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Notes on the Constituents of Social Structure. Soc. Rel. 10 - Spring '65

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Notes on the Constituents of Social Structure

Soc. Rel. 10 – Spring '65

by Harrison C. White

Net

A "net" can be drawn as a set of points with straight lines connecting various pairs of points. In our usage the points represent persons or social parties and each line segment indicates a given kind of social relation between a pair of persons. If the line segment has an arrowhead, it represents an asymmetric relation. In any case, the relation must be familiar and clearly defined in the eyes of the people in the set so that it makes sense to say 1) each pair of people either is or is not in that relation and 2) the relation between one pair has about the same type of content and significance as the relation between all other pair. This is the obvious part of our definition of a "net."

We sharpen this obvious definition of a net by adding further stipulations to make it more useful as a concept in sociology. The basic idea is that a net is more than an observer's recording of a set of relations between pairs of people, but yet is less than a map known and attended to by any or all of the people in the net. We stipulate:

i) the persons in the net accept the idea that they have meaningful indirect relations with anyone paired with a man with whom they are paired (i.e., most of all persons, when considered as the ego viewing the net, accept "composition" as a meaningful "operator" on the net, to use mathematical language);

ii) the relation diagrammed implies sufficient familiarity with the other in a pair to have some idea of whom else he is related to;

iii) yet the many possible indirect connections among people, at various removes (through various numbers and patterns of intermediary persons) are not recognized as falling into distinct new types of relations with their own definitions and contents.

I.e., the indirect connections are not "institutionalized." (If they were, one would have really a superposition of nets, one for each kind of relations possible between a pair of people, and it is better to give this more complex type of structure a different name, as we shall below.)

In other words, persons in a net recognize indirect connections implied by the set of pair relations, but these connections are recognized only in part, and over a limited number of removes, and they are reacted to in concrete terms rather than as well-defined new types of relations.

A second representation of nets helps in thinking about them and particularly in seeing their connection with category systems. Set up a table with one row for each person in the net and also one column. For visual clarity it helps to arrange the persons in the rows in the same order as in the columns. Then the existence of an arrow from one person to another in indicated by a check or a one in the cell formed by the intersection of the row of the former with the column of the other. In this representation it is natural to think of making the concept of net more flexible by attaching a measure of strength to each arrow, just as the arrow is the more natural idea here than the undirected line – which can only be shown by two entries of unity in the table. The network can be regarded as formally similar to a cross tabulation, defined below, with each person being regarded as a category and the relations being the items to be cross-tabulated.

Net Systems

A net continues indefinitely: its structure is essentially local, a matter of pair relations. Yet there must be a common culture to define a type of relation sharply and clearly, if there is to be a net defined by the presence or absence of that relation between pairs of persons. The implication of a common culture and the implication that a net is defined over some set of persons both lead one to define the population over which the net is perceived. Population is essentially a categorical concept; so the concept of net is not in fact independent of the concept of cat. Once a concrete population is defined for the net the idea of other types of relation existing among the population requiring representation by other nets cannot be avoided.

Balanced net systems: if several types of relation are defined on a population, the obvious question is whether there are any limitations on the co-existence of different relations on the same pair. The next question in order of complexity is whether in any set of three people there are necessary connections between the relations of two pairs and the relation to be found between the third pair on the triangle.

One very simple set of propositions about the interconnections of relations on a triangle has gained wide currency, although it is not so much a law as a plausible suggestion confirmed with some regularity. Suppose one type of relation has positive connotations, as in friendship; then if one man is joined by it to each of the two other men, they will tend to come into a friendly relation with each other too. Suppose a second type of relation has negative connotations of enmity, etc. Then the reasoning is that a man's enmity with each of the two other men will be a force tending to generate a positive bond between them. More abstractly, in any triangle either none or two of the pair relations will tend to be negative, the other three or one of the relations (lines) being of positive quality.

This idea of balanced relations, directly parallel to the psychological ideas in consonance theory treated last term, can be extended to refer to larger clusters of points and longer circuits of relations in the graph. One prediction of such extended theories is the formation within the population of two opposed factions such that all positive relations are within the factions and all negative relations between them. The idea can also be extended to take into account the direct nature of the relation when the two parties perceive it differently. Furthermore, third types of relations, such a familiarity, can be introduced and propositions set forth about their impact on allowable configurations of the positive and negative qualities. No satisfactory theory of these complex interrelations has yet been proposed, and in particular no way of consistently introducing measures of the strengths of the relations has been devised. But this discussion can serve as a warning that our neglect hereafter of the existence and interaction of nets of different qualities is dangerous.

Limited systems. A question used commonly in sociometric work, for example the Coleman *et al.* study of drug diffusion, calls for the names of your three best friends or closest colleagues, etc. The implication is, and it seems to be confirmed in actual nets derived from direct observation, that there is an upper limit on the number of links a persons has and should have in a net, and also a lower limit. When the population is large such constraints limit enormously the possible nets; in place of nn (n-1) possible arrows in a population of n persons, there can be at most 3n. In abstract terms one can say that the set has a maximum "local degree." The population for the net system and the requirements of balance among relations are also of course limits on net systems.

Cats

Concretely, a "cat" is a bunch of people alike in some respect, from someone's point of view. Abstractly, a category is the respect in which persons may be grouped as similar – a "box" into which people do or do not fall. These "persons" can of course be any population of things or social parties.

"A single category" is therefore a meaningless idea: at a minimum there is at least the residual category or box into which fall "all others," those not alike in the given respect. To say category is to mean a system of categories.

The different aspects of the cat are emphasized by two different ways of formulating the cat in network terms, where we now use "network" in its formal sense.

Formally, a network is a collection of points in which some pairs are connected by lines.

1) Let one point be set apart from the others as the centre and identified as the attribute or "respect" which the people, the other points, can have. Then those points connected to the center by lines form the cat. (The center need not be in a particular position since the confluence of lines on it is sufficient identification.)

Additional possible connotations of category are suggested by variations on this representation. Let the lines be directed by arrowheads. Arrows leading out from the centre connote an attribute "received" by the points, say sex or citizenship. If all arrows run toward the center an "achieved" attribute, one "projected" by the persons, is implied, say political party or good health.

2) Let the subset of points which have the attribute be fully connected by lines: each line then represents the sharing of the attribute.

An implicit assumption has slipped in with representation 2) above: that "sharing an attribute" is between pairs of people. Why not triplets? The three persons in a category could be represented by
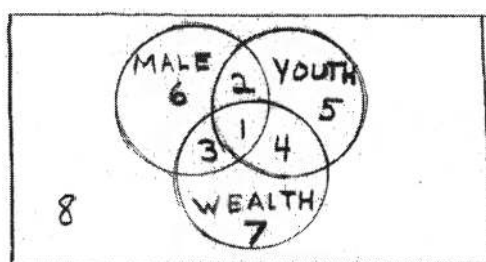
where the dotted lines from each person to the "relation" between the other pair in the triad indicates that all three persons are bound up in each relation. And so on through the quartet, the quintet, etc. as the fundamental unit of similarity. The point is that drawing a complete network of lines between pairs really indicates

only one special, limited possible meaning of jointly belonging to a category. And the advantage of having tried to represent a cat in this network fashion is that it brings out complexities in the possible meanings of category.

Representation 1) can be seen as the limiting case of representation 2) in which not pairs, triads, etc. but the *total* group of persons in the cat is the smallest unit in which it is meaningful to speak of the sharing of the attribute which defines the category. Call this the *total* integration. Representation 1) can also be seen as the other extreme case of representation 2), wherein each person has the attribute as an individual with no connotation of sharing anything with others in the cat. Call this the *isolate* representation.

As in the definition of net so also here we are forced to introduce psychological and cultural elements in our very definitions of the elementary terms of social structure. The total representation of a cat is appropriate where there is an intense consciousness of joint categorical membership and/or clear recognition in the culture of common possession of the attribute. The *isolate* representation is most appropriate where the category is defined by some observer in a way not visible to the persons involved, even though the category may in fact sharply describe their behaviour. The distinction is an old and familiar one, of course: e.g., is "the proletariat" a self-conscious class or a construct of the observer?

Category systems

Ad hoc: Have attribute versus don't have it is the simplest *ad hoc* "system" of categories. Any arbitrary set of categories such that any person in the population belongs to exactly one of them is an *ad hoc* system.

Generic: Mail addresses form a typical generic system of categories: a person is located within successively finer subdivisions of an initial large category. The first level of largest categories can be regarded as an *ad hoc* system, as can each level of subcategories within a next-larger category.

Cross-tabulation: A person is cross-tabulated by being placed simultaneously within two or more *ad hoc* category systems, each of which covers the entire population. If he is placed first in his proper category within one system, and then in his proper category in the second system, and so on, the result looks like a generic category system. But here any one of the *ad hoc* systems can be applied first, as the level of largest categories, and any other be applied next to refine the largest categories, and so on. Whereas in the generic system proper only one set of categories can be used as the first or highest level, and the breakdown into finer categories may be

made in different ways within each of the biggest categories. Thus, location of an adult by the industry, company, division and title of his work affiliation is a generic system, whereas his specification by sex, age, religion, location, and income is a cross-tabulation.

Two different representations of the "cells" or boxes in the cross-tabulation bring out different possible collocations. (The representations used for cats can also be used here, but are too clumsy to give much insight.)

1. The common procedure in social surveys is a "lay out" of the boxes as the intersections of rows far one *ad hoc* system with columns far the other. (Where three *ad hoc* systems are cross-tabulated one needs a cube, or on the printed page a series of such two-dimensional lay-outs.) The order of the rows, and the order of columns, and which system is laid out by rows and which by columns is immaterial.

2. A Venn diagram is the standard way to represent the overlapping memberships in different logical classes, which is just the special case of cross-tabulation with two classes (in vs. out) in each ad hoc system. The typical diagram for membership in three classes (say male sex, youth, and wealth) is:
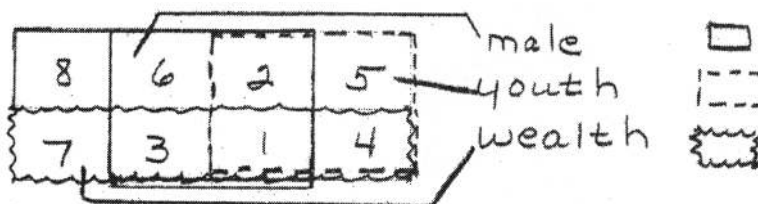
Note: the eight numbered areas can equated to the eight cells in the cube for representation 1.

The distinctive thing in this representation is that one of the two categories of each *ad hoc* system (e.g., male in male *vs*. female above) is singled out by being shown as the inside of a circle. Thus the eight areas above are shown in distinctively different shapes, all centred around area 1 as the core of the classification system. Thus the Venn diagram is a relativistic or subjective way to present a cross-tabulation.

Note that representation 2 for cross-tabulations, using overlapping circles, breaks down if more than three classes are to be used. With four classes one needs 16 intersections ($2*2*2*2 = 16$), 16 different combinations of the inside and outside areas of the four circles, and these cannot be found using circles on a plane. The contrast between representations 1 and 2 is made clearer by using rectangles in place of circles in the Venn diagram. Thus, the three-circle diagram can be shown as
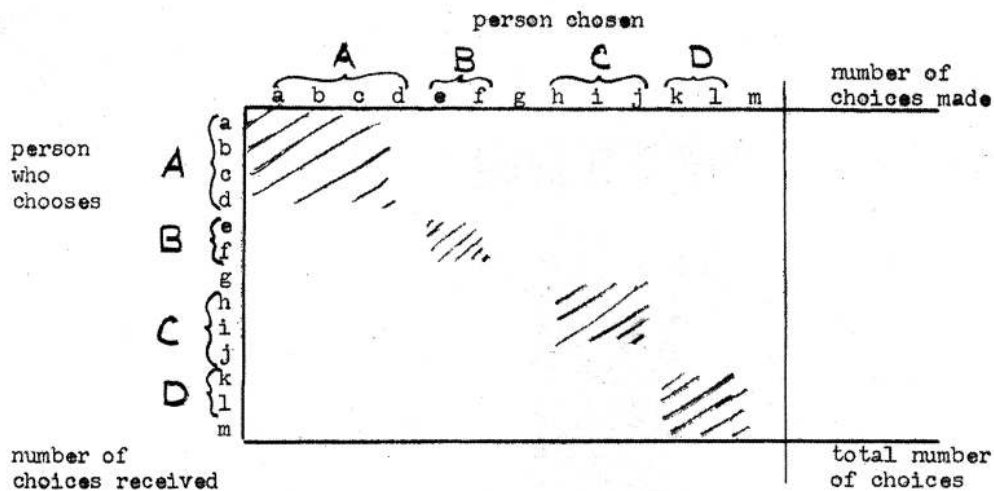
and a similar diagram for 4 overlapping rectangles (plus a corner as above for the residual category) can handle the core of the 4 classes. You can see from this brief discussion that assumptions bootlegged in from our knowledge of two-dimensional spaces can bias our assumptions about such an elementary matter as the overlap of logical classes.

The first question one asks of a cross-tabulation is how much dependence it reveals between the category one belongs to in one *ad hoc* system and the category one belongs to in the other. Suppose there is no dependence at all: the two *ad hoc* systems are not only logically but al so factually completely unrelated. Suppose 100 men of a tabulated population of 1,000 men belong to a given category in one *ad hoc* system, and 50 men belong to a certain category in the other *ad hoc* system. How many men would one expect to find who belonged to both categories? Clearly, 1/10 of the 50 men: but, equally clearly, 1/20 of the 100 men. Fortunately there is no disagreement – one would expect to find 5 men belonging to both categories.

Contextual: Placement in a cat in this system is meaningful only within the context of the whole structure formed by the categories. A hierarchical system of social classes is an example. One is not upper class because of some intrinsic attribute but in contrast to being lower class. The actual criteria a of upper class membership can change, and even become inverted in a given society over time, so that membership in the category is a matter of the context. In this simple case of two social classes one could just say membership is a relative matter, but the word context better conveys the complexity of assignment in more complex systems of categories which form structures. One example of a more complex system would be the schools and cliques in which artists are viewed as falling.

Both the generic and cross-category systems can be regarded as contextual in a primitive way.

Neighbordom is an aspect of each of these types of category systems: which categories are most akin? The answer is built into the definition of generic systems. It is usually clear in contextual systems.

Cities may be categorized in an *ad hoc* system by the size of their populations. In this and similar cases a measure of neighbordom is implied by the recognition in that culture of a structure of similarity among the attributes defining the categories. There is no necessary implication of a closeness perceived by the persons in the categories.

Another way to search out patterns of neighbordom in an *ad hoc* system is through considering transitions of persons between the categories. Consider a cross tabulation of the population in an *ad hoc* system by which category they are in at one time and which category they are in at a later time. There may be many more transitions between some than other pairs of categories; the relative frequency of transitions, with allowance made for the absolute sizes of categories, is a natural measure of neighbordom.

Catnets

The catnet evolves from a simpler system, either net or cat.

Initial net system: The principal result of such an evolution is the definition in the eyes of participants of a new type of relation, equivalence within the structure. The simplest example is the development of cliques in a net of friendship. As the subset of ties among a subset of persons in the net reaches some threshold value, the subset will come to regard itself as having an identity. Most of the pairs in the subset may not be connected by the net relation in a given time, but because of the feeling of identity all relations will be regarded as present in a latent way. That is, any person in a clique will feel free to "mobilize" the relation with another person in the clique.

A clique can continue to grow by the process of "folding in." That is, if one or more clique members have a friend in common in the net outside the clique, other clique members will tend to assimilate the additional man.

When several types of net are superimposed in a population cliques can form in each. Folding-in processes now work across the different types of relations and tend to generate the same membership in a clique on each of the different nets. Moreover the ties between men in different cliques will tend to emerge and die in such a way as to lead to the concentration of most relations between a pair of cliques in a single

one of the types. In less ponderous language, enemies of my friends are my enemies, and are friends with each other.

Given these tendencies toward focusing and alignment of relations, it becomes easier and more common to perceive indirect relations with a wider segment of the population. One reckons relation through the clique memberships, that is through the latent relationships, rather than tracing out the usually long chain of concrete ties that would be necessary to "reach" most other persons in the system. Relations are cumulated more easily once people are lumped together in clusters with a relatively homogenous type of relation between each pair of clusters. The net tends to be seen as a net among the clusters or cliques, with persons in the clique treated as equivalent unless there is an actual path to one of them which is short.

Each person in the catnet thereby secures a much less fragile place in the social structure. If his concrete ties to some other persons are disrupted, there is a clearly demarcated set of persons with whom he can legitimately expect to realize or mobilize new ties quickly. Tighter coupling is achieved in the social structure. The effects of the continual change in nodes and links are more quickly erased.

Yet at the same time a catnet system is also more decoupled in its response to random disturbances. Men in the cliques or cats, being surrounded by a wider range of possible reliable ties, need be less attentive to and concerned in every rumor and disturbance which passes along their actual concrete links of relation. The cats in the net system act as dampers in the spread of disturbances through the population.

Initial cat system: Only cats which are recognized as such by their occupants are considered here. The fundamental difficulty of a cat system is recruitment, the agreed definition of new members. There is no hidden hand available to drop a bucket of blue paint over a new person and thus define unambiguously his possession of the attribute blue and his membership in the blue cat. Instead new ties, representing the relation between sponsor and protege, must continually be spun between people in the cats in a system, whether *ad hoc* or more complicated. Over time the ties between particular cats tend to become a tradition and one ends up with a network defined over the set of categories as nodes.

Wilensky has a concept of career systems as the backbone of our social structure. He describes career systems in terms of stages of advancement and thus presupposes as foundation a contextual system of categories. On the other hand, the idea of regularized paths of advancement suggests the spinning out of network ties among people in successive stages.

In a large society a catnet system tends to become perceived in a broader view as itself a category, one of an ad hoc system that grows links and evolves into a catnet system on a bigger scale. Lumpability is a simple term to use to describe the likelihood

of a catnet system being lumped together as a single category in a broader system. As an example, we all repeatedly have the experience of leaving one life stage and moving on to another; as we do our previous highly refined and detailed perception of the internal social structure for the stage we have left is quickly drilled into a lumped representation as a category or stage.

Neighbourhood systems: The ideal of neighbourhood has several connotations, all consistent with and sharpening the general idea of a catnet system evolved from an initial net. One neighbourhood supplies others linked to it through some overlap in members and numerous relations between its members, and the others in turn have their neighboring neighbourhoods. In the most common usage neighbourhoods are residential areas spread out on the ground. Interconnections are implied by juxtaposition on a two-dimensional map. Yet we know from our own lives that the density of social relations between neighbourhoods often has little to do with physical closeness.

The question is what kind of space can best serve to map the relative closeness of a given system of neighbourhoods? It is a very general question that we could also have asked about networks, except that the yes-or-no character of the relation between a pair of individuals hardly provides the basis for an elaborate discussion of the closeness of points on a net. Neighbourhoods in one city may be best represented on a sphere with highest and lowest social status neighbourhoods at the poles, and the broadest spectrum of distances between neighbourhoods at the same class level being at the equator area representing the middle-class neighbourhoods. In another city factors such as ethnicity, class and political views, which help set and summarize the distances among neighbourhoods, may interact in such a complicated pattern that a doughnut (toroid) shape might be required for an accurate plot of neighbourhoods.

The second representation of a net, as a cross-tabulation of each relation by the person making and the person receiving it, provides a basis for mapping a neighbourhood system. Let the rows for people thought to belong to each neighbourhood be grouped together. Then if the columns are arranged in the same order a heavy clustering of entries in various-sized blocks along the diagonal should be apparent:
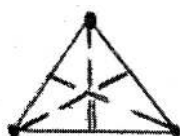
Here small letters label individuals, capitals label the neighbourhoods found, and the hatched areas indicate where an unusually high density of relations is found

(in this case so few persons are concerned that it is hardly necessary to talk of a density of entries). In actually carrying out such a study a number of difficulties arise:

i) Finding the best ordering of the individual rows to bring out the neighbourhood clustering could take an enormous number of trials (Note: 10! = 10*9*8*7*6*5*4*3*2*1 is about 3 million, the number of ways just 10 people can be ordered).

ii) Is it absolute or relative density of choice that should be the criterion? Suppose the individuals in a possible neighbourhood make only one or two "choices" apiece, but practically all of these choices are given to others in the small fraction of the total population. Is it a neighbourhood?

The boundaries between neighbourhoods will not be sharp of course: this is a catnet system with ties connecting different cats. The interconnections will appear as entries scattered aver the table above away from the main diagonal. In a catnet system these entries too will tend to cluster in a few rectangular areas; the assumption is that persons in a cat tend to evolve relations with the same sets of others. By rearranging the groups of rows and columns corresponding to the neighbourhoods found it is possible to make apparent the pattern of closeness among the neighbourhoods, so to speak the neighbourhood structure of the set of neighbourhoods. If in the figure above the areas of high density are clustered adjacent to the blocks shown along the main diagonal, one can see the neighbourhoods are strung out as if along a railroad track in a Western town. If in addition the extreme lower left and upper right corners are also areas of high density the neighbourhoods should be arranged in a ring to represent their social closeness.

Frame

People develop culture in part to meet their needs to visualize, operate in and modify the social structure to which they belong. Some nets persist for a very long time. The pair relation on which the net is based remains stable and clearly defined. New persons are added to and leave the net, but according to clear-cut rules. In such a net it is natural for the simplest kinds of indirect relations to be "institutionalized," that is, recognized in that culture as a distinctive new kind of relation. Indeed, the rules of admission to the net regulate an indirect relation.

If the basic pair relation is say friendship, the man who is a friend of my friend may come to be defined as being in a definite relation to me, say acquaintance. Problems arise because of the enormous variety of types of indirect relations. For example, I also know of men who are friends with not just one but several friends of mine, who

in turn may or may not be friends with one another. The natural step is to categorize many varieties together as a single new type of indirect relation: thus all the above types of friends at one remove can be lumped as acquaintances.

The end state of such an evolution of the cultural definition of a net is what we mean by a frame. The characteristics of a frame are:

i) Indirect ties reckoned through at least one any possibly indefinitely many removes are grouped by a regular scheme into a smaller number of types.

ii) Each type of indirect relation is recognized as a distinct and well-defined relation in its own right, with its own emotional quality and set of rights and duties. It is "institutionalized."

iii) The types of indirect relations form a cumulative structure: just as the "sum" or composition of two direct relations may define a simplest type of indirect relation; so more complex types of indirect relations are regarded as the composition of simpler types.

iv) The structure of indirect relations is a theory held in that culture. That is, it exists independent of any concrete net of relations existing in the society. In particular, the structure is keyed to a central "person" which is really an abstract role; we call it ego. The structure is the same no matter who is assigned the role ego in a particular realization of it; a given person as ego will recognize every type of indirect relation even though no actual person in the existing population of the net is in that role to him.

v) Since it is a theory, a frame tends to be used as an ideal type. Even in the abstract the frame may not be as fully developed and rationalized in a given culture as is implied by the preceding description. Certainly many of the people who use it may have only a confused understanding of it. But even if it is fully developed, and fully understood by all users, the complexities and irregularities in the concrete net of relations may make it difficult to apply in a fully coherent way.

These "types" of indirect relations are categories, of course, and the frame can be seen as an extreme case of a contextual system of categories. But the frame is a floating system of categories which can be anchored on any person and applied from his point of view; in that sense it is subjective. Moreover, one type of indirect relation can be seen as the sum or composition of other types; in this sense the frame has the quality of a network as much as a category system.

Balanced net systems are also akin to frames. The latter can carry the process of cumulating indirect relations much further since they deal with a potential network of relations from the point of view of only one node in it at a time. For the same reason the frame does not deal with possible inconsistencies in the different types of relations which may coexist among a set of people: the frame is a statement about the structure

of abstract types of relations, not about the combinations of different relations with ego or each other that are allowable for actual persons in the population.

A frame can be built using more than one basic type of relation. Indeed it is plausible to assert that a frame is more likely to develop when at least two distinct basic relations are present. The need for an ordering and simplification of indirect relations is more pressing then since the possible types that can result from combinations of two basic relations are much more numerous and intricate. And a culture rich enough to define two basic relations in an aspect of social life is more likely to be able to generate a frame.

The identification of basic relations may not be easy. Between a pair of persons there may exist many well-defined relations simultaneously: how does one tell which are "basic" and which are "indirect"? Clearly the observer wants to deal with as few basic relations as will generate the total spectrum of recognized relations, direct and indirect. The participants may not draw a clear distinction between a basic and an indirect relation: no inconsistency results since from the definition of frame indirect relations can be "added" to generate other indirect relations. But there is a minimum number of basic relations which is sufficient to generate the whole set of recognized relations, and not just any set of relations, no matter how numerous, is sufficient to generate all recognized relations. One cannot say anything further about the identification of basic relations which will apply to any frame. Some cultures will specify a set of a minimum number of basic relations, but even there the observer may find a different set of relations will generate the total frame more simply, to his understanding.

In short, there may be many possible ways to view a given frame as built from basic relations just because a frame is a completely interrelated set of relations. One obvious example of a frame is the system of kinship relations recognized in a society: there are a very large variety of such frames known, at all levels of completeness and consistency in development. Other examples of frames are not as easy to recognize because there is not such a complete system of terms naming the possible indirect relations. In some social systems a frame of relations can be identified which is generated by the basic relations of boss-subordinate and sponsor-protege.

Concluding Notes

This completes our definitions of elementary types of social structure. Rarely will one of these types be visible in isolation as the total social structure of a concrete population. Rather, they are "analytic" types, which are building blocks for complex actual structures.

A variety of more complex system of structure can be defined. Framework, sacred hierarchy, community and institutional system are the ones to be emphasized in lecture: they are the types relevant to the social structures described in the readings. These complex types conform more closely to actual social structures, and are for that reason less easy to describe in simple, abstract terms independent of particular examples.

Nation and polity are the most general types of social structure to which we shall refer; we think of them as being predominantly of the nature of network and category systems, respectively.

Either-or intensities and infinitely sharp criteria of membership have been assumed in defining nets and cats. The realties of social structure are more blurred. The most revealing approach to these realities is through analysis of the validation and legitimation structures and processes which settle issues of existence and intensity of ties and attributes in actual social systems. One special case are the procedures of social science research, which to an increasing extent are being built in as an accepted part of the validation and legitimation procedures in current American society, for better or worse.

Notes on the Constituents of Social Structure

Soc. Rel. 10 – Spring '65

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