social structure, and they reflect implicit social rules of structure.

The behaviors obtained with this task are the result of the effects of social structure, and individual actions including networking ability and personal perception of social structure. This study examined network participation as a product of both voluntaristic (individual) and deterministic (social structure) effects, and no attempt is made to disentangle the two processes. Therefore results represent networking

performance by individuals, not network structure per se.

The analysis of Small World data in the present study does not distinguish between fields of psychology. Fields within psychology differ markedly in gender ratios. Women are more often found in traditionally appropriate fields, such as developmental, educational, and psychology of women, and men have large majorities in "hard sciences" such as experimental psychology. Results from the present study would likely vary for different fields of psychology.

The third limitation concerns the external validity of the study. APA members in New York and California may not be representative of all APA members. Changes, or lack of changes, in these two groups from 1977 to 1986 may not reflect changes in the APA as a whole.

MAJOR FINDINGS

The unexpected lack of gender differences in communication network effectiveness may be related to the limitations described above. Although the current findings indicate that women are as effective as men in using informal communication networks, this technique and analysis may be not sophisticated enough to assess differences. Additional research is needed before one could onclude that there is no gender difference in the efficacy of communication networks.

There are several interesting gender differences in communication networks at the individual level and at the chain link level. Though not demonstrated in this study to be related to chain completion, they are important to examine in the overall communication structure. First we will examine the gender differences at the individual level, especially in regard to target characteristics, and then we will discuss chain link

level effects of the relationship, choosing and being chosen, and career stage.

The effects of gender structure are observed in the fact that women respondents occurred more often in chains to women targets, and similarly for male respondents to male targets. When respondent gender was explored in light of status of chains, males were noted more often than women (1) as PENULTIMATE LINKS, (2) in high status chains, and (3) as PENULTIMATE LINKS in high status chains. This is a description of the dominant male networks, which are sometimes referred to as "the old boy networks." This effect was unchanged from 1977 to 1986. Although the number of women in APA and in the field of psychology has increased significantly, women have not been well integrated into the dominant professional networks.

Further evidence of gender differences in communication structure is found in ties between communication chain members. The differences in choosing and being chosen, career stage of sender and receiver, and the relationship of sender and receiver are discussed below.

Men were receivers for about 65% of the links in 1977 and also in 1986. This percentage of selecting males was also found in the cross cultural studies of Bernard, Killworth, Evans, McCarty, and Shelley (1986). Using a similar research paradigm and samples of populations from four very different cultures, e.g. Paiute Indians, Mormons, and Micronesian Islanders, Bernard and associates found 64% of all choices were male, though slightly more women were chosen by women. In the present study the population was 64% male, contrasted with the 50% ratios in the Bernard et al. study. Considering the gender ratio in the professional population in the present study, there was no effect of

gender.

The apparent absence of gender effect, however, is somewhat misleading. It is important to examine who is choosing whom, and to examine differences in the task for different status targets. Men were more often receivers in chains targeted to high status psychologists. Female receivers were more common in chains to low status psychologists, and this was true for male as well as female senders.

In the gender combination of chain link we can see another effect of professional structure in the process of selecting. As senders, men select women in approximate proportion to the APA gender population, while women chose other women as often as they chose men, which is actually choosing women far more often than the ratio in the professional population. It is reasonable to assume that this reflects that, for this type of networking task, women's connections consist more of women than of men. Gender effects, which are not apparent in the overall 64% rate of choosing males, are seen in this refined analysis.

Gender differences in use of friends by women and coworkers by men may reflect social norms as well as differences in access. When women send to women, the relationship was described as friend or friend-and-coworker, whereas for the female-to male ties the "other" category was used. Males predominantly use coworker when sending to males as well as to females.

It is important to keep in mind that the connections elicited by the Small World task are not representative of one's personal network, but rather these connections reflect the perceptions of the "best" or most efficacious connections to the targets. Women's "best" connections are social ties, whereas men's connections are professional. This is in

accord with the vast body of research which has demonstrated that women are more socioemotionally oriented and men are more task oriented (Unger and Denmark, 1975). Though there was more use of coworker in 1986 for the total sample, there was no change in gender differences in the senders' descriptions of their relationship to the receivers.

Career stage is also an important consideration in network connections. In APA, the increase in women has been in more recent PhD's, resulting in an organization in which there are more males in later career stages and more women in earlier career stages. The gender differences in the association between the type of relationship and different career stages of the sender and receiver may reflect gender differences in mentoring. The male-to-female link was most often described as coworker, while the female-to-male link was most commonly the "other" category. While not all coworkers of different career stages would be in mentoring relationships, mentors would not be described as friends or by using the "other" category. The diversity of connections from female to male, and the relative absence of female mentors for males are additional evidence of gender differences in professional ties.

When women do not have access to the dominant professional networks, which are sometimes called "old boy networks," they have been advised to form their own women's networks (Daniels, 1979). This will improve their access to the resources of other women in their new networks. However, by not continuing to strive to gain access to the dominant professional networks, women may in effect be contributing to their own exclusion from important professional contacts. The act of communicating reinforces existing ties. While membership in specialized networks provides important advantages in professional life, women and other minorities are

well advised to continue to try to gain access to mainstream networks.

There are several important questions which arise from this study. Why do women use social ties for a task within the professional context? Would men use social ties for a non professional task? Do women perceive themselves as having less access, or are they less "inclined to network"? "Inclined" would include social norms as well as ability. Is utilizing colleagues' resources not as socially appropriate for women as for men? Some insight into these questions may be found in the current study by this author which examines strength of tie, a question in the 1986 study only. Preliminary analysis reveals gender differences in strength of tie, and future analysis will examine this gender difference in relation to other variables.

DIRECTIONS FOR FUTURE RESEARCH

Tracing another networking task in this profession would provide additional insight into social structure. Other types of professional networks could be explored by using a task other than forwarding a booklet. Comparison of different networks would provide a broader picture of professional structure. As mentioned earlier, examining networking in fields which have different gender ratios is an important consideration for future research.

It would be interesting to compare results of this study and to results obtained using a related technique developed by Bernard and associates (1986). In this paradigm, the Reverse Small World, a respondent is asked what information he or she requires in order to reach hypothetical targets. By comparing results of this paradigm and the Small World technique, one could compare behavior with self report. Do

respondents actually use the information they request?

Further studies of professional structure would be a basis for formulation and guidelines aimed at diminishing barriers in individual professional advancement, and promoting the growth of the profession. As Mead (1934) wrote men are born into social structures they did not create, and the adult self transforms social experience as it responds to the experience. Individual behavior as well as aggregate action can modify social structure and thereby improve potential opportunities for self and others.

APPENDIX

The booklet used in data collection was identical in 1977 and 1986 with the exception of a few questions on the postcards which were attached to the back cover. The eight pages of instructions are printed here, followed by the postcards for each year.

A FRIEND has sent this passbook to you. Your friend hopes that you will aid this City University of New York study by forwarding this passbook to someone else. The name of the person who sent you this passbook is listed in the Roster below.

ROSTER

	Name	City, State
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____

COMMUNICATION SURVEY

We need your help in a scientific study carried out at City University of New York. We are studying the nature of communication patterns and the factors which influence their effectiveness. You will notice that this passbook has come to you from a friend. His/her name appears in the Roster on page 1. He/she has aided this study by sending this passbook to you. On the next page you will find the name and address of someone else who has agreed to serve as the "target person" in this study. The idea of the study is to transmit this passbook to the target person using only a chain of friends and acquaintances.

TARGET PERSON

John Bargh is an Assistant Professor
of Psychology, New York University,
6 Washington Place, 7th Floor,
New York, New York 10003.

Dr. Bargh received his Ph.D. in 1981
from the University of Michigan in
Social Psychology.

Please turn to page 4 to learn how to take part in the study.

page 3

HOW TO TAKE PART IN THIS STUDY

1

ADD YOUR NAME TO THE ROSTER ON PAGE 1, so that the next person who receives this passbook will know it came from.

2

DETACH ONE POSTCARD FROM THE BACK OF THIS PASSBOOK. FILL IT OUT AND MAIL IT. No stamp is needed. The postcard is very important. It allows us to keep track of the progress of the passbook as it moves toward the target person.

page 4

3

IF YOU KNOW THE TARGET PERSON ON A PERSONAL BASIS, MAIL THIS PASSBOOK DIRECTLY TO HIM/HER. TWO 22C stamps are necessary. Do this only if you have previously met the target person and know each other on a first name basis.

4

IF YOU DO NOT KNOW THE TARGET PERSON ON A PERSONAL BASIS, DO NOT TRY TO CONTACT HIM/HER DIRECTLY. INSTEAD, MAIL THIS PASSBOOK TO A PERSONAL ACQUAINTANCE WHO IS MORE LIKELY THAN YOU TO KNOW THE TARGET PERSON. You may send the passbook to a friend, relative, or colleague, but it must be someone you know on a first name basis.

page 5

Remember, the aim is to move this passbook toward the target person using only a chain of friends and acquaintances. On first thought you may feel you do not know anyone who is acquainted with the target person. This natural, but at least you can start it moving in the right direction. The real challenge is to identify among your friends and acquaintances a person who can advance the passbook toward the target person. For example, who among your acquaintances might conceivably move in the same circles as the target person? It may take several steps beyond your friend to get to the target person, but what is most important is to start the passbook on its way. The person who receives this passbook will then repeat the process until the passbook is received by the target person.

page 6

Mailing a postcard constitutes your consent to be a participant in the survey. At any time you may request removal of your name by notifying the project staff in writing. The information you provide is for use of the research survey only and will be kept in confidence. A summary of the results will be sent upon request.

Please transmit this passbook within 24 hours.

Your help is greatly appreciated.

Cordially,

Florence L. Denmark, Ph.D
Principal Investigator

Martha Ann Carey, M. Phil.
Project Director

page 7

DETACH ONE POSTCARD

FILL IT OUT AND RETURN IT TO

CITY UNIVERSITY OF NEW YORK

page 8

1977 post card

PLEASE FILL IN THIS INFORMATION ABOUT YOURSELF

Name_____
Address_____
_____
Occupation_____
Business Address_____
_____
Age____ Sex____ Race____
Highest Degree____ Year____
Major_____
Institution_____
Please fill in the following information about the person to whom you are sending the folder.

His(Her) Name_____
His(Her) Address_____
_____
His(Her) Occupation_____
Place of Employment_____
_____
Age_____ Sex_____ Race_____
Nature of his/her relationship to you. PLease explain whether she/he is a friend, acquaintance, relative, from work, from school.
_____
Why did you select him/her?
_____
_____
_____

1986 post card

PLEASE FILL IN THIS INFORMATION ABOUT YOURSELF

Name_____
Address_____
_____
Occupation_____
Business Address_____
_____
Age____ Sex____ Race____
Highest Degree_____
Major_____
Institution_____
PLEASE FILL IN THE FOLLOWING INFORMATION ABOUT THE PERSON TO WHOM YOU ARE SENDING THE PASSBOOK.
His/Her Name_____
His/Her Address_____
_____

His/Her Occupation_____
Place of Employment_____
_____
Age_____ Sex_____ Race_____
Circle the nature of his/her relationship to you:
Friend, Acquaintance, Relative, Colleague or coworker, Neighbor, Other-specify_____
Circle how close this person is to you:
Very 1 2 3 4 5 Barely
Circle the reason you selected him/her?
Same geographic area as target
Same occupation as target
Same institution as target
Knows/is target
Other-specify_____

REFERENCES

Ahern, N. & Scott, E. (1981). Career outcomes in a matched sample of men and women PhDs: An analytical report. Washington, DC: National Academy Press.

Alba, R. D. & Moore, G. (1978). Elite social circles. Sociological Methods and Research, 7, 167-188.

Aldrich, H. E. (1979). Organizations and environments. Englewood Cliffs, NJ: Prentice Hall.

Aldrich, H. & Whetten, D. A. (1981). Organization sets, action sets, and networks: Making the most of simplicity. In P. C. Nystrom and W. H. Starbuck (Eds.), Handbook of Organizational Design, volume 1 (pp. 385-408). Oxford: Oxford University Press.

Astin, H. & Bayer, A. (1972). Sex discrimination in academe. Educational Record, 53, 101-118.

Altman, I. (1987). Centripetal and centrifrigual trends in psychology. Paper presented at National Conference on Graduate Education in Psychology, University of Utah, Salt Lake City, Utah.

Barnes, J. A. (1954). Class and committees in a Norwegian island parish. Human Relations, 7, 39-58.

Baumgartner, T., Buckley, W., Burns, T., & Schuster, P. (1976) . Meta)Power and the structuring of social hierarchies. In T. Burns and W. Buckley (Eds.), Power and control: Social structures and their transformation (pp. 215-288). Beverly Hills, CA: Sage Publications.

Bavelas, A. (1950). Communication patterns in task)oriented groups. Journal of the Acoustical Society of America, 57, 271-282.

Becker, H. (1982). Art worlds. Berkley: University of California Press.

Beller, A. H. (1984). Trends in occupational segregation by sex and race, 1960-1981. In B. F. Reskin (Ed.), Sex segregation in the workplace: Trends, explanations, remedies (pp. 11-26). Washington, DC: National Academy Press.

Bernard, H. R. & Killworth, P. (1978). A review of the Small World literature. Connections, 2, 15-24.

Bernard, H. R., Killworth, P. D., Evans, M. J., McCarty, C., & Shelley, G. (1987). Measuring Patterns of Acquaintanceship Cross-culturally. Paper presented at the VII Social Network Conference, Claerwater Beach, FL.

Bernard, H. R., Killworth, P., & Sailer, L. (1981). Summary of research on informant accuracy in network data, and the reverse Small World problem. Connections, 4, pp. 18-25.

Bielby, W. T. & Baron, J. N. (1984). A woman's place is with other women: Sex segregation within organizations. In B. F. Reskin (Ed.), Sex segregation in the workplace: Trends, explanations, remedies (PP. 27-55). Washington, DC: National Academy Press.

Bishop, Y. M. M., Fienberg, S. E., & Holland, P. W. (1975). Discrete multivariate analysis: Theory and practice. Cambridge, Mass: MIT Press.

Blau, F. M. (1964). Exchange and power in social life. New York: Wiley and Sons.

Blau, P. M. (1982). Structural sociology and network analysis: An overview. In P. Marsden & N. Lin (Eds.), Social structure and network analysis (pp. 273-280). Beverly Hills, CA: Sage Publications.

Blumrosen, R. G. (1979). Wage discrimination, job segregation, and Title VII of the Civil Rights Acts of 1964. University of Michigan Journal of Law Reform, 12, 402-502.

Boorman, S. S. and White, H. (1976). Social structure from multiple networks. American Journal of Sociology, 81, 1384-1446.

Bott, E. (1971). Family and society: Roles, norms, and relationship in ordinary urban families. London: Tavistock.

Boulanger, G. and Kadushin, C. G. (Eds.) (1986). The vietnam war: Myths and realities. Hillsdale, NJ: Lawrence Erlbaum.

Brass, D. (1986) Being in the right place: A structural analysis of individual influence in an organization. Administrative Science Quarterly, 29, 518-539.

Brown, M. B. (1983). Frequency tables - P4F. In BMDP Manual, 143-207. author.

Bryan, A. S Boring, E. (1944). Women in American psychology: Prolegomen. Psychological Bulletin, 41, 447-454.

Bryan, A. & Boring, E. (1946). Women in American psychology: Statistics from the OPP questionnaire. American Psychologist, 1, 71-79.

Bryan, A. & Boring, E. (1947). Women in American psychology: Factors affecting their professional careers. American Psychologist, 2, 3-20.

Carey, M. A. (1985, April). Women's Participation in Professional Networks. Paper presented at Hunter College Psychology Conference, New York.

Cole, J. & Cole, S. (1973). Social stratification in science. Chicago: University of Chicago Press.

Cook, K. (1982). Network structure from an exchange perspective. In P. Marsden and N. Lin (Eds.), Social structure and network analysis (pp. 177-200). Beverly Hills, CA: Sage Publications.

Coser, L., Kadushin, C., & Powell, W. (1982). Books: The culture and commerce of publishing. New York: Basic Books, Inc.

Coser, R. L. (1981). Where have all the women gone? In C. Epstein & R. L. Coser (Eds.), Access to power: Cross)national studies of women and elites (pp 16-32). London: George Allen and Unwin.

Coser, R. S Rokoff, G. (1971). Women in the occupational world: Social disruption and conflict. Social Problems, 18, 535-552.

Crane, D. (1972). Invisible colleges: Knowledge in scientific communities. Chicago: University of Chicago Press.

Daniels, A. K. (1979). Development of feminist networks in the professions. In A. Briscoe and S. Pfafflin (Eds.), Expanding the role of women in the sciences. Annals of the New York Academy of Sciences, 323, 215-227.

Deaux, K. (1985). Sex and gender. Annual Review of Psychology, 36, 49-81.

Deaux, K. & Lewis, L. (1984). Structure of gender stereotypes: Interrelationships among components and gender label. American Psychologist, 46, 991-1004.

Denmark, F. L. (1979). Women in psychology in the United States. In A. Briscoe and S. Pfafflin (Eds.), Expanding the role of women in the sciences. Annals of the New York Academy of the Sciences, 323, 65-78.

Denmark, F. L. & McKenna, W. (1976). The small world revisited: Informal communications networks in psychology. unpublished manuscript.
Directory of the American Psychological Association, 1985 Edition. (1985). author.

Directory of the American Psychological Association, 1977 Edition. (1977). author.

Eagly, A. S Steffen, V. (1984). Gender stereotypes stem from the distribution of women and men into social roles. Journal of Personality and Social Psychology, 46, 735-754.

Eisenstadt, S. N. (1981). Interactions between organizations and societal stratification. In P. C. Nystrom and W. H. Starbuck (Eds.), Handbook of Organizational Design, volume 1 (pp. 309-322). Oxford: Oxford University Press.

Eisenstadt, S. N. (1965). Bureaucracy, bureaucratization, markets, and power structure. In S. N. Eisenstadt (Ed.), Essays on comparative institutions (pp.177-215). New York: Wiley.

Emerson, R. M. (1962). Power-dependence relations. American Sociological Review, 27, 31-41.

Epstein, C. F. (1970). Encountering the male establishment: Sex-status limits on women's careers in the professions. American Journal of Sociology, 75, 965-982.

Epstein, C. F. & Coser, R. (Eds.). (1981). Access to power: Cross)national studies of women and elites. London: George Allen and Unwin.

Erickson, B. H. (1979). Some problems of inference from chain data. In K. Schuelssler (Ed.), Sociological Methodology (pp. 276-302). San Francisco: Jossey-Bass Publications.

Featherman, D. & Hauser, R. (1976). Sexual inequalities and socioeconomic achievement in the United States, 1962-1973. American Sociological Review, 41, 462-483.

Fidell, L. S. (1975). Empirical verification of sex discrimination in hiring practices in psychology. In R. Unger and F. L. Denmark (Eds.), Woman: Dependent or independent variable. New York: Psychological Dimensions, Inc.

Friedson, E. (1984). Are professions necessary? In T. Haskell (Ed.), The authority of experts. Bloomington, IN: Indiana University Press.

Friedson, E. (1983). The theory of professions: State of the art. In R. Dingwall (Ed.), The sociology of the professions. London: Macmillan Press.

Granovetter, M. (1974). Getting a job: A study of contacts and cases. Cambridge, MA: Harvard University Press.

Griffith, B. & Miller, A. J. (1970). Networks of informal communication among scientifically productive scientists. In C. Nelson and D. Pollack (Eds.), Communication among scientists and engineers (pp. 125-140). Lexington, MA: D.C. Heath & Company.

Griffith, B. & Mullins, N. (1972). Coherent social groups in scientific change. Science, 177, 959-964.

Hannan, M. & Freeman, J. (1977). The population ecology of organizations. American Journal of Sociology, 82, 929-964.

Hansman, H. (1985). A theory of associative organizations: Externalities, exclusivity, stratification and cooperation. PONPO Working Paper no. 2. Institute for Social and Policy Studies, Yale University, New Haven, CT.

Haray, F. , Norman, R. Z. , & Cartwright, D. (1965). Structured models: An introduction to directed graphs. New York: Wiley and Sons.

Heinz, J. P. & Laumann, E. 0. (1983). Chicago lawyers: The social structure of the bar. Beverly Hills: Sage.

Homans, G. C. (1950). The human group. New York: Harcourt Brace.

Howard, A., Pion, G. M., Gottfredson, G. D., Flattare, P. E., Oskamp, S., Pfafflin, S. M., Bray, D. W., & Burstein, A. G. (1986). The changing face of American psychology, American Psychologist, 41, 1311-1327.

Hrebiniak, L. G. & Joyce, W. F. (1985). Organizational adaptation: Strategic choice and environmental determinism. Administrative Science Quarterly, 30, 336-349.

Huber, J. & Spitze, G. (1983). Sex stratification: Children, housework, and jobs. New York: Academic Press.

Kadushin, C. G. (1982). Social density and mental health. In P. Marsden and N. Lin (Eds.), Social structure and network analysis (pp. 147-158). Beverly Hills, CA: Sage Publications.

Kadushin, C. (1976). Networks and circles in the production of culture. American Behavioral Scientist, 19, 769-784.

Kadushin, C. G. (1974). The American Intellectual Elite. Boston: Little, Brown and Company.

Kanter, R. M. (1977). Men and women of the corporation. New York: Basic Books.

Kaufman, D. (1978). Associational ties in academe: Some male and female differences. Sex Roles, 4, 9-21.

Kaufman, D. & Richardson, B. (1982). Achievement and women: Challenging the assumptions. New York: Free Press.

Kessler, S., McKenna, W., Russell, V., Stang, D. J. & Sweet, S. (1976). The job market in psychology: A survey of despair. Personality and Social Psychology Bulletin, 2, 22-26.

Knoke, D. (1986). Associations and interest groups. Annual Review of Sociology, 12, 1-21.

Knoke, D. & Burke, P. J. (1980). Log-linear models. Beverly Hills, CA: Sage.

Knoke, D. & Kuklinski, J. (1982). Network analysis. Beverly Hills, CA: Sage Publications.

Korte, C. & Milgram, S. (1970). Acquaintance links between white and negro populations: Application of the Small World method. Journal of Personality and Social Psychology, 15, 101-118.

Larson, M. S. The rise of professionalism: A sociological analysis. Berkeley: University of California Press.

Lenski, G. E. (1984). Power and privilege: A theory of social stratification (2nd ed.). New York: McGraw)Hill Book Company.

Kanter, R. M. (1977). Men and women of the corporation. New York: Basic Books.

Kaufman, D. (1978). Associational ties in academe: Some male and female differences. Sex Roles, 4, 9-21.

Kaufman, D. & Richardson, B. (1982). Achievement and women: Challenging the assumptions. New York: Free Press.

Kessler, S., McKenna, W., Russell, V., Stang, D. J. & Sweet, S. (1976). The job market in psychology: A survey of despair. Personality and Social Psychology Bulletin, 2, 22-26.

Knoke, D. (1986). Associations and interest groups. Annual Review of Sociology, 12, 1-21.

Knoke, D. & Burke, P. J. (1980). Log-linear models. Beverly Hills, CA: Sage.

Knoke, D. & Kuklinski, J. (1982). Network analysis. Beverly Hills, CA: Sage Publications.

Korte, C. & Milgram, S. (1970). Acquaintance links between white and negro populations: Application of the Small World method. Journal of Personality and Social Psychology, 15, 101-118.

Larson, M. S. The rise of professionalism: A sociological analysis. Berkeley: University of California Press.

Lenski, G. E. (1984). Power and privilege: A theory of social stratification (2nd ed.). New York: McGraw)Hill Book Company.

Lin, N., Ensel, W., & Vaugh, J. (1981). Social resources and strength of ties: Structural factors in occupational status attainment. American Sociological Review, 46, 393-405.

Lin, N., Vaughn, J., & Ensel, W. (1981). Social resources and occupational status attainment. Social Forces, 59, 1163-1181.

Lincoln, J. R. & Miller, J. (1979). Work and friendship ties in organizations: A comparative analysis of relational networks. Administrative Science Quarterly, 24, 181-199.

Lorber, J. (1981). The limits of sponsorship for women physicians. Journal of American Medical Women's Association, 36, 329-337.

Lott, B. (1985). The devaluation of women's competence. Journal of Social Issues, 41, 43-60.

Lundberg, C. (1975). Patterns of acquaintanceship in society and complex organizations. Pacific Sociological Review, 18, 206-222.

Marsden, P. (1983). Restricted access in networks and models of power. American Journal of Sociology, 88, 686-717.

Moreno, J. L. (1934). Who shall survive? Washington, DC: Nervous and Mental Disease Publishing Company.

Mullins, N. (1968). The distribution of social and cultural properties in informal communication networks among biological scientists. American Sociological Review, 33, 786-797.

Nivea, V. & Gutek, B. (1981). Women and work: A psychological perspective. New York: Praeger.

Nivea, V. & Gutek, B. (1980). Sex effects on evaluation. Academy of Management Review, 5, 267-276.

O'Farrell, B. O. & Harlan, S. L. (1984). Job integration strategies: Today's programs and tomorrow's needs. In B. F. Reskin (Ed.), Sex segregation in the workplace: Trends, explanations, remedies (pp. 267-291). Washington, DC: National Academy Press.

Palisi, B. J. & Jacobson, P. E. (1977). Dominant statuses and involvement in types of instrumental and expressive voluntary organizations. Journal of Voluntary Action Research, 6, 80-88.

Parsons, T. (1968). Professions. In D. Sills (Ed.), International encyclopedia of the social sciences, 12, 539-547. New York: Macmillan and Company.

Parsons, T. (1960). Structure and process in modern societies. New York: The Free Press.

Pfafflin, S. (1984). Women, science, and technology. American Psychologist, 39, 10-12.

Pfeffer, J. (1985). Organizations and organizational theory. In G. Lindzey and E. Aronson (Eds.), Handbook of social psychology, volume 1 (pp.379-440). New York: Random House

Pool, I. deP. & Kochen, M. (1978). Contacts and influence. Social Networks, 1, 1-48.

Price, D. deS. & Beaver, D. (1966). Collaboration in an invisible college. American Psychologist, 21, 1011-1018.

Reskin, B. F. (1984). Introduction. In B. F. Reskin (Ed.), Sex segregation in the workplace: Trends, explanations, remedies (pp. 1-8). Washington, DC: National Academy Press.

Reskin, B. (1980). Fair science: A fair test? Contemporary Sociology, 9, 793-795.

Rogers, E. & Agarwala-Rogers, R. (1976). Communication in organizations. New York: The Free Press.

Rogers, E. & Kincaid, D. L. (1981). Communication networks: Toward a new paradigm for research. New York: The Free Press.

Roper, B. W. (1986). Evaluating polls with poll data. Public Opinion Quarterly, 50, 10-16.

Rose, S. M. (1985). Professional networks of junior faculty in psychology. Psychology of Women Quarterly, 9, 553-547.

Rosen, B. & Jerdee, T. H. (1974). Influence of sex-role stereotypes on personnel decisions. Journal of Applied Psychology, 59, 9-14.

Russo, N., Stapp, J., Olmedo, E., & Fulcher, R. (1981). Women and minorities in psychology. American Psychologist, 36, 1315-1363.

Salisbury, R. H. (1975). Interest groups. In F. I. Greenstein and N. W. Polshy (Eds.), Handbook of political science (pp. 171-228). Reading, Mass.: Addison*Wesley

Schleiffer, S. (1986). Trends in attitudes toward and participation in survey research. Public Opinion Quarterly, 50, 17-26.

Simon, R., Clark, S., & Galway, K. (1967). The woman Ph.D: A recent profile. Social Problems, 15, 221-236.
Smith, D. H. (1975). Voluntary action and voluntary groups. Annual Review of Sociology, 1, 247-270.

Smith, D. H. & Macauley, J. (Eds.) (1980). Participation in social and political activities. San Francisco: Jossey-Bass.

Spilerman, S. (1977). Careers, labor market structure, and socioeconomic achievement. American Journal of Sociology, 83, 551-593.

Stapp, J., Tucker, A. M., & Vanden Bos, G. R. (1985). Census of psychological personnel: 1983. American Psychologist, 40, 1317-1351.

Stewart, J. (1982). Changing structure and social composition of occupations in organizations. In S. Bacharach (Ed.), Research in the sociology of organizations, 1, 301-329.

Terborg, J. & Ilgen, D. (1975). A theoretical approach to sex discrimination in traditionally masculine occupations. Organizational Behavior and Human Performance, 13, 352-376.

Tichy, N. M. (1981). Networks in organizations. In D. C. Nystrom and W. H. Starbuck (Eds.), Handbook of organizational design, volume 2 (pp. 225-249). Oxford: Oxford University Press.

Tichy, N. & Fombrun, C. (1979). Network analysis in organizational settings. Human Relations, 32, 923-965.

Travers, J. & Milgram, S. (1969). An experimental study of the Small World problem. Sociometry, 32, 425-443.

Unger, R. K. & Denmark, F. L. (1975). Woman: Dependent or independent variable? New York: Psychological Dimensions, Inc.

Van de Ven, A. H. & Walker, G. (1984). The dynamics of interorganization coordination. Administrative Science Quarterly, 29, 598-621.

White, H. , Boorman, S. A., & Breiger, R. L. (1976). Social structure from multiple networks I: Block models of roles and positions. American Journal of Sociology, 81, 730-780.

Zuckerman, H. (1977). Scientific elite: Nobel laureates in the United States. New York: The Free Press.