CONNECTIONS
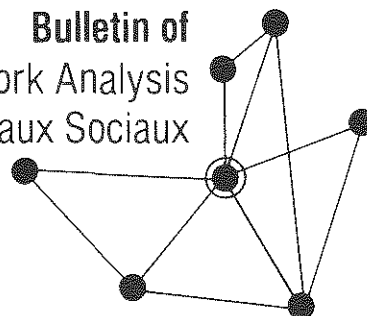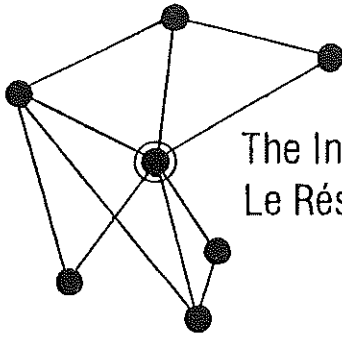
The International Network for Social Network Analysis
Le Réseau International pour l'Analyse des Réseaux Sociaux

CONNECTIONS

Volume II - Number 1

Fall, 1978

CONTENTS:

NETWORK NOTEBOOK

The Editors' Request...

This is the beginning of the second year of INSNA, and the first of three issues of Connections you will receive. Most of last year's members have renewed; please remind forgetful friends, relatives and colleagues.

Call For Contributions:

Our stock in trade is getting information to you before it is published and way before it reaches the textbooks. So please send us abstracts of your unpublished papers, research proposals, students' theses, news, hot information, gossip etc. In addition we would appreciate published abstracts and book summaries because of our disciplinary and nationally diverse membership: that is, what is common knowledge in one field may be new to another. (Remember what path analysis did to sociology - it had been hanging around elsewhere for a long time!)

Next Issue of Connections:

Volume II Number 2 (Spring) is scheduled for April, 1979 with a deadline for contributions on March 15th. Number 3 (Summer, 1979) will consist of a completely new, revised Membership Directory.

The next issue will have a contribution by Herman Turk and Mitsuyo Hanada on "Rudimentary Networks Among Urban Organizations: New Modelings of Some Classic Ideas."; a Bibliographic Update on "Social Networks and Health" by William D. Ratcliffe (see Connections I, #2:25-37); and a critique of block-modeling by Darryl Chubin with a possible reply by its defenders. Contributions are invited also on helping networks and health or other delivery systems.

Please note - it is an editorial policy that publishing material in Connections does not preclude its subsequent publication elsewhere.

Thanks for This Issue:

Editorial thanks go to those contributors (Clyde Mitchell; Russell Bernard and Peter Killworth; Grace Anderson and Laird Christie) who submitted camera-ready copy;to Greg Heil for responding with a quick review of a computer program; to Cathy Morrisey and Mildred Leighton for typing; and to Helen Breslauer, Judy Kjellberg and Willem Van Vliet for proof-reading.

Request for Feedback:

If some members have failed to renew because they are disappointed, we would appreciate their comments and criticisms. Likewise, if readers are pleased, we would also like to hear their comments.

New Computer Setup:

Phillip J. Stone and Ronald L. Breiger (both at the Department of Sociology, William James Hall, Harvard University, Cambridge, Massachusetts, 02138, U.S.A.) have agreed to act as co-editors of comp-uter programs and developments sections for both Connections and Social Networks. Connections will continue to carry initial, preliminary, work-in-progress, etc. announcements of computer programs and developments, while Social Networks will publish abstracts and summaries of more finished versions. Submissions should be short, concise and clearly written. If they include descriptions of a program that involves the mobilization of a number of different algorithms, they should include the appropriate mathematical formulae instead of forcing the readers to go back to, for example, ten original articles. Please don't worry about where your version belongs--just send it along to Breiger or Stone and they will sort it out.

A Hand to Our Calligrapher:

We hope you enjoy our flowing new headings. They were done for us by Toby Salk, 27 Linda Street, San Francisco, California. Special calligraphic rates for network analysts.

Stars and Networks:

We received notice of the chance of a lifetime recently. We pass it on to you:

"I am writing...to ask if you are doing or know of any on-going research in the area of social networks, particularly with relation to stratification.

"We...are currently engaged in producing a new introductory sociology course. Like all other university courses it will consist of specially written course texts, set books and, in this case, sixteen radio and sixteen television programmes to be made by the British Broadcasting Corp. Whereas the course will provide the students with a thorough background in current sociological issues and theory, the broadcast component of the course will be dealing with practical sociology and will show how empirical research is carried out over a broad range of topics and by a wide spread of academic institutions and traditions.

Council. The purpose of this study is to examine determinants and consequences of ethnic diversity, including occupational opportunity, residential segregation, variations in corporate action among ethnic collectivities, and ethnic identity retention. Phase 1, currently under way, involves screening 18,000 households in the metropolitan area. In Phase 2, personal interviews will be conducted with 1,850 adults who are in the labor force or are students. The sample will be composed of first, second and third generation members of five ethnic groups: Anglo-Saxon, Italian, Jewish, German and Ukrainian.

Claude Fischer (Sociology, U.C. - Berkeley is on leave this year at the Center for Population Studies, Harvard University.

Hans Hummell (Sociology, Duisberg) is spending the year at the Netherlands Institute for Advanced Study, Wassenaar.

Edward Laumann (Sociology, Chicago) has recently been appointed Editor of the American Journal of Sociology.

Barry Leighton (Sociology, Toronto), our Associate Editor, is a re-labeled node. He changed his name legally from Barry Crump to that of his wife's on their marriage, and with Ph.D. near completion is now seeking a teaching position in Urban and/or Criminology-sociology of law.

Nicholas Mullins (Sociology, Indiana) has been promoted to Professor.

The Urban Networks Working Commission, recently established by the International Social Science Council, planned to meet in Sao Paulo, September, 1978. Members include Profs. Roy Drewett (LSE), Niles Hansen (IIASA, Vienna), Hardoy (Clasco), Candido Mendes (Sociedad Brasileira de Instrucao, Petrella (ISSC), Schaefer (Institute of Systems Research), and Arthur Summerfield (Birbeck College).

Rolf Ziegler now has the Sociology Chair at Münich (from Vienna).

Letter From Uppsala:

"Let them eat potatoes!" seemed at times to be the motto of World Congress of Sociology, but the beauty of Uppsala and the gracious hospitality of our Swedish network hosts made the visit a warm experience for networkers. Åke Daun and Bengt Rundblad, in cooperation with Anita Jacobson Widding, had privately secured INSNA space in the Institute of (Non-European) Ethnography, and there we met, drank coffee and talked happily. The gnomes of Zurich, Bonn, Tokyo and Washington saw to it that we had plenty of time to talk, as the devaluation of the dollar forced the cancellation of most American paper-presenters at the World Congress. Yet quick-wittedness and long-windedness saved the day. Good sessions were held on math models, urban networks, household organization and kinship structure:

Narciso Pizzaro (Madrid), "Places and networks of places: a homogeneous space for the definition of social structure."

Richard Roistacher (Illinois), "Computer networks and social systems."

Patrick Doreian (Pittsburgh), "Activity, hierarchy and sentiment in small groups."

Alden Klovdahl (Australian National University), "Random walks and urban structure."

Barry Wellman (Toronto), "The Community Question and social networks in Toronto."

Barbara Laslett (UCLA), "Household structure and the social organization of production: Los Angeles, California in 1850."

Robin Ostow (Brandeis), "Occupational backgrounds of labour migrants from Sardinia to Northern Italy, Belgium and the Federal Republic of Germany."

Peter Aaby (Copenhagen), "Towards the brave new world: a comment on Marxist analyses of kinship and biological reproduction in primitive societies."

Louise Tilly (Michigan), "The family wage economy of a French textile city, Roubaix, 1872-1906."

Twenty-four networkers attended an informal Business Meeting. Participants seemed generally satisfied with the state of INSNA and CONNECTIONS; there was agreement that we should avoid doing the kinds of things formal journals do (a resounding NO to book reviews). Some requests were expressed: the Directory should be sorted by U.S. states in view of the large number of United States members (it seems that some members have been using it as a handy accommodations guide), special issues (or chunks of issues) would be useful, and a consumers' guide to computer programmes (see the announcement of a new computer editorship in Network Notebook!). Volunteers needed for all of the above.

Always forward-looking, much discussion was given to the next World Congress. Rumors were reported that it would be held in Spain or Japan (no definite word has been received by INSNA to date). We also considered the possibility of transforming ourselves from an Ad Hoc Group into an ISA Research Committee, if the bureaucratic costs did not outweigh the benefits. This is currently being investigated.

Research Grants Awarded:

Selected Items Only "Research on Information Systems Program," Division of Information Systems Program," (U.S.) National Science Foundation, 1978:

Participation Systems, Inc. (Chandler Harrison Stevens), "Electronic Information Exchange in Legislative Technical Research."

New Jersey Institute of Technology (Murray Turoff), "Electronic Information Exchange Test Facility."

Electronic Industries Association (John F. Hessman), "Electronic Information Exchange in Microcomputer Component Standardization Research."

Massachusetts Institute of Technology (Thomas B. Sheridan), "Electronic Information Exchange in Mental Workload Research."

King Research, Inc. (Donald W. King), "Systems Analysis of Scientific and Technical Communication

Weisner (1976) has investigated the nature of rural-urban networks more systematically than most researchers, by matching migrants in Nairobi with kin of the same age and educational level living at home. Sociometric data on knowledge and visting of others in the network are used to show how highly interconnected these ties are. Ross's contribution to their joint article (Ross and Weisner, 1977) provides a wider urban data base with which to show that rural contacts are positively associated with urban success and longevity.

This East African work has been paralleled by Kaufert's (1976) Ghanaian study, as yet unpublished. She concentrated on a Volta Region village with a long history of successful migration. Villagers see frequent contact with migrants as important for community integration, and feel that continued contact depends on maximizing the flow of information and maintenance of networks among villagers wherever they may be living. She examines the norms which regulate migrant-villager contact patterns and shows how reports of contacts are affected by these norms. Migrants report more visits home and sending more money than villagers say they have received, whereas both agree on more neutral 'facts' such as the migrant's age and education. Kaufert gives much more attention to women's contacts than Weisner or Ross, showing how important these are for feeding information to the women in the village about the outside world.

Colson and Scudder (1975) are also interested in the interconnections between urban and rural areas. They demonstrate the varying influence of kinship networks, ecology and employment opportunities on the spread of urban values and behaviour patterns from the urban to the rural areas in Zambia. Following the residents of two resettlement villages over a fifteen year period provided many opportunities to see how networks developed as the villages settled down and grew, as migrants left for the cities and others moved in for work. Their primary concern is economic adjustment rather than networks, but the implications of their findings for network research make this paper well worth reading.

Barnes (1974, 1977), Ross (1975), Schildkrout (1978), and Wolpe (1974 have been interested in the utilization of networks to attain political goals. Of these, Ross makes the most use of quantified data. He finds that "social networks within the city are based to a great extent on kinship and ethnicity at all socioeconomic levels" (1975:70). Nairobi residents with more education, income and urban experience are more likely to have interethnic friendships than people with less of these qualities, but there is no difference when the measure is the closest friend. The implications of these networks for Kenyan politics are his major concern. Two types of friendship patterns are distinguished: individuals whose friendships are mainly limited by neighbourhood, ethnicity and home contacts and those with wider networks, mainly built up since arrival in town and including a wider variety of people. Men with high sociability scores and social status, long term urban residence and diverse networks (including numerous rural contacts) are most likely to be active in post-independence politics, which Ross typifies as seeking information and making demands on the elite. The mobilization style of independence politics, on the other hand, appears to be unrelated to the nature of friendship patterns. Thus, people with relatively limited networks, who had an important part to play in gaining independence, often lack the contact skills for effective participation today.

Wolpe (1974) examines the politics of Port Harcourt, Nigeria in the early 1960s from the viewpoint of competing 'geoethnic', occupational and religious ties. His focus is at the group rather than the individual level. The mobilization of networks varied with the issue; occupational ties were important during the General Strike and religious ties in conflicts over control of the schools, but geoethnic ties outweighed both of these at election time. Most of the book discusses the growth of communalism in Port Harcourt and the political consequences of its importance.

Barnes (1974, 1977) is also studying local politics, but she provides more detailed information on the formation and maintenance of personalized leadership than Wolpe does. Her town is Mushin, part of the Lagos metropolitan area, and her particular focus is landlords, who need a local power base to ensure security of land tenure and whose commitment to urban residence makes them key neighbourhood figures. Wide-ranging networks and patron-client relationships tie tenants to their landlords, the latter to middle level political leaders, and these to the powerful men in state and national politics. Individuals in leadership roles shift their allegiances with changes in power, minimizing the adjustment necessary for their followers. Political activities at the formal level may disappear, but politics continues to play an important role in the community. The system helps to maintain stability in times of rapid change (which may be a weakness rather than a strength); it also provides both continuity with customary forms of interaction and opportunities for upward mobility.

Schildkrout (1978) studied Mossi migrants to Kumasi, Ghana, particularly the differences between first generation migrants from Upper Volta and young men who have grown up in Kumasi. Since the Mossi are aliens, far from home and kin, their networks are somewhat different from those found among short distance migrants in other towns. The locally born tend to be more fluent in Hausa (the lingua franca of northern strangers) and to have wider networks within the immigrant community than their fathers. Neither group has much to do with the local Asante, though it is preferable to deal with the government through the Asantehene (the local traditional ruler) rather than directly. Mossi tend to cluster in certain parts of town, though houses are often shared with members of other stranger ethnic groups. Fictive kinship ties, which sometimes cross ethnic boundaries, make up for the absence of real kin. The use of neighbourhood networks for mutual aid and as a power base for economic and political activities is described.

ON FREEMAN'S SEGREGATION INDEX: AN ALTERNATIVE

J. Clyde Mitchell (Nuffield College, Oxford, England)

ABSTRACT. A segregation index is proposed which varies between +1 and -1 as against that proposed by Freeman which has a lower limit of zero even when links are concentrated in off-diagonal blocks. The distribution of the index is tested on 60,000 random networks. A simple chi-square estimates the departure from the null hypothesis of even distribution of links in diagonal and off-diagonal blocks. Some undesirable features of the proposed index are listed.

In a recent paper Linton Freeman (1978) proposed an index of segregation designed to gauge the extent to which people who share the same social attribute have social links with one another.[1] I was immediately attracted to the idea since its utility in asking questions about the underlying determinants of network structures is apparent. Accordingly I wrote a Fortran program to compute the index and tried it out on a set of data that I have frequently used to test my programs - Kapferer's cell room data (1969). In the course of this exercise certain features emerged which led me to question one feature of the index. Freeman's index has a value of 1.0 when there are no cross-links between the two sets of people who do and who do not share some social attribute. The index has a value of zero when 'the number of links between sub-class members and outsiders is greater than or equal to the number expected by chance under the random choice assumption' (Freeman 1978, p.417). That the index should be set to the same value of zero when both the expected links equals the observed and when they are less than the observed is, I think, a disadvantage. Situations do arise when members of a set have links with outsiders rather than with members of their own set - sort of negative segregation - and this state of affairs, which may be sociologically interesting - ought to be differentiated from that when there is no apparent bias in the distribution of links.

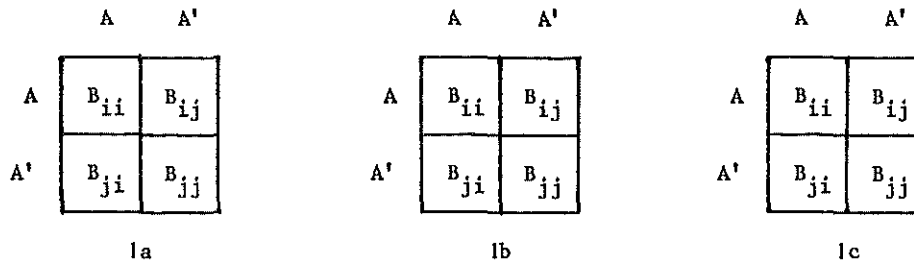The three different situations are illustrated in the matrices in Figure 1.

Figure 1. Matrices illustrating complete segregation, no segregation and complete negative segregation.

Consider a sociomatrix which has been partitioned in such a way that the members sharing some social attribute are separated from those who do not share this attribute. The set sharing the attribute is labelled A and its complement A'. In Matrix 1a the links are confined to the diagonal blocks B_{ii} and B_{jj} the off-diagonal blocks B_{ij} and B_{ji} being empty. In Matrix 1b the links are distributed equally in all four blocks, while in Matrix 1c the diagonal blocks are empty and the links are confined to the off-diagonal blocks. Matrix 1a would have a Freeman segregation index of 1.0 but both Matrices 1b and 1c would have an index of zero.

Clearly an index which yields a value of +1 for matrix 1a, a value of zero for matrix 1b and a value of -1 for matrix 1c would be desirable. An index which meets these conditions may be derived if we work with the overall densities of the diagonal and off-diagonal blocks.

Define the following terms:

C_{ii} = number cells in block B_{ii}

X_{ii} = number of links in block B_{ii}

C_{ij} = number of cells in block B_{ij}

X_{ij} = number of cells in block B_{ij}

etc.

The overall density of the diagonal blocks, say, D_{kk} would be:

$$D_{kk} = (X_{ii} + X_{jj})/(C_{ii} + C_{jj})$$

The matrix has been partitioned in terms of those in the cell room who were Roman Catholics as against other church affiliations. The density of links within both sets i.e. the density in the diagonal blocks is (8+8)/(9*8+6*5) = 0.1569. The density between the sets i.e. the off-diagonal blocks is (12+12)/(9*6+9*6) = 0.2222. The cell-room workers, accordingly, had proportionately more links with those of a different church affiliation than they had with those of the same church affiliation - treating the residual set of non-catholics here as having a common non-catholic affiliation. The difference in density is in fact -0.0653. The maximum difference in density that could arise given 40 existing links and a partition into sets of 9 and 6 would be:

$$D_{max} = [40/(9*8+6*5)]-0.0 = 0.3922$$

Similarly the minimum possible density would be:

$$D_{min} = 0.0 - [40/(9*6+9*6)] = -0.3704$$

Adjusting the minimum difference in density proportionately to correct for the proximity of the observed difference to zero we have

$$D_{min} = -0.3704 - [(-0.3704+0.3922)*(-0.3704-(-0.0653)/(-0.3704)]$$

$$= -0.3883$$

The Mitchell index then becomes:

$$SMI = [2.0*(-0.0653)-0.3922-(-0.3883)]/[0.3922-(-0.3883)]$$

$$= -0.1723$$

In terms of the Freeman index the expected number of cross-links would be [40/(15*14)]*[9*6] = 10.2857. Since this is less than the observed number of cross-links i.e. 12 the Freeman index is set to zero. This, in my opinion, obscures a point that may possibly be significant. In fact I think that the greater than expected links outside sets of specified church affiliation is probably to be explained by other factors masked by church affiliation but this does not alter the fact that the index ought to reflect the concentration of links outside the set if it in fact exists.

I am not able myself to develop an expression for the variance of this index. In fact I am not sure that one is possible given that the expression is not straightforward but must be adjusted in order to take a value of zero when the links are evenly distributed in both diagonal and off-diagonal blocks. I have computed the indices for 12 sets of 5000 networks each in which the size of the network was set at 30, partitioned into arbitrary sets of 17 and 13 and with densities varying regularly from 0.05 in steps of 0.05 to 0.30. Links were filled in in cells defined by rows and columns of the matrix selected by a pseudo-random number generator on the Oxford University ICL 1906A until the required number for the appropriate density had been reached.[3] The following table sets out the indices aggregated for the 60,000 random networks against the distribution expected from a normal curve with the same means and standard deviations as the observed distribution.

Table 1. Observed and Expected Distribution of Segregation Indices

Range of Indices		Observed	Expected
-1.0	-0.8	0	0.7
-0.8	-0.6	20	21.6
-0.6	-0.4	300	299.6
-0.4	-0.2	3248	2985.4
-0.2	0.0	26572	27091.3
0.0	0.2	26916	26444.6
0.2	0.4	2669	2853.5
0.4	0.6	264	282.8
0.6	0.8	11	19.9
0.8	1.0	0	0.6
Totals		60000	60000.0

The distribution of the index seems to approximate a normal distribution reasonably well but the mean of the observed distribution is in fact -0.0027 with a standard deviation of 0.1428. A t-test of the

ON MEASURING SYSTEMATIC INTEGRATION

Linton C. Freeman (Lehigh University, Bethlehem, Pennsylvania, U.S.A.)

ABSTRACT. A separate index of systematic integration is introduced that seems to solve the problems raised by Mitchell (1978). Taken together with the segration index, this measure of integration permits the systematic examination of social links between two classes of people whether their observed cross-class links are over or underrepresented as compared to a random baseline.

In my earlier paper (Freeman, 1978), I suggested that segregation could be thought of as a restriction on social network ties between members of two distinguishable 'kinds' of people. Thus, segregation was seen as a systematic--as opposed to random--social arrangement that reflected limitations on the access of different classes of people to one another.

Given this view, there are two different situations in which segregation is absent: (1) when cross-class links are random, and people relate to each other as if they were unaware of class membership, and (2) when there are more than the expected number of cross-class links, and people in each class seem to be going out of their way to relate to members of the other class.

This latter situation implies systematic (or perhaps "formula") integration. It arises when people are not segregated, but rather its opposite. And it is this kind of systematic departure from random relations among people that interests Clyde Mitchell (1978) and to which my measure of segregation is insensitive.

Mitchell has proposed a measure, MSI, that is responsive not only to segregation in the sense defined here, but to systematic integration as well. Such a measure is undoubtedly useful; it yields a kind of information that is unobtainable from a strict measure of segregation. The measure proposed by Mitchell, however, has three limitations that have been specified by its author: (1) it does not vary linearly with switching cases from within-class to cross-class linkages, (2) it requires an <u>ad hoc</u> adjustment to make the expected number of cross-class links under the assumption of randomness produce an index value of zero, and (3) it has an unknown distribution.

Here, I would like to propose an alternative solution to the problem raised by Mitchell. Instead of a combined measure of segregation-integration like MSI, I shall propose a <u>separate</u> measure of systematic integration with the same properties of linearity, rational zero point and known distribution as my segregation index, S.

Measuring Integration

Let m = the number of points in the set under study,

m_g = the number of points in a subset designated according to an external criterion (age, sex, race, etc.)

n = the number of edges linking points in the set under study,

e^* = the number of edges that link points in the designated subset with points not in the subset, and

$E(e^*)$ = the expected number of cross-subset links under an assumption of random generation of edges.

Then, if $E(e^*) \geq e^*$, if there are fewer than the expected number of cross-subset links, Freeman (1978) proposed that segregation be measured by

$$S = \frac{E(e^*)-e^*}{E(e^*)-Min(e^*)}$$

where

$Min(e^*)$ = the minimum possible number of cross-subset links, which is <u>uniformly equal to zero</u>.

By the same reasoning, we can define a measure of integration to be used whenever $E(e^*) < e^*$, that is if there are <u>greater</u> than the expected number of cross-subset links. The measure of integration is

$$I = \frac{E(e^*)-e^*}{E(e^*)-Max(e^*)}$$

where

$Max(e^*)$ = the maximum possible number of cross-subset links, which is always equal to $(m_g)(m-m_g)$.

This integration measure, I, varies between o and 1. A value of 0 indicates a complete lack of systematic integration: the number of cross-subset links is either equal to or less than the number expected

A REVIEW OF THE SMALL WORLD LITERATURE

H. Russell Bernard (West Virginia) and Peter D. Killworth (Cambridge, England)

ABSTRACT. Recently, we have been experimenting with the Small-World Technique (SWT), due to Stanley Milgram, in order to generate data on aspects of social structure. We feel that the SWT is a potentially powerful way to study social structure because it generates behavioral data. This review paper summarizes the available literature to date, and presents a program of related experiments which we are currently developing or wish others would do. In general, we hope that others will begin to study social structure experimentally.

Introduction

Recently, we have been experimenting with the Small-World (SW) technique, due to Stanley Milgram (1967, 1969). Considering the initial interest in the SW problem, there isn't a great deal of literature on it. Studies on the SW problem fall into two categories: theoretical papers which treat the problem mathematically, and observational studies which present data collected by the SW technique. In this paper we will review the SW literature to date, and discuss ways to use variants of the SW technique for getting data relevant to a theory of social structure. We hope that this will stimulate others to study social structure experimentally.

Original Problem

The SW problem was formulated in 1958 by Pool and Kochen in what has become a classic underground paper, recently published (1978). Milgram stated the problem in 1967 thus: "starting with any two people in the world, what is the probability that they will know each other?" (p. 62). This particular formulation is, of course, very general; it doesn't mention the existence of social structure. In fact, this formulation of the problem is blatantly independent of social structure. Clearly, if we asked "what is the probability that any *two investment brokers* will know each other?" the probabilities would be higher than in the earlier question.

Pool and Kochen found that there is one chance in 200,000 that any two Americans (n = 2×10^8) taken at random will know each other. They assumed that Americans "know" (on average) 500 others. (This figure had been determined in 1961 by Gurevich in his doctoral dissertation at MIT). Pool and Kochen also reported that more than 50% of the time any two Americans can be linked together if two intermediaries are allowed.

To our knowledge, the SW problem has not yet been empirically tested. There are good logistic reasons for this (how does one ask randomly selected pairs of Americans, or black Americans, or tailors in South Africa if they know one another?), so Milgram reformulated the problem (p.62): "Given any two people in the world, person X and person Z, how many intermediate acquaintance links are needed before X and Z are connected?" By so reworking the problem, Milgram was able (for $6801) to develop his now-famous SW technique. In the technique, a "starter" (S) is given the task of getting a folder to a "target" (T). S is told that he or she can pass the folder to T directly, only if T is a personal acquaintance (i.e. "known to S on a first-name basis" is the usual criterion -- but more on this below). And so the chain grows, until the folder gets to T.

In the original experiment the drop-out rate was very high. Only 44 out of 160 chains were completed. At each remove on each chain, there was a chance that a person would not send the message along. Over the years, the mail has continued to be the preferred mode of message transfer for SW experiments. But there are costs. In 1975 Jean Guiot, a management theorist, published the first SW experiment in which telephones were used. The study was restricted to a single city (Montreal), but there is no reason that long distance calls could not be the vehicle for message transfer. In a current

Kochen developed their original theory without social structure as an input). On the other hand, two of the chains in the Korte and Milgram study (and one chain in the Travers and Milgram study) had only one intermediary. This means that all that is required to test the original one-intermediary problem is a sufficiently large number of SW experiments. The reformulation of the SW problem by Milgram was not, therefore, really necessary. It was interesting; and it yielded a brilliant new technique; but it didn't have to be done in order to test the SW problem. As it turns out, Milgram's reformulation is just another question that can be asked about intermediaries beyond 1.

An alternative way of tackling the mutual-acquaintance-problem (and this is an experiment we are now conducting, along with Linton Freeman) is to put random pairs of people in a room (or onto a phone) and ask them a) do you know each other? and b) if not, who do you know in common? Their communication would be monitored, to allow discovery of exactly what features about each other enables a pair to find a common acquaintance. (It would be good to know whether such an acquaintance would in fact ever be used in any traditional SW experiment. How could one test this?) By doing this procedure in increasingly large populations (towns, cities, regions, etc.), we can tell what the chances are of people knowing someone in common. If social factors are of interest, then this can be studied also. Suppose that we want to find out if people who fly to Europe from the United States know someone in common. The best way to find out is to go to Kennedy airport, grab people in random pairs and ask them. This (and other direct tests of the SW problem) is expensive and difficult to do; but it is much less expensive than many experiments in the biological and physical sciences. Of course, much pretesting would be necessary to ensure good data return on the investment. After all, knowing that random pairs of people have, say, a 1 in 10 chance of knowing one another may not by itself be a very useful statistic. We need also to understand how people go about the task of finding their mutual acquaintance(s).

Lin, Dayton, and Greenwald

Some information on this question is presented by Lin, Dayton, and Greenwald (1977, 1978). Their first paper deals primarily with the problem of attrition, while the second presents data on reasons for choices by intermediaries. Data were collected in an "urbanized area" in the Northeast. There were four targets: a white male, and a white female; a black male, and a black female. There were 300 starters, also split into four groups on the basis of how much information they had about Ts (whether or not they knew T's race or occupation). Because of the high (30%) completion rate, and the additional information acquired from intermediaries, these data are probably the richest available in the SW literature.

In the first paper Lin et al. examine some causes of attrition. They find, as did Korte and Milgram (1970), that crossing racial boundaries is difficult. Another finding which also agrees with Korte and Milgram was the tendency for a drop in social status between penultimate link and target. An attempt to extend the influence of social status to other links in the chain produced no significant results, but Lin et al. nonetheless believe that (p. 116) "the effective strategy ... is one where a participant is relatively high on the occupational status hierarchy, so that a panoramic view of the structure below enhances the search for ... a target relatively low in the status hierarchy."

In their second paper, Lin et al. concentrate less on attrition and more on social structure as revealed by their SW experiment (although chains are still divided into successful -- those which reached the target -- and unsuccessful). They found that the occupational prestige of successive links in completed chains "tended to" rise; whereas in unsuccessful chains it stayed approximately constant. Further, participants in successful chains guessed that they knew more people than those in the unsuccessful chains. Lin et al. then examined how well each individual in a chain knew his or her next link by answers to the question "how many days ago did you last see this person?" By this expedient measure, they found that participants in successful chains "tended to use" weaker (i.e. less-well-known) ties than participants in unsuccessful chains.

These conclusions are very interesting, but are clouded by several factors. First, Lin et al. never quantify the "tendencies" in their data. They report no significance tests. Rather, their conclusions are illustrated by diagrams which display only means. Furthermore, the diagrams often contradict the conclusions stated in the paper. Part of the ambiguity of the results might be removed by allowing for the fact that participants in unsuccessful chains, several removes back from termination, may be making choices in

membership of each category (or state) is a function of the target. The transition probabilities between states were obtained partly from data we had gathered in a previous experiment (see the reverse SW discussion, below), and partly from intuition. Unlike Hunter and Shotland, we used no actual SW chain data to obtain the probabilities in our model.

Because the membership of each category changes with target, but transition probabilities vary only weakly (it turns out), the resultant path lengths from most of the U.S. to any T are virtually independent of the T. This agrees with the Milgram-Travers-Korte findings. Indeed, the fit to their data is very good, considering the small number of parameters (3) we used. However, free parameters allow easy fits to data. Clearly such parameters should be both reduced in number as far as possible, and, ideally derived from observations.

Of course, the number and type of categories is essentially another free parameter in both Hunter and Shotland's and our models. We have proposed (Killworth and Bernard, 1978b) a method for deriving the categories for a Markov model (if, indeed, such categories exist). This involves asking Ss to name their choices of first-links to a variety of Ts. Ss are allowed to ask as many questions about each T as they wish, until they feel able to make a choice. At the end of this phase of such an experiment, all the Ss are recontacted and asked to provide information about themselves corresponding to the aggregate of questions asked by all Ss about all Ts.

This procedure gives, for each S-T combination, the following data: information about S; comparable information about T; which questions were asked about T by S (coded as zero or one); characteristics of the choice made; and the reasons S gave for making the choice. Factoring these very rich data should yield various starter categories, choice categories, and a (hopefully short) list of fundamentally different questions which Ss require in order to make a choice.

Some Other Small World Papers

A similar approach to Hunter and Shotland, but purely theoretical, was taken by Stoneham (1977). She created a spatial model (in which spatial distance is the relevant criterion for communication) with many (100) categories, and simulated the Markovian chains by a Monte Carlo method. (Although one could probably generate the required statistics analytically by methods similar to those of Pool and Kochen, the labor would be immense, and the simulation method seems most suited to the problem). She was able, by adjusting only two parameters, to fit the mean and standard deviation of path lengths found by Travers and Milgram. The difficulty with this type of study, of course, lies in its interpretation. As with all models (including our own) fitting two parameters by adjusting two others is hardly a test of a theory, but of equation solving. Yet, lacking a way to obtain either of Stoneham's parameters from other data, there seems no way to confirm or deny her method. Andrews (1977) has questioned the procedure on different grounds. He suggests that percolation rather than diffusion, may be the relevant process to model. Since nobody has applied percolation theory to model the SW process, it is impossible to tell whether Andrews' suggestion is of any value. Andrews reiterates this suggestion in a recent note in this journal (1978).

Two SW experiments are described in articles by Bochner and others. In both experiments the SW technique was modified to allow open-ended chaining. In a high-rise building study in Sydney, Australia (Bochner, Duncan, Kennedy, and Orr, 1976), seventeen residents of a high-rise complex "were given chain-booklets with instructions to advance these through their social networks in the building."

This study was done to test the "proximity hypothesis," i.e., that in impersonal situations like a high-rise city building, proximity of residence is a major determination of interaction. The results were disastrous, but enlightening. Two interviewers went door-to-door, canvassing a random sample of 84 starters; 38 persons were not at home; 29 refused to participate (in a face-to-face request situation!) and 17 renters agreed to start a folder on its way.

Of the 17 started folders, only 6 went beyond the starter. The object was only to move the folder to "another person in this building, whom you know on a first-name basis." There was no target, and this might account for the low participation. Theirs is a preliminary research report, and doesn't add much to the literature except for the potential negative results about participation in social science experiments by urban

experiment, together with complexity, soars. We attempted a way out of this by removing all intermediate links, and creating a vast list (1267) of mythical targets. Starters were presented with the list, which also contained the town, occupation and race or ethnic background of each target. The Ss were instructed in the SW technique and asked to write down their choice, from among the people they knew, for the first link in a potential chain from them to each of the 1267 Ts. With each choice, Ss provided information on the types of choice made (e.g. mother, cousin, friend, acquaintance, or whatever), together with the sex of the choice and the reason that choice had been made. The reason could be in one or more of four categories: something about the location of T caused S to think of his or her choice; or the occupation of T was responsible for the choice; the ethnicity of T; or some other, unspecified, reason.

Six main conclusions were drawn from the data.

1) A mean of 210 choices per starter account for the "world" (i.e. the 1267 targets). This number is probably an underestimate. However, only 35 choices are necessary to account for half the world. Of the 210 choices, 95 (45%) are chosen most often for location reasons, in preference to the other possible reasons; 99 (47%) are chosen most often for occupation reasons; only 7% of the choices are mainly based on ethnicity or other reasons.

2) Choices are mainly friends and acquaintances, with strong cleavage by sex. For any given T, the type of choice used by the majority of Ss was always a friend or acquaintance, and never a family member. For any given T, the most likely sex of the choice (i.e. over all Ss) can be predicted accurately on 82% of occasions. This sex tends to be male, unless both S and T are female, or if the T has a low-status occupation.

3) Location was the usual reason for choice (out of the four categories), with occupation second most used. For any given T, the reason for choice used by the majority of Ss was *always* location or occupation, never ethnicity or other reasons. This most popular reason for choice may be correctly predicted 81% of the time for any given T.

4) The decision as to which choice was made appears to depend primarily on the occupation of T, and secondly on T's distance (near/far) from Morgantown, West Virginia, where the experiment took place.

5) The expression "having one's man in" can be partially quantified. One can define a choice to "handle" a state (e.g. Alabama) in the U.S. if he or she was chosen for two thirds or more of the targets in that state for which choices were made on the basis of location. Then, for any S, on average, half the states are each "handled" by a single choice.

6) The accuracy of Ss' recall about their networks is low, in the sense that their recall is incorrect more often than it is correct (i.e., their recall could not be put to any other use with any reliability). This confirms previous experiments on informant accuracy.

Reliability of data

Now let us suppose that, at some future time, statistical reliability has been thoroughly obtained. How should we interpret the data? And can we trust it? An example will illustrate the problem.

In 1972 we invented a clique-finder and exported it. We tested it on dozens of organized groups and found it to be very subtle. Invariably, the pictures we drew (including covert relationships, in some cases) appealed to the intuition of managers. Everyone agreed that the technique (called CATIJ -- rhymes with cabbage) was a "useful decision-making tool." It was this last part that worried us. Managers could certainly tell whether the pictures we drew conformed to what they *wished* were true. But we simply could not say that the results of CATIJ were correlated to morale or performance or any other measure of organizational effectiveness.

In 1975 we began to question the premise of this kind of work. Namely, that the input data for studies or organizational communication are accurate. In other words, if we ask people who they talk to, are their answers accurate? In a series of papers we have shown (Killworth and Bernard, 1976; Bernard and Killworth, 1977) that people do not

of steps in SW chains, etc.) which serve as stringent tests of statistical models. But, as we have said above, knowing a mean path length alone says nothing about social structure. How, then, can the SW method be modified to yield more relevant data?

First, what do we need to know? A basic description of social structure involves knowing all the people that each person in the structure knows, and the reasons he or she knows them. This is not only unwieldy, it may also be irrelevant. The precise details of each person's networks may be akin to the characteristics of individual molecules in a gas, in which bulk motion (and not molecular details) is the important quantity. In other words, data-reduction may be necessary not only for research purposes, but also for enlightenment. Therefore, the first thing we need to know is how much, and what kinds of data are needed. It seems to us that the members of a social structure ought to be able to tell us this.

Suppose three separate SW experiments are performed, all with the same target, each with, say, 200 starters. The first set of starters and all their intermediaries are given "full" information about the target. What constitutes "full" information is found by the aggregate of all questions asked by starters in the experiment discussed here and in Killworth and Bernard (1978b). To our knowledge (from pretesting) full information may include such esoteric items as the T's hair color, choice of contraceptive method, age of oldest child, and so on (!) The second set of Ss and their intermediaries are given no information but are free to request as much information as they desire. The third set are given nothing but T's name, address and occupation. (Perhaps other sets might be given less than that: just location, or just occupation, as in the work of Lin, Dayton and Greenwald, 1977).

One can then examine whether the SW chains are significantly shorter for Ss armed with a lot of information about T. If this is not the case, then a great deal of data immediately becomes irrelevant—at least for acquaintance chains.

In general, the types of experiments we have described in this paper should provide much of the data one needs to understand social structure. Then there is another, more serious, question to answer.

Second, what should we do with the data? It is embarassing to admit that we really have no idea at this stage how to answer this question, and we suspect that this would be true for most other researchers as well. Just what would a quantitative theory of social structure have in it? As we stated in the beginning of this paper, we hope that future research in social networks will enable us to answer this question directly.

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ETHNIC NETWORKS: NORTH AMERICAN PERSPECTIVES

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Assimilation and integration, two major topics of ethnic studies, can be viewed from a network perspective, as the processes of migrants "plugging into" new types of networks.[1] Usually these *processes consist of migrant or immigrant minorities' networks being "hooked up" to the majority* networks. For many migrants there is much shifting and adding to a network web. But certain persons carry with them the frayed ends of the home village network which they cannot adapt in order to "plug into" the host-community urban nets, or else which host-communities are unwilling to accept.

Ethnic Networks: Immigrants.

Ethnic immigrant networks may be regarded as either assets or liabilities, (Herman: 1978). Assets can be considered on a number of levels, as resources they give access to either information or introductions or needed tangible assistance. Occupants of crucial nodes in networks may act as facilitators, or gatekeepers (i.e. screening devices). They may offer their services "freely", expecting no more than the implicit mutuality of a diffuse friendship, or alternatively, network contact may become exploitative. Homogeneous ethnic friendship networks can be dead-end, excluding ethnic members from needed resources and acting as blocks to upward mobility. But a few enterprising members with the necessary linguistic skills may seek means of overcoming these barriers, through formation of friendships outside of their own ethnic groups.

Networks can also be considered as liabilities. The case of visible minorities presents special problems. While a number of the members of a disadvantaged minority group may remain in their ethnic ghetto, a small number may join majority organizations. These latter may "earn" their entrance through special achievements and skills, at times they may be admitted as token members in response to anti-discrimination legislation. Through earning membership or even through passing they may overcome an ethnic handicap or effectively negate it, and so join the majority. Figures I, II and III present a summary of these processes.
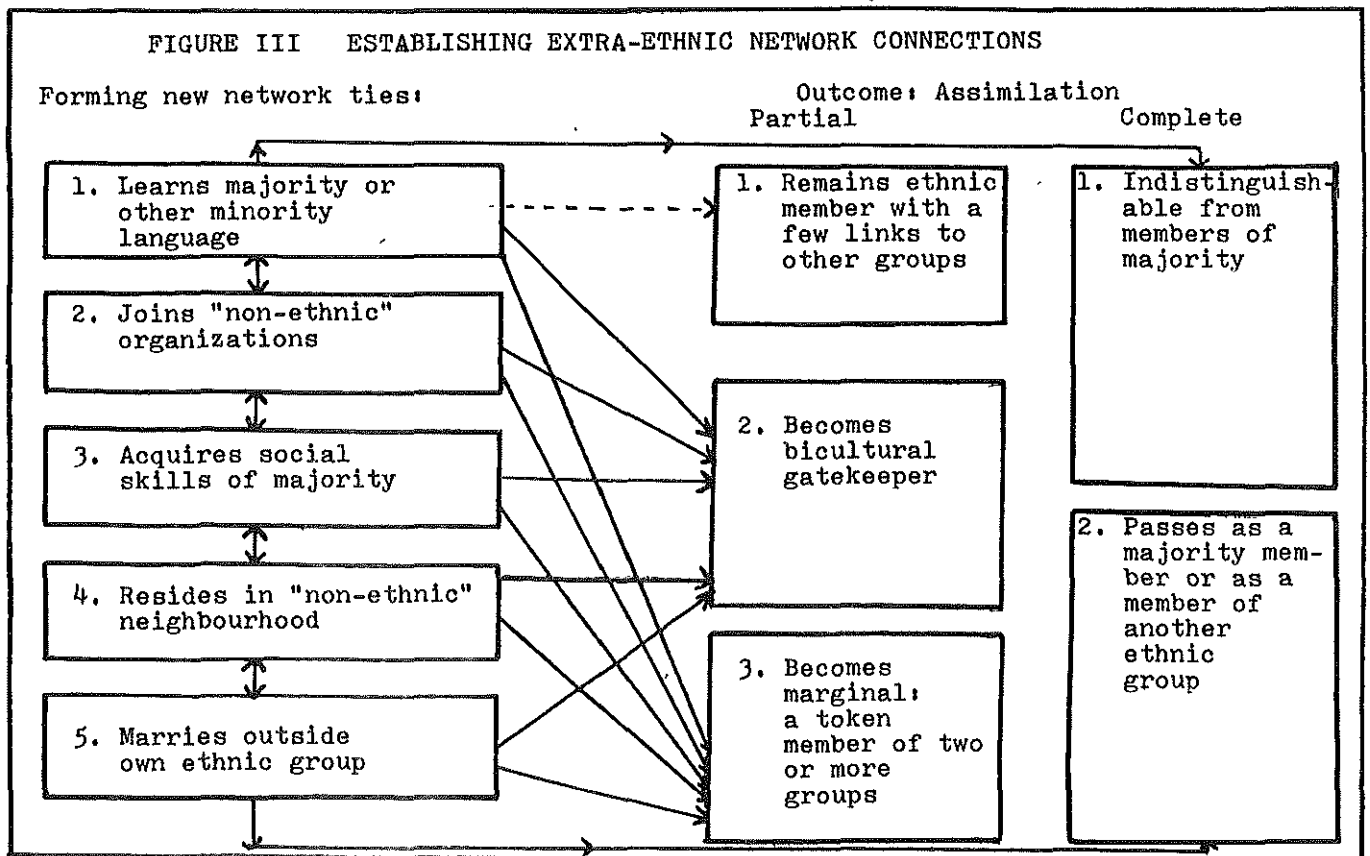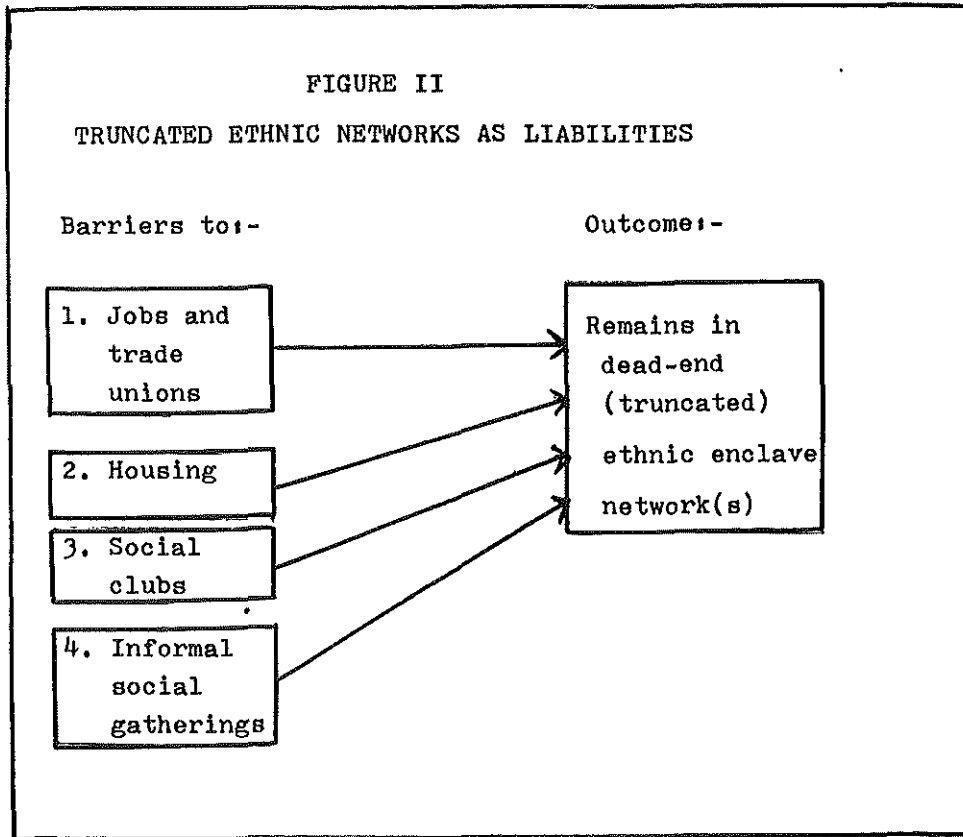
Many of the studies of ethnicity and networks are concerned with ethnic networks as assets or resources. This is very evident in the studies of migration, whether from overseas or from within a country. Since ethnic members who sponsor migrants have limited network contacts, they tend to channel the newcomers into particular types of jobs, which then become ethnic specializations. Herman's study (1978) of Macedonians in the restaurant industry is a good example of this process. Gold (1978) in his study of a Cajun community in Louisiana shows how ethnic networks can be revitalized through the activity of enterprising merchants. They use the label of "Cajun" as a resource by urging members of local communities to support their fellow ethnic members by purchases at their retail stores and by using their services. Although the term "Cajun" indicates extremely mixed ancestral background, the primary emphasis is placed upon the French Canadian component and on ties to the Province of Quebec. So the term Cajun (quasi French Canadian) is an umbrella identifier. The group grows through intermarriage and friendship and makes linked persons "Cajun" (of whatever ethnic and racial background and even with very tenuous French Canadian ties).

Through the use of ethnic networks many Portuguese immigrants (Anderson, 1974) have been channelled into construction and janitorial jobs, although they were initially recruited as farm labourers or railway section hands. Wiley (1967) writes of an occupation becoming an "ethnic mobility trap," so that in order to advance, the person has to rejoin the mainstream to commence retraining -or, as Wiley suggests in his tree metaphor, the process is likened to being left out on the limb of a tree and, in order to climb higher one has to climb back to the main trunk. On the other hand, Anderson (1974) postulates three channels, progressive, switching and stagnant, leading to either jobs with upward mobility or to dead-end jobs. The first job in the new country is an important determinant of the channel subsequently entered.

Bennie Graves (1970) in his study of particularism (family or friendship networks) in the pipeline construction industry points out that jobs which require a high degree of skill or where mistakes would be very costly do not lend themselves to nepotism. But where compatibility is the most important aspect of the work then family and friendship (and, usually, by implication, ethnic) networks are likely to be very important.

In research on elites, Clements (1975) indicates that frequently elite networks do not extend across ethnic boundaries. In part this is due to the "old boy" network extending back into the

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[1] The term "ethnic group" in sociology and anthropology has been used very loosely in most of the literature. We have used the term here with reference to community, aggregate, a bounded *entity or a series of interconnected, open-ended networks involving immigrant or native ethnics, for* lack of a more precise global term.

FIGURE II

TRUNCATED ETHNIC NETWORKS AS LIABILITIES

Barriers to:-

Outcome:-

1. Jobs and trade unions

2. Housing

3. Social clubs

4. Informal social gatherings

Remains in dead-end (truncated) ethnic enclave network(s)

FIGURE III   ESTABLISHING EXTRA-ETHNIC NETWORK CONNECTIONS

Forming new network ties:

Outcome: Assimilation
Partial   Complete

1. Learns majority or other minority language

2. Joins "non-ethnic" organizations

3. Acquires social skills of majority

4. Resides in "non-ethnic" neighbourhood

5. Marries outside own ethnic group

1. Remains ethnic member with a few links to other groups

2. Becomes bicultural gatekeeper

3. Becomes marginal: a token member of two or more groups

1. Indistinguishable from members of majority

2. Passes as a majority member or as a member of another ethnic group

or frequent transferral, keep in touch with kin, and hence ethnic networks, in other parts of the country, as Piddington (1965) has demonstrated, in a study of French Canadians in Canada. Gold (1976; 1978) also researched the network contacts of French Canadians in Quebec Province and in Louisianna, and more generally in North America.

In addition to examining ethnic networks as resources and facilitators or assets, their lack may also be perceived as barriers to scarce jobs, housing, social clubs or to trade union entrance. Some ethnic networks can be liabilities (Herman: 1978). The hiatus between networks may be bridged by "passing"- that is, switching ethnic or racial categories, and also networks, into majority ones.

Obviously the route of passing is not possible for many members of highly visible minority groups for it depends in part on playing the role of a member of the desired group so well that the actors are assumed to have the "ascribed" characteristics, and also to give every physical appearance of belonging. For non-visible minorities, it may suffice to learn a majority language (although complete bilingualism is seldom attainable before the second generation), in order to join non-ethnic organizations and also by acquiring the social skills of the majority, to pass into a more favoured ethnic group. (For example, during World War II, census statistics of Canada indicate that many persons of German background took on Dutch ethnicity.)

Some partially-bilingual members of ethnic "groups" may be so successful at entry into the majority and in cutting their ethnic network ties that they become assimilated into the majority (Maxwell, 1977). However, there is a dearth of studies completed within the framework of network analysis to illuminate our partial knowledge of this subject.

The structure of power is a major factor in network analysis as Boissevain (1974) has shown. Blau (1964: 106-112) looks at overwhelming benefactions without specifically examining ethnic networks. Shulman (1971) and Newson(1973) in non-ethnically oriented network studies separately examined mutual aid. In these latter cases, equality of power is implied.

Power may also be exploitative, both within a network composed of several ethnic groups such as the Mafia (Cressey: 1969; Blok: 1974) or between one network and another where they make contact. Illegal immigration has many facets which are indicative of exploitative networks (Samora: 1971; Anderson: 1971, 1974).

Ethnic networks may also exert power at an international level. Zurawski and Anderson (1975) have conducted a preliminary examination of the networks of Polish groups in Canada, which lead back to their countrymen in Poland and which are extended through persons working with the United Nations in New York and with the Vatican in Rome.

Perrucci and Pilisuk (1970: 1042-3) in an examination of leaders and ruling elites suggest that "power does not reside in individuals but in institutional contexts.... What is clearly needed is the identification of a network of resources." While, once again their work did not refer specifically to ethnic leadership, yet it has obvious utility in this area.

It is apparent that a fruitful field of research would be the examination of the institutional resource bases of power among ethnic leadership. For example, a well-educated Portuguese immigrant owns a travel agency and his brother owns a real estate business. Together they are very influential in the local Portugese Association and in the ethnic parish. They also tend to speak for the local ethnic community at the level of municipal politics. Through both formal roles and informal contacts which are grounded in institutions they have major power resources at their disposal.

We are in dire need of ethnic studies which bond power to networks. For power is the dynamic element which makes things happen- it can be likened to the electricity running along a power grid. When two circuits make contact, sparks may initially fly, but then energy surges through and puts to work all the elements which are "plugged into" the circuit. Perhaps the lack of studies of ethnicity and power within the context of networks reflects the fact that the sources of funding for ethnic studies come either from the government with its cautious tendency to avoid the controversial or from the ethnic groups themselves and incidentally through these very same networks which we are anxious to examine.

Ethnic Networks: Native Peoples.

In the United States and Canada the urban migration of native peoples has increased at an exponential rate over the last twenty years. Because Indians and Inuit have been the focus of study of anthropologists primarily, and because their traditional cultures and patterns of change in these cultures have been the dominant themes in anthropological research, investigation of native peoples as urban residents has been very limited. In reference to our lack of information on contemporary native peoples, a research librarian at the Library of Congress has noted that "it is considerably easier for

Indian centre, and thus serve as an alternate means of entry to urban life. These networks are second stage institutions that promote and facilitate chain migration of Indians to cities." (1978; 161) It is worth noting that in Snyder's study of Denver Navajo (1971) the rates of interaction within the Indian urban enclave declined over time and that contacts of the migrants were increasingly initiated with non-Indian persons in the city, suggesting that in this case crystallizaton of an exclusively Navajo group was not likely to occur.

Studies by Dosman (1972), Spindler and Spindler (1966), and Christie (1976) indicate that social class differences in reserve communities correlate with both patterns of migration to cities and with the extensiveness of and importance of kin-friendship networks in urban places. In each of these studies it was found that "elite" or "affluent" sectors of the reserve communities tended to be "plugged into" off-reserve networks -usually consisting of both Indian and non-Indian persons. In some instances these included middle or upper middle class non-Indians (Spindler and Spindler) or representatives of the Department of Indian Affairs (Christie: 1976, Dosman: 1972). Such bonds made the transition to urban life a simpler and more stable process. Dosman notes for his Saskatoon group that urban migrant members of the "affluents" of the reserve frequently obtained housing in middle class neighbourhoods, participated in non-Indian associations and often "passed" as whites. Nagler (1970) found a similar pattern among his "middle class" migrants. There may thus be a unique opportunity in the study of native migration to observe network formation and functioning at both the "home" and the "target" ends of the migration process. The vertical dimension - social mobility viewed as an aspect of network formation, may be of particular interest because of the relative lack of large, "institutionally complete" groups among urban native peoples due to the recency of extensive urban inflow and the relative ease with which, for "affluents" and second generation persons, passing may be accomplished.

Price suggests that such groups as the Caughnawaga Iroquois of New York and the Navajo of Albuquerque, New Mexico, are exceptional in that, in size and persistence of urban residence, these single-tribe aggregations have been able to establish themselves with some success. They are also unusual in that they represent occupationally specialized groupings (silversmithing among Navajo, steelwork for the Caughnawaga) among whom socialization for participation in these trades continues generation by generation and for whom also a relatively monopolistic control of the activity ensures -to a certain extent at least- continued, high paying employment.

Jeanne Guillemin has provided information of an uniquely valuable nature on a similar single-group urban enclave in her study of the Micmacs of Boston (1975). This may be the closest approach to a relatively full, network oriented study on a native group that we have. Here, unlike the Caughnawaga and Navajo cases, there is no special occupational niche held by the Indian group but rather a pattern of unskilled, low-paying factory labour. Guillemin found that the Indians tended to be largely working or lower class, they had a pattern of job instability (sometimes eight to twelve positions occupied in a single year) and lacked indigenously-developed help-agencies. However, in spite of friend and kin networks that functioned almost entirely within the group, and which could provide little access to either occupational or residential benefits, a pattern of informal interaction made occupational and hence urban survival possible through widely disseminated information. While the expectation of the group did not necessarily include either permanent urban residence or occupational mobility, the closely knit bonds among fellow band members ensured urban migrants of the information on and access to, marginal work positions, housing and friendship.

Conclusions: Networks and Future Directions.

There are notable gaps in our knowledge of the structure and functioning of both ethnic and native peoples' networks. Many of our observations come from "black box" inferences about the operation of networks, rather than from more direct means of measurement. We pick up hints about the important part which networks play in studies that were never designed to evaluate them. In many cases the networks are a by-product of the original research design, rather than being a variable under examination.

Network studies of ethnic groups in North America have seldom focussed upon rival factions, coalitions and conflict groups, as has been done elsewhere (Boissevain: 1974). In Whyte's analysis of "Cornerville" (1943) we have opportunity to observe the conflicting factions of an Italian neighbourhood. Whyte in effect presents the data on conflicts and coalitions in terms of networks, without, of course, using the current terminology in the field. Few additions to the literature on networks and conflict have been made since that time (However, see Lorrain and White, 1971).

Space has precluded the possibility of examining many other important topics, such as the linkages maintained through immigrants sending remittances back to the homeland and also the processes of reverse migration and their influences upon networks.

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SPECIAL JOURNAL ISSUES

Abstracts from SOCIAL NETWORKS I(1), (August, 1978).

FRANK, Ove (Statistics, Lund) "Sampling and Estimation in Large Social Networks."

An unknown network is modelled by a directed or undirected graph having vertices of different kinds. Partial information is available concerning the vertex labels and the edge occurrences within a simple random sample of vertices. Using this information we find unbiased estimators and variance estimators of such graph parameters which can be given as dyad or triad counts. In particular, we give approximate formulae pertaining to large networks.

POOL, Ithiel de Sola (M.I.T.) and Manfred KOCHEN (Michigan) "Contacts and Influence."

This essay raises more questions than it answers. In first draft, which we have only moderately revised, it was written about two decades ago and has been circulating in manuscript since then. (References to recent literature have, however, been added.) It was not published previously because we raised so many questions that we did not know how to answer; we hoped to eventually solve the problems and publish. The time has come to cut bait. With the publication of a new journal of human network studies, we offer our initial soundings and unsolved questions to the community of researchers which is now forming in this field. While a great deal of work has been done on some of these questions during the past 20 years, we do not feel that the basic problems have been adequately resolved.

SAILER, Lee Douglas (California, Irvine) "Structural Equivalence: Meaning and Definition, Computation and Application."

This paper presents a generalization of the concept of "structural equivalence", the key concept in algebraic approaches to the study of social networks. Two points in a graph or set of relations will be called "structurally related" if they are connected in the same ways to structurally related points.

It is suggested that this new definition suitably weakens Lorrain and White's categorical approach, and is more appropriate than CONCOR. Structural relatedness is compared to these approaches via several simple examples.

SEIDMAN, Stephen B. (George Mason) and Brian L. FOSTER (S.U.N.Y. - Binghamton) "A Note on the Potential for Genuine Cross-fertilization Between Anthropology and Mathematics."

Although there has been much discussion in recent years of the applicability of mathematical methods in the social sciences, little attention has been paid to the interaction of the sociological analysis and the mathematics. In this paper, an example of an extremely fruitful interaction between anthropology and mathematics is described. The interaction has, on the one hand, greatly increased the subtlety and sophistication of the sociological analysis, while on the other hand it has posed interesting mathematical questions.

WOLFE, Alvin W. (South Florida) "The Rise of Network Thinking in Anthropology."

The encyclopedic inventory of the first half of the twentieth century, "Anthropology Today", published in 1953, gave little inkling that within a few decades developing trends in social theory, in field experience, in electronic data processing, and in mathematics would combine to bring to prominence a distinctive theoretical approach using a quite formal network model for social systems. Now, sophisticated mathematics and computer programming permit sophisticated network models - networks seen as sets of links, networks seen as generated structures, and networks seen as flow processes. Although network thinking has shown a dramatic rise from the "Anthropology Today" of 1953 to the current anthropology of 1978, it is predicted to soar in the next quarter century, much of the weighty burden of network analysis having been lifted from us by ever more rapid electronic data processing.

state for which choices were made on the basis of location. Then, for any starter, on average half the states are each handled by a single choice.

(vi) The accuracy of starter's recall about their networks is low, in the sense that their recall is incorrect more often than it is correct (i.e. their recall could not be put to any other use with any reliability). This confirms previous experiments on informant accuracy

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SOCIAL NETWORKS: An International Journal of Structural Analysis

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Scope:

Social Networks is an interdisciplinary and international journal. It provides a common forum for re-presentatives of anthropology, sociology, history, social psychology, political science, human geography, biology, economics, communications science and other disciplines who share an interest in the study of the structure of human relations and associations that may be expressed in network form. It publishes both theoretical and substantive papers. Critical reviews of major theoretical or methodological approaches using the notion of networks in the analysis of human behavior are also welcome, as are reviews of recent books dealing with social networks and social structure.

There are no restrictions on the kinds of papers dealing with social networks that will be considered for publication. Acceptable papers may range from abstract formal mathematical derivations to concrete descriptive case studies of particular social networks. In every case, the editorial criteria for accept-ance will be based on the degree to which a paper makes a broad theoretical or methodological contribution to the study of social networks. The editors are therefore particularly interested in papers that attempt to uncover the processes by which social networks emerge, evolve and have consequences for other aspects of human behavior.

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Soon after the move newcomers were apt to personalize relationships with others who in different cir-cumstances would probably have been treated with more distance. For example, some of the women said that thay had talked at length with tradesmen who had come to work in the house, and the women remarked that this was unusual and due to their desire to talk with someone. It was not uncommon for family members to mention that they had entertained their real estate agent soon after the move and that he had become a friend, although such relationships only rarely remained active at the end of the year. Newcomers' relation-ships with shopkeepers and service people during the early weeks and months in the city were part of the pattern of rapidly filling empty local networks. I believe that the newcomers found these relationships provided them with both sociability and confirmation of themselves as friendly people during a time when there were few alternative local sources of interaction. During this time the newcomers seemed to want to make relationships, and only gave secondary importance to the particular other involved.

By the middle or end of their first year in the city, many of the contacts the newcomers named at first as important to them were no longer mentioned. But, while the contacts had changed, the structure of their local network had changed very little. Throughout the year, newcomers maintained many relationships with others outside the local area, and these portions of their networks generally remained completely stable in both content and structure.

I suggest that what appeared to be the newcomer's network during the early stage after the move be called a "scaffolding". A new term is used to distinguish the structure by its temporary nature and to contrast it with a social network which always includes a degree of change but involves greater stability. The scaffolding is only "for the time being". It follows the pattern of structure of a person's "normal" network, but the relationships included in the scaffolding are short-lived and are qualitatively different from network contacts. The scaffolding is supportive while different or stronger relationships develop. In time, parts of the scaffolding are cast aside almost unnoticed. Other parts develop and are integrated into a more permanent network.

Sometimes the newcomers were aware that their scaffolding was a temporary construction. This was especially true of frequent movers. For others, often less experienced movers, the scaffolding was seen as something which would develop permanence, and newcomers were often sorry when this did not happen.

The scaffolding may be a feature of overall network development which is applicable to a range of situations. The concept might be applied to people who join a new organization and develop temporary supports before building more permanent relationships. In some settings a scaffolding is formed for pleasure and support in a situation of limited duration. Examples of such settings would be a hospital (for the patient) and the singles' bar (for the person who hopes to meet someone to marry).

There is another perspective from which to view the scaffolding, which was only minimally considered in the Australian research reported here. This view focuses attention on the others who become involved in scaffolding relationships: the older residents who repeatedly make short-term relationships with a series of newcomers, or the regulars in the singles' bars who want to make a stronger, lasting relationship but have only repeated unsuccessful attempts.

In the newcomer study, I talked with school principles who expressed with conviction their belief that new children often become involved at first with less popular children who have been unable to make other friends. Some of the newcomer women found that the neighbors who first offered help and friendship were, in fact, people who had been unsuccessful in making permanent neighborhood relationships. Similarly, a number of the men found that those who were most helpful at work at the start were looking for relationships they had failed to make before. Of course, there were some older residents who befriended newcomers as a kindness, while they enjoyed many other long-term relationships in the city, and these are a different category than that just discussed.

Some of the situations of those others involved in scaffolding relationships seem similar to the anthropologists' familiar tale of being first approached by the deviant in the group. Whether deviant or not, these people represent a category worthy of investigation. Who are these people whose efforts to set up more permanent ties have repeatedly failed, with the result that their "normal" networks contain a series of short-term relationships? These are the others in the situationally-formed scaffolding, and we know very little about them. It is this category of others which contained the people newcomers cast aside as soon as stronger network supports developed.

In studies of network development and change, it seems useful to be aware of the temporary nature of early relationships, here called the scaffolding. This is a structure which provides temporary support while stronger network ties are developed. Of additional interest is the investigation of that category of others who become involved in repeated scaffolding relationships.

manipulations. Just running a correlation at various lags, as one might be tempted to do, gives a very biased answer. A great many strange and counterintuitive operations involving aliasing, windowing, prewhitening, etc., must be done to get the right answer; cf. Jenkins and Watts, 1968.)

We used three pairs of people: a pair who talked a lot; medium; and a little. The time lag over which the auto-correlations hit zero (i.e. the "short" time scales for each pair) were 98, 68, and 51 minutes, respectively. What a surprise! The less you talk with someone, the shorter is the time scale for which you talk with him -- though it isn't proportional, at least.

More interesting are the power spectra. They're rough, of course, because of the dichotomous data that went in. But there is a peak at a period of order ten hours in all three spectra, which is not exactly predictable a priori. (N.B. The "day" is 21 hours, so there is a three-hour gap removed from each record each day. This obviously messes up the power spectra a bit, so that the ten hour figure should be treated with caution. Is it significant that this is roughly half the 21-hour day?). We would appreciate it if anyone who would have predicted the ten hour peak before reading this note would tell us what it means. There's obviously a signal there, even if it's a dubious one.

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WORLD SYSTEMS ANALYSIS

Harriet Friedmann(Sociology, University of Toronto)

"Network analysts may be interested in the new area of "world systems" or analyses of the world economy. It is transdisciplinary in orientation and participation, although sociologists have been most active in establishing organizational structures. The approach in part emerged from problems encountered in many disciplines involved in studying national development, namely the arbitrary way of interpreting the relationships between variables "internal" and "external" to a nation. The world system perspective seeks to transcend international studies of interactions among nations, to formulate patterns of relations and to analyze variables at the global level. Thus, political, economic, cultural, and other types of variables can be measured using the world as entity existing in its own right, not reducible to its component parts ("social facts" aren't new in principle, but the recognition of new ones sometimes is). Moreover, the component parts need no longer be restricted to nations: producers for a world market, political agencies with direct ties at the world level, cultural institutions, scholarly journals or individuals communications of ideas, and many other types of "node" can produce a variety of networks for analysis. There have thus far been two conferences on the Political Economy of the World System, a section formed within the American Sociological Association, and the founding of the Fernand Braudel Center for the Study of Economies, Historical Systems, and Civilizations at SUNY, Binghamton, which issues an international quarterly, Review. The best source of information on research and meetings is the newsletter "Political Economy of the World System (PEWS) NEWS." This can be obtained from the editor, Fred Block, Institute of International Studies, University of California, Berkeley, Cal. 94720."

a clique analysis technique for obtaining clusters of delegations without prior bloc definition. Mokken's procedure for multiple scaling is also demonstrated. In addition to these methods for studying roll calls, procedures are devised for studying co-sponsorships including graph techniques to analyze co-sponsorships patterns and Mokken's scaling technique to examine cumulative leadership in co-sponsorships.

Four distinct time periods are included in this study. The first is from 1950 to 1955, when the Asian-African countries began to caucus, with Asian issues predominating. At the end of this period, the Bandung Conference of 1955 began to introduce greater collaboration among nonaligned countries. The addition of 16 new member states leads to the second period, 1956 to 1959, during which events in the Middle East predominated. The increment of 16 new African states in the UN in 1960 leads to the third period, 1960 to 1963. There was increased attention to African questions in this period, but also there was growing concern by Afro-Asian nations with economic problems, a concern they shared with Latin American countries. Due to the U.N. financial crisis, the General Assembly did not meet in 1964. The fourth period, 1965 to 1968, involved intensified efforts to modify the southern African situation.

To summarize the results · by region, the Afro-Asian group was stable in voting cohesion during the period studied, but its sponsorship cohesion increased considerably. The Afro-Asian countries acted as one group, on voting as well as sponsorships. The center of the sponsorship network shifted from Asian to African nations. The leadership was initially a weak Arab group but became more hierarchical in the second period, involved several wings in the third period, and became united in the last period.

The basic limitations of this study involve its inclusiveness in terms of nations, issues and time periods, and methods. For example, more study of interplay between developing and developed nations might yield further knowledge about the developing nations. Similarly, examining other issues besides colonial and socio-economic issues might show the extent to which other issues (particularly east-west issues) prevented greater collaboration among the developing nations in the earlier years studied. Because of data availability, the evolution of the Group of 77 since 1968 is missed. Perhaps most surprising in a methodological analysis is the use of new techniques without comparing the results with what more conventional (particularly factor analysis) procedures would have yielded. Some of the techniques employed here do answer questions which the previous techniques could not have addressed, but it would have been valuable to see where the Stokman results depart from other analyses. Yet these limitations should not detract from this study; the project is already very large, and expansion along any one (let along all four) of these lines would have made it all the more complex.

A Theory of Group Structures: Basic Theory (Vol.I); Empirical Tests (Vol.II). By Kenneth D. Mackenzie. _New York: Gordon and Breach, 1976._

James Taylor (Section de Communication, Université de Montréal). (Used by Permission from Systemletter _6, (Feb. 1978)_

K.D. Mackenzie's A Theory of Group Structures is a difficult, but original and important work; it will almost certainly eventually be adjudged a landmark contribution to the study of organizational processes. It should appeal to a wide audience, including researchers in domains as varied as general systems and organization theory, the social psychology of group behavior, and communication theory.

Mackenzie sets out to propose answers to two questions: (i) how to characterize the notion of a group structure, and (ii) how to characterize the notion of structural change.

No concept has been more used and less well defined in communication studies of group behavior than that of structure. The root of the problem has long been identified: group structures tend to be nonstationary, or time-dependent. What structure one perceives in a group depends on when one looks and what the members of the group are collectively doing when we look. For example, a baseball club has one observable structure for when it is batting, one for when it is fielding, and one for the clubhouse, one for before games, and one for after (and probably different structures for after good games and bad games). But if group structure is a time-dependent, multi-dimensional structure, a new problem is posed: what is an appropriate unit of observation? Or, in other words, how can one decompose the elements of structure?

The answer given by Mackenzie is daringly simple. The latter argues that the task process serves to impose on the group a set of structural options which may differ for every phase of the task. Phases are bounded by milestones, which are attained when a set of communication activities has been accomplished. Hence one begins one's analysis of group structure by first looking at the logic of the task. For each logically-definable phase of the task, one obtains a completed "who-to-whom" matrix of communications, of what Mackenzie calls a first-pass group role matrix. This frank appeal to logic brings Mackenzie's work into line, not only with previous work by Roby, Lanzetta and Flament, but also with the general

Warren argued that the transfer of decision-making from local to state and national levels had strengthened vertical linkage and weakened horizontal integration. The political machine performed the integrative function when the socio-political context fostered dense neighborhood-based multi-stranded interpersonal networks. The political boss promoted and protected the ethnic community through vertical linkage to a city-level decision center.

Changes in political, economic and educational structures created conditions where neighborhood-based interpersonal networks became ineffective mechanisms for political influence, suggesting that a federal effort to create a functional alternative to the political machine requires: (i) the activation of an aspatial ethnic network, (ii) resources to create vertical linkage to the sources of power and resources, (iii) vertical linkage between upwardly mobile members of the group and the grass roots community, and (iv) horizontal linkage within the community.

The study examines the extent to which federal resources for bilingual education have enabled the Puerto Rican community to develop the specified linkages. Data, collected over a four-year period, are based on interviews with participants and observers of key events, observation of meetings, conferences and court proceedings and analysis of numerous public documents. These data were used to identify and describe the activist's network and its function in the policy process.

Findings suggest that, so far, the Puerto Rican community has accomplished only the first two requirements specified above. The most visible activists were members of a pre-existing aspatial interpersonal network. The decision which created access to jobs in the school system stemmed from a lawsuit sponsored by a city-level group, supported by members of the aspatial network, with minimal grass roots involvement. The lawsuit was resolved in a consent decree whereby the Board of Education agreed to provide bilingual education programs on a city-wide basis.

While the consent decree achieved a formal policy change, implementation was controlled by non-governmental groups—the administrators and teachers inside the school bureaucracy who perceived bilingual education as a threat to their professional interests. Their fears were compounded by the convergence of the City's financial crisis with the date for implementing the consent decree. Thousands of black and white teachers were laid off at the same time that the decree required the hiring of more Puerto Rican teachers. Mounting opposition to bilingual education by the teachers' union suggests that the Puerto Ricans may have to seek other resources to create vertical linkage to the grass roots community.

The study makes three theoretical contributions: (i) it identifies (a) the social process which replaced the political boss to promote and protect the interests of the minority community—defined here as an aspatial network, and (b) the structural changes which make it difficult for new groups to develop effective aspatial networks in the present, (ii) it specifies the dimensions of an effective network—a vertical dimension which links it to the sources of power and resources and a horizontal dimension which links it to the grass roots community, and (iii) it suggests that sometimes a weak and diffuse network is more functional than a dense or concentrated one.

ETHNICITY AND NETWORKS AMONG THE TORONTO MACEDONIANS

Peter Vasiliadis (M.A. Thesis, Anthropology, York U., Ontario)

This study is directed toward an examination of the adaptation of a rural ethnic group to a foreign urban environment. It investigates the migration patterns and especially the structural organization of Macedonian ethnicity and of social networks as co-determining factors for their adaptation.

Ethnicity and networks are utilized together as they cannot be easily separated and should not as they are both important as dependent factors in the maintenance of the ethnic group. The networks operate from an individual, intrapersonal up to a wider cultural level with no clear starting point as they are also interdependent elements.

The Macedonians are a relatively successful immigrant group which keeps private the structural manifestations of their ethnicity through the use of their social networks. The Macedonians have adapted to Canadian society at a partial Macro-level yet retain a tightly organized ethnicity at the Micro-level. The social networks of the original Macedonian environment has been realigned in their new environment so that in Toronto they are dependent on household-, neighbourhood-, and village-networks in contrast to other Mediterranean groups.

Throughout the thesis I have utilized a partial systems approach. Social networks used within is viewed as a communications system. The system of communication is in the end a network relationship among parts of the system which I feel offers the beginnings for a more useful grounding in social networks.

that would be needed for conventional matrix storage. A side benefit of this approach is that PL/I has efficient and flexible capabilities for carrying out useful bitstring manipulations. The second important feature is that the computation time for the structure search procedures is greatly reduced by the fact that they operate on connected components of graphs, which are usually much smaller than the input graphs themselves. In future versions of SONET, this feature will be utilized to reduce the amount of core needed as well. An equivalent result can be achieved in SONET-I by the somewhat laborious process of using the bitstring representation of a component as input to CAT2. MATCOMP can then produce the adjacency matrix of that component, which can then be passed to the other procedures.

Capacity to Utilize Attribute Data

A unique feature of SONET-I is its capability to utilize a dataset containing information on attributes of individuals represented by the rows and columns of a sociomatrix (Seidman and Foster 1978). The importance of incorporating such information in structural analysis is readily seen by considering the fundamental importance of sex markers in kinship diagrams. Patrilineages, for instance, could not be represented without them. In SONET, lineages could easily be represented as connected components in a patrilineal descent graph--i.e., in a parent graph in which all edges terminating in females have been removed. The use of such attribute data is even more critical if analysis of friendship and other non-kinship networks is to be successful (e.g., friends are usually the same sex and about the same age).

In SONET-I, attribute data is integrated into the total analytic procedure in three programs which have different functions. These functional differences can best be seen by making two distinctions. First, as the examples above suggest, we may consider attributes of individuals (e.g., sex) or we may consider attributes jointly for pairs of individuals (e.g., age difference). CAT1 utilizes individual attribute data, while CAT3 is concerned with pairwise attribute data. Regardless of whether individual or pairwise attribute data is considered, the SONET-I programs use it as the basis for one or another kind of subset operation. The basic distinction among the different types of subset operation is that between the physical subsetting and the conceptual subsetting of a list or matrix. In the former, an actual sublist or submatrix is produced, and the length of the list or order of the matrix is likely to be reduced. In the latter, the length of the list or order of the matrix remains unchanged; in a matrix only the set of non-zero entries is actually subset, while in a list it is the nonzero entries in a corresponding bitstring which are subset. Both CAT1 and CAT3 perform conceptual subsetting while CAT2 performs physical subsetting.

It should be noted that missing data in the attribute dataset can be handled by the SONET procedures in two ways. CAT2 can be used to physically eliminate missing data cases from the analysis. On the other hand, rather than searching for missing data, the programs can set up filter conditions which select cases with certain specified attributes, lumping missing data cases together with those which do not possess the desired attribute.

FUNCTIONAL OVERVIEW OF SONET-I

SONET-I can be functionally divided into four sections concerned roughly with (a) network data input, (b) data transformation, (c) structural analysis, and (d) characterization and comparison of structures.

Section 1: Matrix Construction

Section 1 consists of one program (MATCOMP) which constructs sociomatrices and searches for the connected components in the graphs which they represent. Structural analyses which cannot be performed on extremely large matrices can be done on the components taken sequentially, and in general nothing is lost.

Section 2: Data Transformation and Preparation

Section 2 consists of four programs for subsetting the matrices, combining them, and otherwise transforming them in preparation for structural analysis. These programs are of two types:
    A. Programs which perform subsetting operations on the basis of attribute data
       (CAT1, CAT2, CAT3)
    B. A program performing matrix operations on relations (OPMAT)

Section 3: Structural Analysis

Section 3 consists of a structural analysis program which (a) searches for graph theoretic structures of several kinds and (b) constructs reduced graphs.

Section 4: Comparison and Characterization of Structures

Section 4 contains facilities to allow characterization and comparison of structures. This is an

REVIEW OF "A SPECIFICATION FOR A PACKAGE FOR THE ANALYSIS OF SOCIAL NETWORK DATA - 'SNAP." By David DEANS, Clyde MITCHELL, and Clive PAYNE (Nuffield College, Oxford).

Greg Heil (Computer Science, Toronto)

An abstract outlining the goals of the project which produced this package was printed in CONNECTIONS 1 (#2) p. 21. The first version is now apparently complete. Here I have attempted to glean the important features of SNAP as they relate to the criteria: Portability, Efficiency, Extendability, Capabilities, Generality, and Ease of Use.

1. Portability: A major effort seems to have been made by the designers of the system to ensure portability. It was written in standard fortran where ever possible with machine dependent features isolated in as few routines as possible. Their attempt apparently was only partly successful with respect to character handling on the CDC machines. The system is largely disc-resident thereby requiring a minimum amount of core.

2. Efficiency: This is hard to judge without details on their algorithms and code. Their data structures were apparently designed with the goal of minimizing storage use. This is generally the main determinate of cost when data must be transfered during execution. One would expect then the package to be usefully efficient for networks of quite large numbers. Actual limitations depend on machine capacities. If the networks are sparse then the size of the largest manipulable network grows linearly with the machine size. If the networks are dense then the largest network size is proportional to the root of the machine size.

3. Extendability: Here again the data structure is the key issue. Does your data fit into some combination of the following slots?:

(i) Sets: element lists with labels
(ii) Linkages: interactions between set elements
  a. Graphs: linkages with the same Domain as Range; b. Relations: Domain possibly different from Range.
(iii) Valued Linkages: the above with values for the individual linkage of either binary, integer or
        real number type
(iv) Atributes of set elements
(v) Scalors
(vi) Network defined as a collection of the above having a common Domain and Range set

Their use of these types appears to be well thought out and it should be possible to extend the system to any analysis involving the above data types. Few details however were given on how one might write one's own application package. In a field where so little is settled this capability is an essential component of a satisfactory package. (See the comment on Generality below.)

4. Capabilities: The system is still quite small with regard to the tasks it performs. Here is a list of the application tasks currently performed. (Note-details of exact options have been suppressed for brevity.):

(i) MEASURES: Graph measures s.u. distance, centrality, and node degrees.
(ii) SUMMARY: for any linkage data type computes coordinality distribution and statistical measures
        for ties of each element in the Domain (Range) of the relation.
(iii) BREAKDOWN: Same but restricted to unvalued linkages.
(iv) HUBBEL: Hubbel (1965) I/O analysis of unvalued graphs: degree of connection between elements
        though all weighted n-step paths.
(v) REORDER: permutes graph to reveal clusters by maximizing nearness of entries to diagonal or by
        forming partitions with high internal cohesion.
(vi) CLIQUES: computes 4 types of cliques for graphs.
(vii) PRINCOMP: forms principal component analysis of Networks.
(viii) CLUSTER: forms simple or hierachical clustering on symmetric valued graphs.

5. Generality: By generality I mean the number of types of analysis the package performs as it is or as it can be directly coded in the command syntax. The command syntax is virtually identical to SPSS and shares its limitations. The function performed by the various commands are as follows:

(i) ENTITY DECLARATION: see 'Extendability' above.
(ii) MANIPULATION: elementary matrix and scalor operations
(iii) DATAMANAGEMENT: input, output, interface to other packages and conversion facilities.
(iv) TASKS: see 'Capabilities' above.

Ommitted here are control statements. There is no facility for repeated execution of tasks under program control. This capacity is crucial for the generality criterion. No matter how complete a set of Application Tasks are provided, the system will always be limited to that set - unless some form of conditional branch is added. Because of the excellent data structures provided by the system then tasks which generate networks algebraically, could naturally and easily be performed by the command language with the simple addition of a control syntax.

6. Ease of Use: Given the mathematical sophication required of the scientist in this field the package is about as easy to use as is conceivable. The definitions and data types are natural. The system is transparent with regard to details about parameters of the input data. Finally, few opportunities are provided by which the user could burn his fingers. Hence this is a simple package, is easily understood, and has great potential for application to network data with only minor modifications.

ces perspectives ne semblent pas avoir de critères de sélection, et analysent seulement les cas manifestes de revendications. Il est suggéré qu'une interprétation adéquate ne peut être arrivée que sur la base d'une recherche qui essaye d'expliquer les relations fondamentales de pouvoir dans le système urbain, particulièrement quand il s'agit de situations d'inertie ou de non-revendication. La seconde partie de cet article est un compte rendu d'une recherche empirique sur la suppression d'un mouvement ouvrier de revendication à Londres contre des politiques de logement 'pour les masses'. Cette recherche montre de quelle façon la portée et l'exactitude des interprétations marxistes et dites 'structuralistes' peuvent être avancée afin de prendre en compte ces critiques. En même temps, elle explore l'utilisation des pouvoirs coercifs par les autorités locales anglaises et l'influence exercée par les corporations industrielles sur la politique du logement.

FRANK, Ove. "Estimation of Graph Totals." _Scandinavian Journal of Statistics_ 4 (1977): 81-89

A real variate is defined for the ordered pairs of nodes in a finite graph. We consider the problem of estimating the total of the variate values from the information provided by a node sample. The node sample is selected by a known probability sampling design, and the variate values are observed for the pairs of nodes in the sample. Several concrete interpretations of the estimation problem are indicated. Unbiased estimators and variance estimators are given. In particular the results are applied to arc frequency estimation in a simple directed or undirected graph. (from Stanley Wasserman)

FRANK, Ove (Statistics, Lund). "Estimation of the Number of Vertices of Different Degrees in a Graph." Report No.: LUSADG/SAST-3052/1-9(1978), Dept. of Statistics, University of Lund, S- 220 05 Lund 5, Sweden.

An unknown graph is partially observed by selecting a vertex sample and observing the edges in the subgraph induced by the sample. The sample is selected by either simple random sampling or Bernoulli sampling. We consider the problem of estimating the numbers of vertices of different degrees in the unknown graph by using the sample information. Unbiased estimators are given and their variance-covariance matrix is shown to depend on a set of intrinsic graph parameters which can hardly be satisfactorily estimated from the sample information without further assumptions. In particular, the problem of estimating the number of isolates (vertices of degree zero) is considered in some detail.

FRANK, Ove (Statistics, Lund). "Estimating a Graph From Triad Counts." Report No. LUSADG/SAST-3053/ 1-24 (1978), Dept. of Statistics, University of Lund, S-220 05 Lund 5, Sweden.

An empirical graph $\tilde{G}$ is described by a random graph model which generates $\tilde{G}$ from an unknown graph G by independent removals and additions of edges. We consider the problem of estimating G by using the triad counts in $\tilde{G}$, i.e. the numbers of different induced subgraphs of order three in $\tilde{G}$. We describe methods of estimating a transitive graph and a forest, and we indicate a possible approach for a general graph G.

FRANK, Ove (Statistics, Lund), "Inferences Concerning Cluster Structure." (May, 1978)

A model of cluster structure is considered in which observational errors occur in determining whether or not two objects belong to the same cluster. The true cluster structure can be represented by a transitive undirected graph, and the observed structure is generally not transitive. It is possible to make inferences concerning various parameters in the unknown cluster structure by using a set of subgraph count statistics. The first- and second-order moments of these statistics are investigated and estimators are suggested for the number of clusters, the mean cluster size and some other parameters. Some properties of the estimators are illustrated by simple computer experiments.

FRIEDKIN, Noah E. (Sociology, Chicago). "University Social Structure and Social Networks Among Scientists." _American Journal of Sociology_ 83 (6), (May, 1978): 1444-1465

Findings are presented that describe the pattern of research communication among faculty in the six physical science departments of an elite American university. The findings provide a basis for modifying and extending Peter Blau's analysis of the relationship between university social structure and the pattern of communication among university faculty. Blau regards the formation of integrative multi-disciplinary social networks within university communities as highly problematic; he suggests that academic departments are the primary site of integrative social networks within universities. My findings suggest that academic departments are not appropriate units for describing the pattern of research communication among university faculty, at least in the physical sciences, and that university social structure can foster an integrative social network which is multidisciplinary in composition.

against various possible changes in threshold distributions is considered. Stress is placed on the importance of exact distributions for outcomes. Groups with similar average preferences may generate very different results; hence it is hazardous to infer individual dispositions from aggregate outcomes or to assume that behavior was directed by ultimately agreed-upon norms. Suggested applications are to riot behavior, innovation and rumor diffusion, strikes, voting, and migration. Issues of measurement, falsification, and verification are discussed.

GUREVITCH, Michael (Open University, England) and Alex WEINGROD (University of the Negev). "Who Knows Whom? Acquaintanceship and Contacts in the Israeli National Elite." Human Relations 31 (3), (1978): 195-214.

Based upon data collected by means of a mailed questionnaire, this article examines the widely held assumption that "everyone knows everyone else" within the compact Israeli national elite. Data were collected on acquaintanceships among political, bureaucratic, economic, professional, academic, and cultural-artistic elites. The elites tend to be drawn from among the European-origin well educated minorities, although such features as kinship, schooling, and army service are unimportant for making initial contacts. The analysis shows that elite members do not all know one another, although groups such as politicians and media specialists are acquainted with a strikingly high proportion of elite members. Moreover, there appears to be a central core group within the elite composed of politicians, bureaucrats and economic specialists who are strongly acquainted with one another. Finally, the findings indicate the demise of the elite "generalist," and their replacement by functional, well trained specialists.

LEUTZ, Walter N. "The Informal Community Caregiver: A Link Between the Health Care System and Local Residents." American Journal of Orthopsychiatris 46 (4), (Oct., 1976): 678-688

A community mental health agency identified a group of informal caregivers, "local people to whom residents turn for information and advice," in an Hispanic community of East Harlem. This group (n=29) of clergy, spiritualists, merchants, and social club owners reported on a simple..."checklist for each contact he or she had with a person seeking help with a drug or alcohol problem." In addition, they were divided into two groups, one of which was given a referral guide with weekly informal training in particular substance abuse resources......Goals in this exchange were...:to make them aware of the relative seriousness of different types and patterns of drug and alcohol use, and...to help them see which types of programs were appropriate for which problems." "Results suggest that formal human services agencies and their intended clientele would benefit by increased efforts on the part of these institutions to locate and work with community caregivers." (from A.V.A.S.; used by permission)

LEVY, Paul S. "Optimum Allocation in Stratified Random Network Sampling for Estimating The Prevalence of Attributes in Rare Populations." Journal of the American Statistical Association 72 (Dec., 1977):

This work considers estimation of dichotomous characteristics of rare populations by sample survey. In particular, we investigate optimum allocation when a network sampling rule (also called multiplicity rule) is used to link members of the rare population to enumeration units and when the enumeration units are chosen by stratified random sampling. For this situation formulas are derived for optimum allocation under the restriction that an enumeration unit is linked to at most one member of the rare population, and the cost efficiency of network sampling rules is compared to that of conventional enumeration rules. (from Stanley Wasserman).

PICKVANCE, C.G. "Marxist Approaches to the Study of Urban Politics: Divergences Among Some Recent French Studies." International Journal of Urban and Regional Research 1 (2), (June, 1977): 219-255

Cet article commence en mettant l'accent sur le débat entre Lojkine et Poulantzas pour identifier les divergences (ainsi que certaines convergences) au sein de la théorie politique marxiste. Ceci permet de passer à un examen critique de deux études récentes majeures sur la politique urbaine en France partant d'une perspective marxiste--celles de Lojkine et de Biarcz et al. Il est montré que les points forts et les points faibles de ces études concrètes relèvent des démarches théoriques qu'elles adoptent. La mise au jour de ces points est destiné à développer les études subséquentes dans ce domaine.

WELLMAN, Barry and Barry LEIGHTON. "Networks, Neighborhoods, and Communities: Approaches to the Study of The Community Question." Urban Affairs Quarterly 14 (3): (forthcoming - March, 1979).

The Community Question is the classic sociological inquiry into the fate of 'community' in the face

form of "cheap labor," enabling U.S. capital to bypass regulations against the importation of cheap labor. The cheapness of Korean labor is rooted in conditions in South Korea. A "split labor market" analysis is made of the relations between various classes in the U.S. and Korea resulting from a gross discrepancy in the price of labor between the two countries. This international "system" is, to some extent, replicated in the relations between the immigrant community and the surrounding society. Of particular importance is the parallel "middleman" role of the South Korean government and immigrant petite bourgeoisie in helping to keep Korean labor "cheap" for the benefit, in part, of U.S. capital. Implications of both international and local split labor markets for U.S. workers are discussed.

CLEMENT, Wallace (McMaster U.). "Uneven Development: Canada and the World System."

Canadian society has been shaped by external forces which have distorted the class and power structure of the nation. The result has been uneven development with many of the productive sectors of the economy under foreign control, while at the same time the spheres of circulation and service have been Canadian strongholds. This affects not only the Canadian power-structure class formation, but also its external relations. Within the world system, Canada has a 'go-between role' mediating between the U.S. and Third World nations; it also has direct investments flowing from its strongholds in finance, transportation, and utilities. This study is based on an analysis of the 113 dominant Canadian and 194 dominant U.S. corporations and the elites which control them.

CRANE, Diana (U. of Pennsylvania). "Reward Systems in Avant-Garde Art: Social Networks and Stylistic Change."

Is the development of a new style avant-garde art accompanied by the emergence of social networks that are analogous to those that facilitate cognitive change in basic science? Social factors in the emergence of three styles--Abstract Expressionism, figurative painting, and Photo Realism--were examined using interviews and documentary materials. The development of Abstract Expressionism was characterized by both the emergence of social networks and a recognizable 'paradigm' in the sense of a world view and a set of specific tools and procedures. Figurative artists are linked by extensive formal social networks, but stylistic consensus is lacking. The Photo Realists have a distinct world view and a set of techniques and procedures, but informal social networks do not appear to be cohesive. The reward system for avant-garde art, in which material rewards have become more important than symbolic rewards during the past decade, may have affected the development of Photo Realism and figurative painting.

HANNA, William John and Alex STEPICK (U. of Texas, Dallas). "The Multiple Dependencies of Small Towns."

Probed are some of the implications of the internal colonialism literature against data from the secondary cities of Mbale, Uganda, and Oaxaca, Mexico. Focus is on three propositions: (i) the government is not a neutral institution external to group conflict within its jurisdiction, (ii) elites at the periphery are not semiautonomous, but are better described as collaborators with the center, and (iii) political participation at the periphery is discouraged by center and (with exceptions) periphery elites. Evidence tends to provide confirmation for the first propositions, but the second and third must be modified to account for the observations that elites in Oaxaca are more autonomous than those of Mbale, and that there is also more local participation in political activity in Oaxaca. To explain these differences, seven working hypotheses are offered: (a) vertical conflict is dependent upon a critical mass at the periphery, (b) the more recent the Ru-to-Ur migration of the townsman, the less likely he is to engage in oppositional political activity, (c) horizontal conflicts among those at the periphery lessen vertical conflict, (d) potential intersector alliances politicize the individual sectors and create a synergistic political effect, (e) the stronger the political machine, the weaker the political protest against the regime, (f) the greater the potential (structural) Ur unrest, the more likely political opposition will be tolerated in the periphery to relieve political pressures that otherwise might be directed at a repressive center, and (g) the weaker the economic ties between center and periphery, the more political autonomy will be allowed the periphery.

LASLETT, Barbara (U. of Southern California). "Household Structure and the Social Organization of Production: Los Angeles, California in 1850."

Family maintenance requires access to the means of subsistence for the members included within it. Thus, the organization of productive activities--through which sustenance is obtained--should have an impact on family units. The results of research on the city and county areas of Los Angeles, Calif. in 1850 provide confirmation for this view by demonstrating that the organization of production--for subsistence in the countryside and for exchange in the town--affected the structure of the coresident domestic group through its impact on the family's access to its own subsistence.

PEIL, Margaret (Centre for West African Studies Birmingham U., England). "Adaptation to Urban Life: A West African Comparative Study."

The Goldlust and Richmond model of adjustment to urban life was developed from a study of immigrants to Toronto. Reported is a test of its validity in eight West African towns. The model suggests that adjustment varies with the premigration characteristics of the migrants, the conditions of their migration, the nature of the society into which they move, and the length of their stay. The attitudes and behavior of migrants are likely to change in the process of settling down in a new town, but migrants may also bring about modifications in the society, especially if they arrive in large numbers and/or are able to assume positions of political or economic power. Where the host population is better educated and has better access than migrants to economic, political, and social resources, the migrants may suffer discrim-- ination and feel the need to group together for mutual protection. In West African towns, however, migrants are often at least as well educated as the indigenes and it may be the latter who feel discriminated against. Data come from interviews with about 150 men each in Tema (a new industrial town and port on the Ghanaian coast) and Ashaiman (a suburb); Aba and Abeokuta (provincial marketing and administrative centers in south- eastern and southwestern Nigeria); Ajegunle (a suburb of Lagos, the Nigerian capital); and Kakuri (an industrial suburb of Kaduna, the former capital of northern Nigeria). Scales were developed to measure relative premigration advantages, strength of social contacts, economic position, political efficacy, and satisfaction with urban life. The strength of correlations between these scales and the effect of length of residence and of living in towns of varying characteristics on the migrants' satisfaction are discussed. The widespread intention of West African migrants to return home eventually provides considerable contrast to the Toronto model. The numerous differences between the towns suggest that any urbanization model should undergo considerable comparative testing before it is accepted.

SIDERI, Sandro (Institute of Social Studies, The Hague, Netherlands). "Development and Dependence: The Emerging Regional Division of Labor in Latin America."

The main elements contributing to a restructuring of the world economic system and their effects on Third World countries, mainly in Latin America, are exposed. The transnational production and distri- bution structure of the multinational corporations (MNCs) constitute the supporting element of this process, while effecting increasing denationalization of large economic sectors. Third World govern- ments must be willing to accept this consequence while guaranteeing low wages, political stability, appropriate business climate, etc. MNCs and Third World leaders have a mutual interest in these guar- antees. Military regimes constitute the crucial element in the establishment of such a system. Their emergence has been facilitated by the development of the national security doctrine, which gives a global or regional dimension to national strategies. These strategies are characterized by strict state control of wages; monopolization of basic industries, energy and infrastructures; and liberal foreign trade, foreign investment, and income distribution policies. While adoption of this model in Brazil has generated a fast industrialization rate and overall growth, together with increasing inequalities and distortions, its adoption in other countries, such as Chile, is causing rapid elimination of existing industries and obstacles to new ones. Industrialization of some subcenters and recession in rich count- ries require elimination of existing or potential regional competition. The resulting regional integr- ation is very effective, though its cost seems high and unequally distributed.

SIU, Bobby C.Y. (McMaster U.). "The Origin and Development of the Women's Revolutionary Movement in China, 1900-1912."

Four propositions are dealt with: (i) the ideology of a social movement is created and justified in the larger political context, (ii) preexisting networks are conducive to the rise of the movement, (iii) protest activities of the movement increase when the policies of political differentiation deviate from the demands of the movement, and (iv) protest activities of the movement increase when the application of social control is inconsistent and/or ineffective. An examination of the women's literature in this period shows that the ideology of the women's revolutionary movement included: (a) the unification of women, (b) the promotion of women's rights through political activism, (c) patriotism, and (d) tactics of national salvation. Such ideology of "political women" was similar to that found in the Chinese news- papers. Educated women constituted a significant proportion of the movement, especially in its initial phase. To determine the organizational prerequisites of the women's movement, three geographical regions were compared: Tokyo (Japan), Shanghai, and the Cantonese region. Three types of networks were nec- essary to the emergence of the movement in China: women's schools, student associations and political organizations. In the early 1900's the few Chinese women who were studying in Tokyo joined student associations which were in the process of politicization. Early women's organizations and periodicals were established to supplement the already existing revolutionary forces. During the course of the movement, the Chinese women founded at least forty-four organizations and nine periodicals which were explicitly revolutionary. The primary demand of the Chinese women was the abolition of the Manchu regime; it was argued that only with the regime's downfall could Chinese women be liberated. A government prop-

UJIMOTO, K. Victor (U. Guelph). "Postwar Japanese Immigrants: The Allocation of Time to Organizational, Social, and Leisure Activities."

Because official Canadian policy for multi-culturalism is directed at promoting cultural pluralism, studies exploring the relationship between employment and adaptation to Canadian society by ethnic groups are important. One way in which aspects of adaptability can be determined is by examining what people do in time and in space. It is hypothesized that engagement in isolated activities in which social contact with others is minimized or nonexistent will undoubtedly have an impact on the kinship and communication structures of ethnic groups. This implication may or may not be valid for some ethnic groups. Focus is on the variations in activity patterns based on a questionnaire survey of 100 postwar Japanese immigrants to Canada. Chapin's aggregated model of human activity pattern is used to determine the differential allocation of time as influenced by the propensity or readiness to engage in the activity and the opportunity to engage in that activity. Data suggest that the phenomenon of differential allocation of time by Japanese immigrants for voluntary organizations, social, and leisure time activities can be explained with reference to three conditions: (i) the immigrant's accomplishments and experiences during the initial period of residence in Canada, (ii) the cultural and social characteristics which the immigrants brought with them from Japan, and (iii) the immigrant's social interaction at work. An explanation is offered for why some Japanese immigrants are able to allocate more time to voluntary organizational activities than others who limit their nonwork time activities to a small network of personal affiliations or to individual leisure time activities.

WELLMAN, Barry (Toronto). "The Community Question and Social Networks in Toronto"

A network analytic approach to the Community Question is proposed in order to separate the study of communities from the study of solidarities. The development and theoretical implications of three arguments about the Community Question are reviewed: The Lost argument contends that communal ties have become attenuated in industrial bureaucratic societies; the Saved argument contends that solidary communities remain as important sources of sociability support and mediation with formal institutions; the Liberated argument maintains that while communal ties still flourish they are no longer clustered in solidarities. Data from the study of 845 networks of "intimates", focused in the Borough of East York, Toronto, Canada suggests that both the Liberated and Saved arguments are viable network patterns under appropriate conditions, for social systems as well as individuals.

ZEITLIN, Maurice and Richard Earl RATCLIFF (U.C.L.A.) "Class Domination, Political Hegemony, and State Policy: The Case of Chile."

How have the contradictory intraclass locations of land and capital within the dominant classes of contemporary capitalist countries affected state policy and class action? There was a period in capitalist development during which the landed aristocracy and emerging capitalists constituted contending classes engaged in continual struggle for social supremacy and political hegemony. Even after the definitive ascendance of capitalism, large landowners retained a determinate location within it as a specific "class segment" . How, to what extent and with what consequences the contradictions between these class segments become politically expressed is determined, it is hypothesized, by two social processes: (1) by whether the given "moment" of economic development in which land and capital are implicated tends to constrict, stabilize, or spur the expanded reproduction of their underlying structural locations, or (ii) by how and to what extent the historically determined forms of production tend to differentiate/integrate the occupants of these structurally contradictory locations. Theoretically, the segment of the dominant class which occupies the decisive location in the process of production will have its specific interests actualized over time by organized class action and/or state policy. This is the "hegemonic segment" of the dominant class. The actual political action of the contending segments and their capacity for political leadership is itself a significant determinant of their relative political power. The political economic relevance of such intraclass leadership is greatest at th ose historical moments when unwanted forms of social production are originally being forged. In turn, these class struggles also sculpt and restructure the internal relations within them. Intraclass hegemony may also be crucial in assuring the realization of a given class segments' interest by the appropriate uses of state power. This theoretical framework is applied to the analysis of three moments in Chilean historical development: (a) mining capital's struggle for state power in the mid-nineteenth century, (b) the Balmaceda epoch and civil war and (c) the period of the Left's political rise in the 1960s.

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