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A REANALYSIS OF MURDOCK'S MODEL FOR SOCIAL STRUCTURE BASED ON OPTIMAL SCALING

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Murdock's *Social Structure* (1949) is widely regarded as his most important work, the masterpiece exemplifying his approach to cross-cultural research. Often considered to be a modern classic—chosen by Barnes (1971), for example, as one of three important approaches to the study of kinship—*Social Structure* summarized much of what was known at the time about kinship, marriage, and community organization and added many new research findings. Murdock's use of the cross-cultural method was a significant methodological advance, and his book contained a great deal of original theoretical thinking, based on an interdisciplinary approach that synthesized concepts from psychology, sociology, and anthropology.

Murdock's book is organized in three parts—four chapters on family form, clan, and community; a three-chapter treatment of kinship; and a final three chapters on sex and incest taboos. The center of the treatment of kinship, Chapter Seven, "Determinants of Kinship Terminology," is in many ways the book's apex. There Murdock formulates and tests a large number of hypotheses about relationships between social structure and kinship terminology. Now, forty years later, it remains one of the very few examples in anthropology of formulating and testing a complex deductive system. Given the significance of this achievement, we are struck by the extent to which

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Murdock's findings appear to have been ignored. We do not see discussions of Murdock's findings in the literature—there seem to be no attempts to replicate, build upon, or falsify his findings.

We believe that many of Murdock's important findings were obscured and not adequately appreciated because his analysis was limited to a bivariate, rather than a multivariate, model. Murdock borrowed from Tylor (1889) the assumption that the structure of culture was based on "adhesions" between pairs of variables and that cross-tabulation was the appropriate method for testing hypotheses about the patterning of culture. Murdock was also influenced by the positivist philosophy of science that was in vogue at the time. He therefore proceeded by what he called the "postulational method" of scientific inquiry (Murdock 1949: 127). This method involves stating a set of basic assumptions—postulates—from which are derived a set of hypotheses—theorems—which are subjected to empirical test. Testing is by means of contingency tables showing the degree of association between pairs of variables.

Bivariate hypothesis testing in a system of many variables can produce a large number of separate tables. Murdock's Chapter Seven uses 42 tables, therefore, to summarize the data on the 197 cross-tabulations that are directed at testing 30 separate propositions. The hypotheses are very specific, as exemplified by Theorem 14: "In the absence of clans and of polygamous and extended families, the isolated nuclear family tends to be associated with kinship terminology of the lineal type," and by Theorem 5, which states that nonsororal polygyny "tends to be associated with kinship terminology of the bifurcate collateral type." Murdock's reasoning in deducing the 30 propositions is clear and elegant, but the effect of the mass of separate propositions is confusing. The reader finds it difficult to keep track of the many separate theorems or to see how they fit into a system. The difficulty in seeing the overall pattern is a particularly unfortunate limitation of the analytic strategy, given that the title of Murdock's book promises a treatise on *Social Structure*.

Murdock's thinking is more directly oriented to multivariate models than his method allows for. Early in Chapter Seven, he outlines a multivariate view of causation:

> No single factor or simple hypothesis can account for all observable effects. From this it follows that different determinants must often exert their pressure in opposite directions. What operates is a sort of parallelogram of forces, and the phenomena which ensue represent, not the effect of particular forces but the resultant of them all. Often, indeed, the influences exerted by opposing factors may be so evenly balanced that a relatively insignificant supplementary factor may suffice to tip the scales [Murdock 1949: 126].

Later he describes a multidimensional model of similarities judgments: " . . . the extension or differentiation of kinship terms

depends . . . upon the total net effect of all similarities and dissimilarities exhibited by the relatives in question" (Murdock 1949: 133). During several of his analyses, Murdock talks about controlling for third factors. For example, he says that patrilocal residence in association with nonsororal polygyny will foster bifurcate collateral terminology (Theorem 10), but that this effect will be weakened by the countervailing tendency for unilineal kinship systems to have bifurcate merging terminology (Theorem 9).

Murdock's hypothesis-testing model has often been criticized. Its use may account for the common complaint that the cross-cultural method takes phenomena out of their contexts. Limiting analysis to a long list of separate bivariate tests is not a necessary feature of the postulational method. In fact, deductive systems in the physical sciences usually pertain to complex multivariate systems. However, Murdock, along with many of the other leading social scientists of his time, presented his bivariate method as if it were the epitome of the scientific method.

In fact, the limitations of the method were due not to the use of a formal deductive structure, but to the state of statistics at the time. In 1948, the only commonly used multivariate models were factor analysis, multiple regression analysis, and cluster analysis. All were difficult to do, given the absence of computers, and their uses were restricted to a few social science specialties. The analytical mode adopted by Murdock, a product of the state of technology in the 1940s, has been confused by many with the cross-cultural method. In fact, however, many of the new multivariate models share a concern with structure, and with context; often it is because of those concerns that the models were developed. The new multivariate models allow for a representation of a system of variables in a single model, and they allow for examining a structure while controlling for the effect of factors exogenous to that structure.

Reanalysis Using Optimal Scaling

We will analyze cross-cultural data on Murdock's social organization and kin term variables with a multivariate model, optimal scaling, that allows us to view the interrelationships among all variables and all societies at the same time. We can then compare the perspective obtained by examining all variables simultaneously with the pairwise examination originally made by Murdock.

We use optimal scaling (Kendall and Stuart 1961: 568–584) to obtain a multidimensional spatial representation of both the societies and the variables in the same space. This method is also known as correspondence analysis (Greenacre 1984, Hoffman and Franke 1986), dual scaling (Nishisato 1980), and canonical analysis (Gittens 1984).

These methods all involve similar procedures, whose origins trace back to the early part of this century.

In the optimal scaling representation, variables that tend to co-occur in the same societies are close together in the spatial representation, while variables that rarely or never occur together in the same societies are far apart in the picture. Similarly, societies that are characterized by a similar set of variables are close together, while societies that have few or no variables in common are far apart. One of the main advantages of the method is that the societies and the variables can be plotted in the same space, which means that the societies are plotted close to the variables that characterize them, and the variables are plotted close to the societies in which they frequently occur.

It should be immediately apparent that variables that are "functionally" related should occur near each other in the representation. A second advantage of the optimal scaling analysis is that it gives a visual display of all the relationships among the variables (and societies) in one analysis, instead of treating the variables a pair at a time, as Murdock was forced to do by the analytical methods of his day.

The Sample

Murdock was concerned with the inadequacy of the data base used in his study and, after the publication of *Social Structure*, he set about to remedy this by continuing his search of the literature for more cases. He coded them for social structure variables, which he then published in the "Ethnographic Atlas" (Murdock 1967), and for kin terms, which he published in "Kin Term Pattern and their Distribution" (Murdock 1970). Our analysis is based on the expanded sample of 351 societies for which we have complete data from these two samples. Our sample includes 138 of the 250 societies that formed the sample for Murdock's *Social Structure*.

Optimal scaling requires that Murdock's polychotomous variables be converted into a set of dichotomous variables. To avoid possible statistical problems with infrequently-occurring categories, we deleted any category of a variable with a frequency of less than 25. A dichotomous variable (trait present/trait absent) was produced from each of the remaining categories. Our final working sample consisted of 63 variables. The 32 social organization variables are listed in Table 1, and the 31 kin term variables are listed in Table 2.

Figure 1 presents a graphic display of the results of the optimal scaling of the 63 variables over the 351 cultures. The code for these variables is presented in Table 1 (Social Organization Variables) and Table 2 (Kin Term Variables). Since it is difficult to comprehend the spatial relationships between so many variables at first glance, we depict the social organizational variables and the kin term variables separately in Figures 2 and 3, respectively.

Table 1. Social Organization Variables

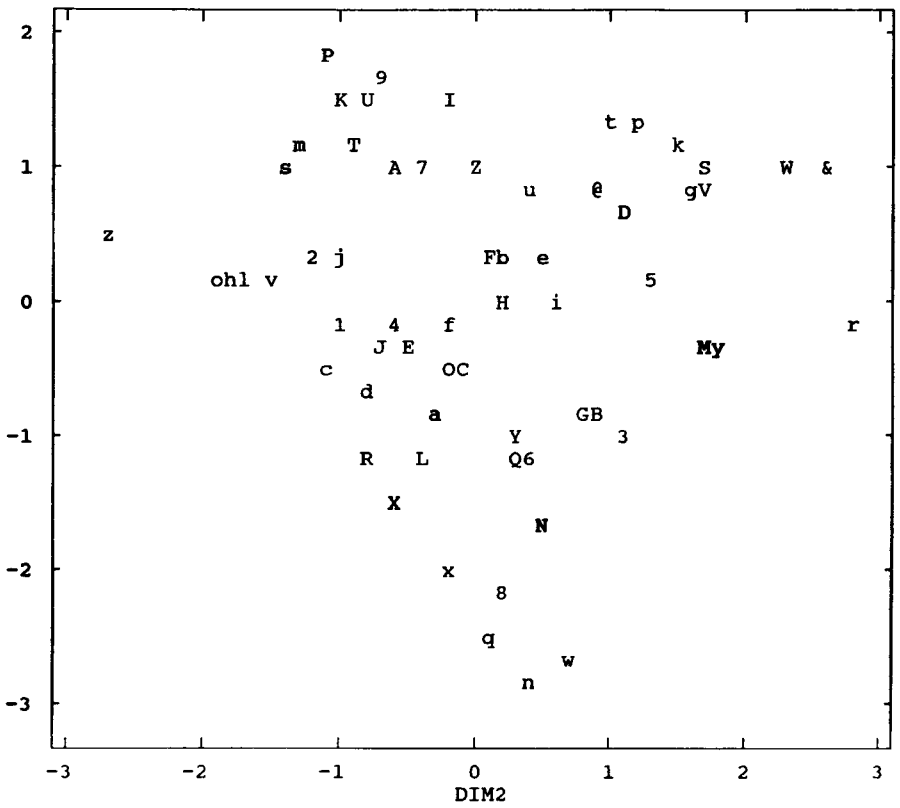
Atlas Variable	Code	Frequency
MODE OF MARRIAGE		
Bride Price	A	135
No Exchange	B	87
Bride Service	C	50
FAMILY TYPE		
Independent	D	166
Small Extended	E	108
Large Extended	F	57
MARRIAGE TYPE		
Monogamy	G	71
Limited Polygyny	H	68
Nonsororal Polygyny—Wives Not Coresident	I	141
Sororal Polygyny—Wives Coresident	J	68
MARITAL RESIDENCE		
Patrilocal	K	123
Virilocal	L	94
Matri- or Uxorilocal	M	61
Bilocal	N	33
COMMUNITY ORGANIZATION		
Agamous	O	133
Clan Communities	P	58
Endogamous Demes	Q	35
Exogamous Communities	R	46
Segmented Communities	S	75
PATRILINEAL KIN GROUPS		
Localized Lineages, Phratries, or Moieties	T	68
Dispersed Sibs	U	77
MATRILINEAL KIN GROUPS		
Localized Lineages, Phratries, or Moieties	V	38
Dispersed Sibs	W	37
BILATERAL DESCENT GROUPS		
No Descent Groups, or Bilateral Groups Only	X	74
Ego-Centered Kindred	Y	59
COUSIN MARRIAGE		
Permitted	Z	81
Prohibited	a	105
No First Cousins Permitted	b	63
SETTLEMENT PATTERNS		
Nomadic or Seminomadic	c	87
Transhumance	d	36
Villages	e	148
Neighborhoods of Hamlets	@	62

Table 2. Kin Term Variables

Kin Variable	Frequency	Code	Definition
1. GRANDPARENTS			
Bisexual	188	f	(Grandmother) (Grandfather)
Merging	71	g	(Grandparent)
Bifurcate Bisexual	58	h	(MoFa) (MoMo) (FaFa) (FaMo)
2. GRANDCHILDREN			
Merging	184	i	(Grandchild)
Bisexual	49	j	(Granddaughter) (Grandson)
3. UNCLES			
Bifurcate Merging	106	k	(Fa, FaBr) (MoBr)
Bifurcate Collateral	95	l	(Fa) (FaBr) (MoBr)
Skewed Bifurcate Collateral	58	m	(Fa) (FaElBr) (FaYBr) (MoBr)
Lineal	51	n	(Fa) (FaBr, MoBr)
4. AUNTS			
Bifurcate Collateral	93	o	(Mo) (MoSi) (FaSi)
Bifurcate Merging	97	p	(Mo, MoSi) (FaSi)
Lineal	51	q	(Mo) (MoSi, FaSi)
Generational	39	r	(Mo, MoSi, FaSi)
Skewed Bifurcate Collateral	45	s	(Mo) (MoElSi) (MoYSi) (FaSi)

5. NIECES AND NEPHEWS (male speaker)			
Bifurcate Merging	99	t	(Child, BrChild) (SiChild)
Sex Differential Bifurcate Merging	41	u	(Child, BrChild) (SiSo) (SiDa)
Bifurcate Collateral	43	v	(Child) (BrChild) (SiChild)
Lineal	39	w	(Child) (BrChild, SiChild)
Generational	28	x	(Child, BrChild, SiChild)
Sex Differential Lineal	32	y	(So) (Da) (BrSo, SiSo) (BrDa, SiDa)
Sex Differential Bifurcate Collateral	25	z	(So) (Da) (BrSo) (SiSo) (BrDa) (SiDa)
6. SIBLINGS			
Dravidian	88	1	(ElSi) (YSi) (ElBr) (YBr)
European	39	2	(Si) (Br)
Yoruban	34	3	(ElSi, ElBr) (YSi, YBr)
Algonkian	31	4	(ElSi) (ElBr) (YSi, YBr)
Kordofanian	26	5	(Si, Br)
7. COUSINS			
Hawaiian	106	6	(Sibling, Cousin)
Iroquois	120	7	(Sibling) (// Cousin) (X Cousin)
Eskimo	35	8	(Sibling) (Cousin)
Omaha	29	9	(Sibling) (// Cousin) (X Cousin) +Omaha Skewing
Crow	30	&	(Sibling) (// Cousin) (X Cousin) +Crow Skewing

Figure 1. Scaling of All Variables



Comparing these two figures, we see that the kin term variables have a much greater range of variation on both dimensions than do the social organization variables. The mental structure, reflected in kin terms, is less constrained than the actual social organization, and we may speculate that we will better identify the purest cultural types through the kin term classification than through the social organization variables.

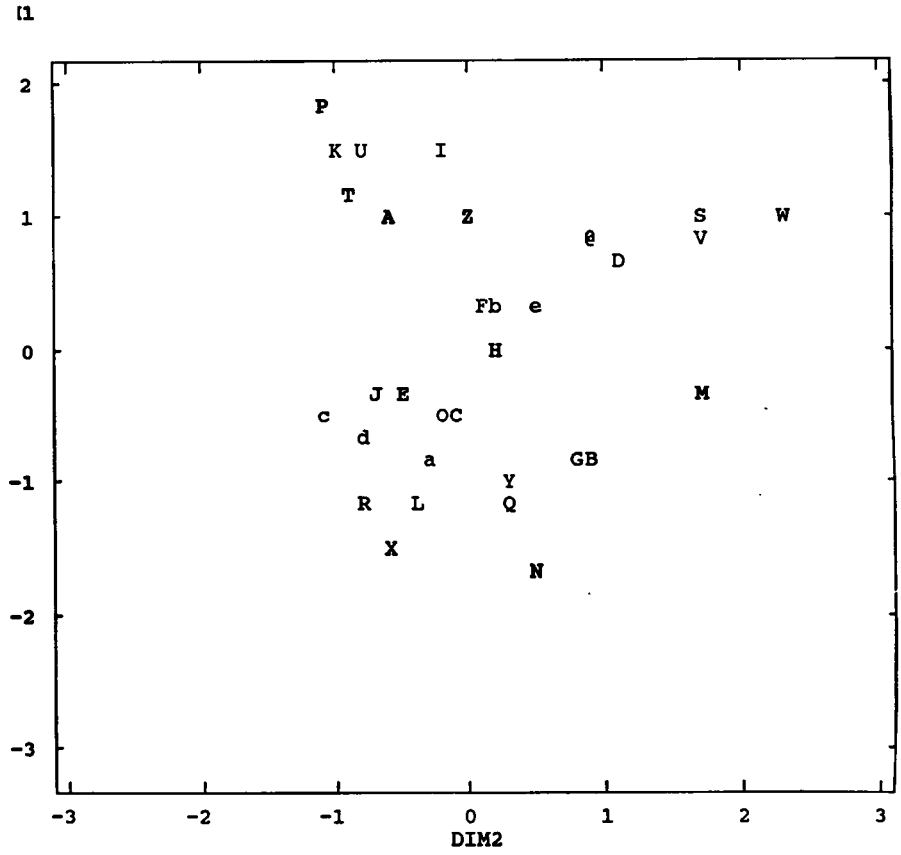
Scaling of Social Organization Variables

Figure 2 represents the social organization variables. At the upper left of the figure is a cluster of variables associated with patrilineal descent; at the upper right is a cluster of variables associated with

matrilineal descent; variables associated with bilateral social organization are found at the bottom of the figure. The variable for clan communities (P) takes the most extreme positive value on dimension 1; bilocal residence (N) takes the most negative value on that dimension. Dispersed matrilineal sibs (W) takes the most extreme positive value on dimension 2; clan communities (P) takes the most extreme negative value on dimension 2.

In understanding this figure, we find it useful to go through it by substantive domain.

Figure 2. Scaling of Social Organization Variables



Descent

Patrilineal descent, defining membership in localized patrilineal groups (lineages, phratries, or moieties) and indicated by T in Figure 2, is located in the upper left-hand quadrant. Patrilineal descent, defining membership in dispersed patriclans and indicated by U, is to be found close by in the same quadrant. Comparable forms of matrilineal descent, indicated by the symbols V and W, are both to be found in the upper right-hand quadrant of Figure 2. Bilateral descent with no corporate kin groups, indicated by X, and ego-centered kindred, indicated by Y, are situated in the lower left and lower right quadrants of the diagram.

Residence

Patrilocal residence (K) is, as would be expected, in the upper left-hand quadrant, near patrilineal descent (T and U). Bilocal residence (N) also falls near the comparable descent loci in the bottom half of the graph. It should be noted, however, that virilocality (L) is in the bilateral, rather than the patrilineal, cluster. This is not surprising if one notes the "Atlas" definition of virilocal residence:

> The recent tendency to employ this term [Virilocal] . . . for all cases where a wife joins her husband at his place of residence is strongly to be deplored. It needlessly confuses a number of sharply differentiated residence rules and practices. Two of these—Avunculocal and Patrilocal—have been separately defined above, and the term [Virilocal] will be here confined to situations . . . in which *male kinsmen are not structurally aggregated in localized unilineal kin groups.* [Murdock et al.: 118.]

The distance between the location of Patrilocal (K) and Virilocal (L) in Figure 2 attests to the correctness of Murdock's insight in making this distinction. Matrilocal residence was distinguished from uxorilocal in the same manner, but since there were fewer than 25 instances in either of these categories, we decided to combine them—M in Table 1. The scale position of M on the Figure 2 plot is midway between the matrilineal and the bilateral cluster, as Murdock's theory would predict. Avunculocal residence does not appear in our analysis, because there were fewer than 25 instances of it in the sample.

Community Organization

The location of the symbols for types of Community Organization, shown in Figure 2, are interesting and were not anticipated by Murdock. Clan communities (P) are at the very top of the quadrant that contains the patricluster of types of patrilineal descent shown above. Segmented communities (S) are located in the middle of the

matricluster, and both the exogamous communities that lack a clan organization (R) and endogamous demes (Q) are located in the bilateral descent cluster.

Marriage Type

Murdock's *marriage type* variables show an interesting pattern. Nonsororal polygyny and wives live apart (I) is in the patrilineal cluster, whereas sororal polygyny and wives live together (J) is in the bottom half of the graph, closer to the bilateral descent cluster. Monogamy (G) is even more closely associated with the bilateral descent cluster. Limited polygyny (H) is not located close to any descent cluster. This may well be because the Atlas failed to include the coresidence pattern for cowives or the rule concerning whether or not they were sisters. It might be worth while making these distinctions.

Mode of Marriage

Of the seven subcategories coded in the Atlas, only three had a frequency of 25 or more. The most commonly occurring mode of marriage in our sample was Bride Price (A), whose scale position is in the upper left-hand quadrant of the graph, near the patrilineal descent cluster. The absence of exchange (B) is, by contrast, in the bilateral descent sector, close to monogamy (G). Bride Service (C) is also located in the bilateral sector.

Settlement Pattern

Settlement Patterns are not as strongly associated with the descent configuration as are the social structure variables discussed above. Nomadic and seminomadic settlements (c) are in the bilateral sector, as is transhumance (d). Neighborhoods and hamlets (@) however, are in the matrilineal sector. Villages (e) are close to the center of the graph and thus not closely associated with any particular form of social organization.

Family Type

Independent families (D) are in the matrilineal cluster in the upper right quadrant, whereas small extended (E) and large extended (F) families are near the center of the graph and thus not closely associated with any descent type.

Cousin Marriage

Cousin marriage is permitted (Z) in cultures with unilineal descent groups. This trait is located on the borderline between the patrilineal and matrilineal clusters. Prohibition of marriage to first cousins (b) is found nearby, and appears to be a variation on this trait. Cousin marriage more generally prohibited (a) is located in the bilateral cluster.

Scaling of Kin Term Variables

Figure 3 shows the optimal scaling coordinates for the kin term classification variables. We have circled three clusters—lineal, bifurcate merging, and bifurcate collateral. Within these clusters, terms for first-generation relatives (uncles, aunts, nieces, and nephews) are the most interesting. D'Andrade (1971) finds a strong entailment relationship between first-generational terminology and cousin terminology, based on the hypothesis that uncle/aunt terminology is the unmarked category of the generation dimension. In Figure 3, terms for first-generation relatives are tightly clustered within the lineal, bifurcate merging and bifurcate collateral clusters.

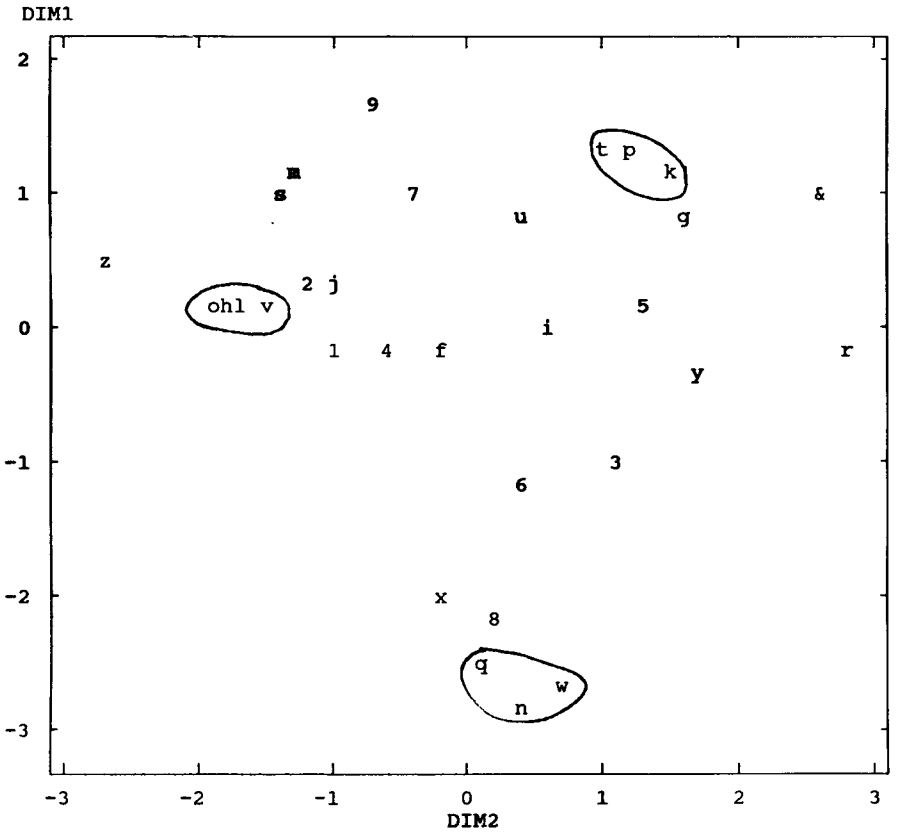
At the bottom of the figure is the cluster of kinship terminologies of the lineal type. Within this cluster, we have circled the first-generation terminologies (uncle, aunt, nephew/niece), (n, q, w). Nearby, but further up on this dimension is lineal (Eskimo) cousin terminology.

At the opposite extreme of Dimension 1 are the kinship terminologies that involve bifurcation, also known as the cross-parallel distinction. At the center of the cluster, in the upper right quadrant, are the three terminologies pertaining to first-generation bifurcate merging—uncle, aunt, and nephew/niece (k, p, t). Scattered around this central cluster are the bifurcate merging cousin terminologies. Crow is to the far right, Omaha and Iroquois to the left, with Omaha in the upper left quadrant and Iroquois near the vertical axis.

To the left of the upper left quadrant we see terminologies that use both lineality and bifurcation: the bifurcate collateral types. As with the lineal and bifurcate merging clusters, the first-generation terms (aunt, uncle, niece/nephew) are in a tight cluster, which also includes bifurcate bisexual grandparent terms (h, l, o, v).

Between the lineal and bifurcate merging clusters we find a broad band of generational terminologies, which use neither lineality nor bifurcation. At one extreme, generational nephew/niece terms are near to Eskimo cousin terms. This close association must indicate the presence of a number of societies that make the lineality distinction in ego's generation, but do not make that distinction in the child's generation. Further up, and near the center of the generational region,

Figure 3. Scaling of Kin Term Variables



we find generational cousin terms (Hawaiian). At the far right, and near the horizontal axis we see the most extreme absence of lineality, generational aunt terms. Following D'Andrade's (1971) logic, we would predict that absence of the lineal distinction in the parents' generation would entail its absence elsewhere in the system; hence, generational parent terminology is the purest form of the type.

Bifurcate collateral terminologies use the most distinctions. There appears to be a gradient of increasing numbers of distinctions along the horizontal axis from generational aunt terminology at the far right (fewest number of distinctions) to bifurcate collateral nephew/niece terminology, with sex distinguished (Z), at the far left. The logic of this gradient with respect to the sex distinction can be seen by examining sibling terms. Kordofanian sibling terminology (5), which lumps all siblings together, is just above the horizontal axis, on the right side of

the picture. European sibling terminology (2), which distinguishes sex of siblings, can be seen as like Kordofanian, but with the addition of the sex distinction. It is near the horizontal axis to the left of the figure, near the cluster of first-generation bifurcate collateral terms. Similarly Yoruban (3), which only distinguishes relative age of siblings, appears near to generational cousin terms, while Dravidian (1) and Algonkian (4), which distinguish both sex and relative age of siblings, are to the left of Yoruban terminology, and near the bifurcate collateral parent/child cluster. Hence, addition of the sex distinction shifts a terminology to the left, toward the bifurcate collateral cluster.

Relationships between Social Organization and Kin Terms

There are clear relationships between the social organization variables and the kin term variables. The matrilineal cluster overlaps with the center of the bifurcate merging cluster, and the patrilineal cluster overlaps with the edge of the bifurcate merging cluster, as well as with much of the bifurcate collateral cluster. Bilateral descent and bilocal residence are located near the lineal and generational kin terminologies.

Cousin terms show especially interesting relationships with the social organization variables. Omaha and Crow cousin terms are near the centers of the patrilineal and matrilineal clusters. The Iroquois pattern was, according to Murdock, associated with patrilineal (Dakota), matrilineal or double (Iroquois), or bilateral (Yuman) descent systems (Murdock 1949: 224). In our analysis, Iroquois cousin terms are in the upper left-hand quadrant and thus more closely associated with patrilineal than with other forms of descent. They are, however, closer to the matrilineal cluster than are Omaha cousin terms. Interestingly, Iroquois terms are adjacent to the variable for first-cousin marriage permitted. Eskimo and Hawaiian terms are near the bilateral cluster, with Hawaiian closer to the center of the bilateral social organization variables and also close to the variable for cousin marriage prohibited. Eskimo cousin terms take a more extreme negative value on the first dimension.

The strong association of bifurcate merging with matrilineality seemed surprising to us at first. However, this relationship is predicted by Murdock, who says that polygyny of the nonsororal type "operates as a social differential rather than as a social equalizer. . . . . In short, nonsororal polygyny tends to prevent the occurrence of merging" (1949: 143). He then notes that nonsororal polygyny is associated with patrilocal residence and patrilineal descent, which "exert an influence directly counter to that of polygyny, i.e., in favor of merging" (1949: 144). Finally, he says: "By virtue of its association with patrilocal residence and patrilineal descent, which favor bifurcation, it is more conducive

to bifurcate collateral than to lineal terminology. . . . . Nonsororal polygyny is, in fact, the only social determinant we have discovered that favors bifurcate collateral terminology" (1949: 146).

Murdock's reasoning, then, is that unilineal descent favors bifurcate merging terminology, but that the association of nonsororal polygyny with the patrilineal cluster causes many patrilineal societies to use bifurcate collateral terminology. These predictions are exactly what we see—the bifurcate merging cluster overlaps with both the patrilineal and matrilineal clusters, but is centered nearer to the matrilineal clusters, with bifurcate collateral terminology being centered closer to the extremes of patrilineality.

Murdock's Social Organization Types

In Chapter Eight of *Social Structure*, "Evolution of Social Organization," Murdock proposed a classification of societies into eleven social organization types. He then outlined a theory of evolution, in which he described possible transitions from one type to another. We will not examine Murdock's evolutionary claims here, only the validity of his typology. We can do so by graphing the location of the types in our optimal scaling space. This is possible because optimal scaling allows for representation of societies in the same space as the variables—a society is proximal to the traits that it is most likely to have.

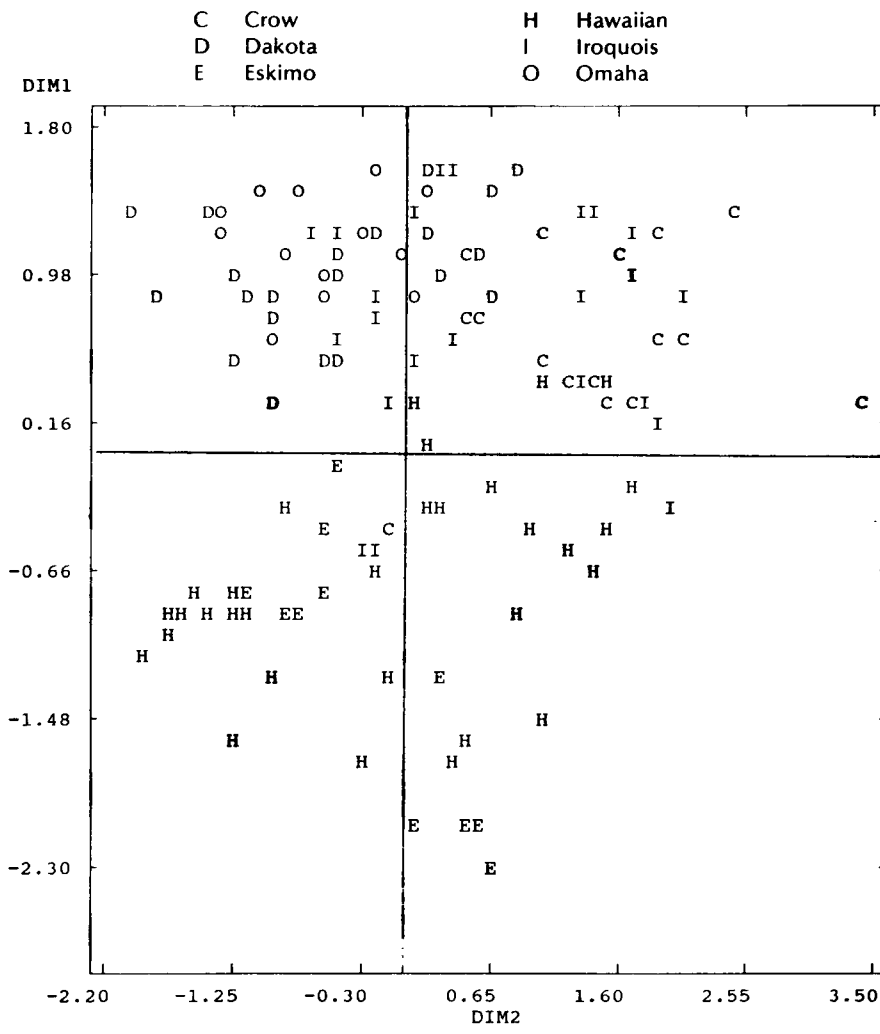
For this analysis, we were restricted to the subset of 138 societies that were in Murdock's analysis. We identified the social organization type of each of these from Murdock's Tables 61–71, in which he lists the eleven types (with subtypes) and the names of the societies in each type. A number of Murdock's types have small numbers of cases. An example is Nankanse, which has only 5 cases in Murdock's original sample. We concentrate here on six social organization types that have 10 or more cases in our sample. These types ae Eskimo, Hawaiian, Omaha, Dakota, Crow, and Iroquois, and comprise 115 cases. In Figure 4, we plot the locations of societies in the optimal scaling space, with a code for social organization type. We can easily identify three regions corresponding to the patrilineal and matrilineal clusters, as well as the bilateral region. Below the horizontal axis, all societies are either Hawaiian or Eskimo, with four exceptions. Eskimo types are found at the most negative extremes of the vertical axis, and in a cluster that is surrounded by the Hawaiian types.

Above the horizontal axis are only four Hawaiian societies, all others are Crow, Iroquois, Dakota, or Omaha. Crow types are concentrated in the upper-right quadrant, the matrilineal cluster, as one would expect. Omaha types are concentrated in the upper left quadrant. Dakota are also in the upper left quadrant, and they have a wider range of variation

than the Omaha types. Iroquois types are found throughout the unilineal region, with greatest concentration in the region of Iroquois cousin terms and the bifurcate merging terms.

It is clear from this diagram that there is a strong correspondence between Murdock's social organization types and the clustering of societies in the optimal scaling space. There appear to be three types—Eskimo, Crow, and Omaha—that epitomize bilateral, matrilineal, and patrilineal organization, respectively. The other three types—Hawaiian, Dakota, and Iroquois—have a wider range of variation around these three types.

Figure 4. Scaling of Social Structure Types



Summary

The optimal scaling procedure has allowed us to reexamine Murdock's social structure data. We find a first dimension of contrast between unilineal and bilateral forms of organization, with a second dimension contrasting patrilineal and matrilineal forms. We find verification for Murdock's hypotheses about the effects of patrilineal organization upon merging of same-sex siblings. Patrilineal organization, associated as it is with general polygyny and easy segmentation of lineages, produces bifurcate collateral terminology. Matrilineal organization, by contrast, produces merging. Hence, the second dimension of the configuration, besides reflecting a contrast between matrilineality and patrilineality, is also a dimension of increasing numbers of distinctions in kinship terminology.

REFERENCES

Barnes, J. A.
1971 Three Styles in the Study of Kinship. Berkeley and Los Angeles: University of California Press.

D'Andrade, R. G.
1971 Procedures for Predicting Kinship Terminologies from Features of Social Organization. *In* Explorations in Mathematical Anthropology. P. Kay, ed. pp. 60–75. Cambridge: MIT Press.

Gittens, Robert
1984 Canonical Analysis: A Review with Applications in Ecology. Berlin: Springer-Verlag.

Greenacre, Michael J.
1984 Theory and Applications of Correspondence Analysis. London and New York: Academic Press.

Hoffman, Donna L., and George R. Franke
1986 Correspondence Analysis: Graphical Representation of Categorical Data. Journal of Marketing Research 23: 213–227.

Kendall, M. G., and A. Stuart
1961 The Advanced Theory of Statistics, vol 2. London: Griffin.

Murdock, George P.
1949 Social Structure. New York: Macmillan.

1967 Ethnographic Atlas: A Summary. Ethnology 6: 109–236.

1970 Kin Term Patterns and Their Distribution. Ethnology 9: 165–208.

Murdock, George P., et al.
1962 Ethnographic Atlas. Ethnology 1: 113–134.

Nishisato, Shizuhiko
1980 Analysis of Categorical Data: Dual Scaling and Its Applications. Toronto: University of Toronto Press.

Tylor, Edward B.
1889 On a Method of Investigating the Development of Institutions: Applied to Laws of Marriage and Descent. Journal of the Anthropological Institute 18: 245–272. (Reprinted in Readings in Cross-Cultural Methodology, ed. Frank W. Moore. Second Printing [reset]. New Haven: HRAF Press, 1966. P. 1–25.)