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This paper suggests the applicability of metric multidimensional scaling for research within the political arena. Multidimensional scaling allows the researcher to simultaneously observe change and rates of change within the policy's attitudes toward the candidates and issues in election campaigns. Multidimensional scaling also reveals which dimensions the voters use to differentiate the candidates and their stand on various issues. By observing the trajectories of the candidates' movement through multidimensional space, it becomes possible to accurately predict the outcome of a election. Also included is a study using this technique to measure the variable effects the media have in political advertising. Finally, it reports the results of a study using multidimensional scaling to plot the changes in voters' attitudes toward the major political figures and issues in the 1972 presidential election. A random sample of the voters from Champaign County, Illinois, scaled sixteen concepts at five points in time. At each time three dimensions emerged. The trajectories of the two major candidates suggest a lawful motion through the space, which yields a prediction of the outcome of that election. (Author/RB)

A METHOD FOR POLITICAL COMMUNICATION RESEARCH

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ABSTRACT

This paper suggests the applicability of metric multidimensional scaling for research within the political arena. The measurement technique has certain advantages over traditional unidimensional political polls. Multidimensional scaling allows the researcher to simultaneously observe change and rates of change within the polity's attitudes toward the candidates and issues in election campaigns. Multidimensional scaling also reveals which dimensions the voters use to differentiate the candidates and their stand on various issues. Thus, the candidate can get very accurate feedback on the salience of issues involved in a constituency's voting decision. By observing the trajectories of the candidates' movement through multidimensional space, it becomes possible to accurately predict the outcome of an election. The paper also proposes a study using this technique to measure the variable effects the media have in political advertising. Finally, it reports the results of a study using multidimensional scaling to plot the changes in voters' attitudes toward the major political figures and issues in the 1972 presidential election. A random sample of the voters from Champaign County, Illinois, scaled sixteen concepts at five points in time. At each time three dimensions emerged. The trajectories of the two major candidates suggests a lawful motion through the space, which yields a prediction of the outcome of that election.

In this paper we will describe a methodology which applies metric multidimensional scaling (MDS) techniques to the analysis of the perception of political objects within the social milieu. This method predicts that issues and candidates will converge within the cognitive structure or the semantic space of the individuals of a culture. By generating a mean space through a large, representative sample one can pinpoint the relative strengths or weaknesses of the candidates' standing against each other and on specific issues, as well as the relationship between issues and the polity's perceptions of the candidate. This occurs as a result of measuring the distance from a mean position which represents the culture's collective space.

Observations of movement within the space point to changes in relative positions of political objects, while indicating precisely where changes in the information load can be of positive benefit to a candidate. This implies that observation of movement is directly related to messages in the polity's information. Hence, through the use of this technique, the public will, in effect, assume a greater role in the agenda setting of a campaign, since movement within the space is related to information supplied through both interpersonal and mass media channels. Using the dimensions identified by the technique as salient to the population, the candidates and the media will provide that information which is relevant to the issues upon which voters are making their choices.

The candidates and the media can perceive those issues which are salient (i.e., those issues which are changing radically in the space, and the directionality of change) and use that information to modify

campaign message behavior. If we cannot identify the specific issues, and allow the public to identify those issues which are salient and differentiated, we must ask the question, "Is the agenda being set on the dimensions the media wants or those that the voters want?" For example, in the 1968 presidential elections we had concepts in the space which expressed a perception of the candidates' relationship with the anti-war movement. Essentially, Nixon and Humphrey were undifferentiated on this issue, therefore the issue was not salient. Yet a great deal of campaign time was spent by either candidate defending himself on an issue of little relative concern to the voters rather than having that time spent on in-depth discussions of more salient concerns of the population (i.e., crime, economic policy, foreign affairs, and so forth).

It can be argued that education in complex methodologies has little relevance for the student of journalism. However, increasingly, working journalists are being exposed to sophisticated poll data which they must interpret for the public at large. Multidimensional scaling techniques are becoming more prominent in the social science literature, and due to the continuous nature of the measures, the sensitivity, and relatively high validity of the instruments, this trend is not likely to change. Further, with modern algorithms, MDS measurements are less expensive than the interview and ordinal scaling methods normally used by pollsters attempting to predict election outcomes and the population's position on a given issue.

This paper will show that one can generate an analyzable mean space for a social system being measured. It can be shown that a space can

be derived for any cultural sub-system, vis., wealthy white-Protestants, rural poor, etc., so long as clear criteria are drawn for the identification of that sub-system. Sub-system measures can be compared and difference tests can be reliably employed, because all measurements are continuous ratio scales. The New Look Model of Blumler and McLeod (1973) points to the kind of widespread social changes which have made the introduction of measuring methodologies of great sensitivity and versatility a sine qua non for media effects and political opinion research.

The limited effects model developed by Lazersfeld, Berelson and Gaudet, (1944) has traditionally been the hallmark work in the area of voting behavior research. In it, the authors identified three principle effects of the media on voting: activation, reinforcement, and conversion. Principally, the research focused upon persuasion while ignoring the cognitive effects of political information. Selective exposure was elevated to the status of a law, and reinforcement was assumed to play an overwhelming effect. The patterns of party identification, existing as they did in an era of gratuitous political machines, promoted considerable political stability in voter behaviors, while political indifferents were perceived as avoiding potentially persuasive messages. Finally, the authors identified traditional conceptions of attitude change as the only method whereby political behaviors might be changed.

Contrasting this model, Blumler and McLeod (1973) show that greater volatility among party voters has been more or less concomitant with a trend toward decreasing party ties that has accompanied a variety of socio-political changes since World War II. Therefore, the authors con-

clude that there is greater room for influence through communication channels, particularly mass communication channels. Indeed, it is possible that individuals in the informational environment perceive the media as significant others.* In addition, selective exposure (see Carter and Sebald, 1963) is of little or no importance. Reinforcement continues to be important, but where involvement is low, as Sherif and Cantril (1947) indicate, thin and weak defenses are held which are susceptible to beliefs.

The comparative upshot of the two studies is: while Lazersfeld and Berelson (1944, 1954) were able to conclude that the mass media had only limited effects on voter behavior, the New Look indicates that the voting public has become a volatile mass of individuals who are sensitive to information carried on mass media channels, and who are prepared to act on the basis of this knowledge.

In addition, Danowski (1974) has shown that attention to a specific medium is related to the environmental uncertainty of the receiver. In a volatile political situation, the individual will increasingly seek message cues from the media which will guide his or her behavior. Given the increasing instability in the political arena, it would be safe to assume that political messages, conveyed by mass media channels, are having considerably greater impact. Also, Woelfel and Hernandez (1970) indicate that the various media have variable capacities for handling messages of certain mass.

This brings up a point suggested earlier, i.e., which stories are going to impact, or, does any story played up in the media impact upon

*For a discussion of the role of significant others and linear force aggregation, see Woelfel and Hernandez, 1970.

an individual's cognitive set to the degree that it is displayed? Hanneman and Greenberg (1973) found that relevance and salience of the information for an individual are better predictors of whether one becomes acquainted with a news story than the news value of the information. We would hypothesize that relevance and salience can be operationalized in terms of the location and movement of specific concepts along specific dimensions within the cognitive space. It is the particular concept-objects that constitute the information which will impact. From this view, concepts which are accelerating, and therefore assuming greater mass, are becoming more salient to a voter's decision processes.

We submit, therefore, that measures of voter sentiments should be sensitive to subtle shifts in the arrangement of concepts within the space. Studies such as Stern (1971), Clarke and Ruggels (1971), and a great many others, typically employ arbitrary preference indicants and quantum retention measures. They conclude from this methodology that recall is nil, or that this medium or that medium is dominant. However, they ignore the fact that whether or not an individual can recall the details of a story does not delimit the ability of the information contained in the story to provoke changes in the array of concepts within the individual's cognitive space.

The effect of information on this space occurs simultaneously with the introduction of the information into information processing fields. Hence, it is registered, and changes in the array occur instantaneously. Woelfel and Barnett (1974) theorize that information accumulates within the space linearly and the effect of a quantity of information is the

arithmetic aggregate of a set of inputs multiplied by weighting factors, which takes the general form:

$$A = B_1X_1 + B_2X_2 + B_3X_3 \ldots B_nX_n$$

Retention, or the degree to which information is holisitically retained, is a factor which is related to redundancy and other factors, principally sociological (e.g., education level, professional involvement, and SES). The existence of this dimension of recall does not allow us to assume that information has had no effect on those who cannot remember the details of a particular story. Sears (1969) concludes that the average citizen attends only to the most prominent headlined news, and beyond that, his political knowledge is exhausted. Despite this observation, the average citizen carries an array of cognitive impressions of a wide variety of issues that do move as information changes.

Ultimately, it must be recognized that all input, and hence, all effects, occur along semantic dimensions. This view is supported by Nimmo (1970) who suggests that one ideally uses media channels to effect changes in the attribution of popular or salient qualities to candidates, e.g., from reliable and honest to independent and forthright, according to what the audience perceives it wants in a candidate. Crudely, these perceptions, and the distance of a candidate from an idealized mean perception of the particular category under consideration constitute the make-up of what we call cognitive space. Support for the view that the media supplies information that respects this kind of categorical arrangement is also given by the recent findings of McCoombs and Weaver (1973)

which point to the need of the voter for orientation. Orientation is a concept which implies that campaign information should orient towards the needs and gratifications of the voter. The difference between what the voter perceives as being necessary to fulfill his needs and gratifications and what the candidate delivers is a measure of the relative closeness of candidate and need-objects (i.e., his needs for a position on amnesty), or his cognitive space.

Typically, criticism of this view comes from scientists employing unidimensional techniques. These methods, however, do not show the interactive effects of the variety of concepts in a cognitive space, nor do they give an indication of the underlying dimensions along which attitudes and behaviors are generated.

Finally, we should point out that the need for orientation leads to exposure and exposure generates and reiterates the array of concepts within the space. McCoomb and Weaver's (1973) concept of "filling in the gaps" is, in our view, tied to the placement of issue-concepts or social objects along continuums which express for the individual his perception of the issue, the candidate's stance on the issue, and the differences between the two. We propose to describe here these spaces in terms of a multidimensional space which changes as a correlative of changes in the amount and type of information the voting individual is exposed to. The advantage of this technique lies principally in its sensitivity to subtle shifts in the location of issues in cognitive space.

Theory--The Measurement of Cultural Definitions

The process of definition entails relating objects of thought to each other. The definition of any concept may be taken to be that term's relationship to all the other concepts which are used to differentiate that referent as a unique object (Fillenbaum and Rapoport, 1971). "Fundamentally this involves taking note of similarities and differences between objects, or identifying the attributes of an object with similar attributes of different objects, and differentiating the attributes of the object from those attributes of the objects which are different" (Woelfel, 1972:5, [Chapter 4]).

The perception of a single object as a unique object implies a process of categorization in that all the discrete stimuli which constitute the physiological mechanism of that perception are set apart from the totality of stimuli impinging on the individual at the time and designated as a single object of thought. The category renders discrete a continuous process of exposure to the environment, whereby an arbitrary segment of a continuum of stimulation is set aside and identified as a unique object.

When an individual identifies two objects as "yellow," for example, it is not implied that they are the same with regard to color, only that they are similar enough to be described by the same linguistic symbol. The visual color spectrum covers the range from about 4000 to 6400 Angstrom units, and research indicates that color differences of only a few Angstrom units are perceivable (Munsell, Sloan & Godlove, 1933; Halsey, 1954), yet ordinary language does not provide color terms for all these differences.

The ordinary language people speak (and for the most part the symbol system of social science) allows only a crudely approximate description of the perception of any object.

Mathematics provides a language capable of describing differences small without limit, and can describe differences much smaller than may be discriminated by human perception. The continuous set of positive real numbers offers a potentially error-free language for the definition of any set of social objects with a level of precision far greater than the limits imposed by human perception. Woelfel states that (1972:11 [Chapter 4]):

> Dissimilarities among objects (whatever those objects may be) may be represented by a continuous numbering system such that two objects considered to be completely identical are assigned a paired dissimilarity score or distance score of zero (0), and objects of increasing dissimilarity are represented by numbers of increasing value. Assuming that the definition of an object or concept is constituted by the pattern of its relationship to other objects, the definition of any object may be represented by an 1Xn vector, d_{11}, d_{12}, d_{13},...d_{1n}, where d_{11} represents the distance or dissimilarity of object 1 from itself (thus $d_{11}=0$ by definition), d_{12} represents the distance or dissimilarity between objects 1 and 2, and d_{1n} represents the distance between the 1st and nth objects. Similarly, the second object may be represented by a second vector, d_{21}, d_{22}, d_{23},..., d_{2n}, and the definition of any set of concepts or objects may therefore be represented in terms of the matrix
>
> $$\begin{matrix} d_{11}, d_{12}, \ldots, d_{1n} \\ d_{21}, d_{22}, \ldots, d_{2n} \\ \vdots \quad \vdots \quad \vdots \\ d_{n1}, d_{n2}, \ldots, d_{nn} \end{matrix}$$
>
> where any entry d_{ij} represents the dissimilarity or distance between i and j.

The distance matrix D describes the static structure of the interrela-

tionships among a set of N objects at any one point in time possessed by a single individual. Process may be recorded in successive matrices $D_{t0}, D_{t1}, \ldots, D_{tn}$, where the intervals between time periods 0, 1, 2,...n, remains constant,* and the changes between the matrices calculated. These intervals can be made as small as desired to increase the isomorphism with the continuous nature of the notion of process. Since this paper is concerned with social systems rather than single individuals, the matrices should be generated for an entire culture.

The collective consciousness (Durkheim, 1951), i.e., that aggregate psychological configuration which constitutes the culture, or a sub-culture, may be represented accurately as the average matrix $\overline{D}$, where any entry $\overline{d}_{ij}$ is the arithmetic mean conception of the distances or dissimilarities between objects i and j as seen by all members of the culture.

What has emerged then is a cultural definition of a set of concepts, in matrix format, dynamic in the sense that successive matrices can be generated to measure change over time. The difference $\overline{D}_{t_1} - \overline{D}_{t_0}$ would represent the cultural change taking place over the interval from t_0 to t_1. The rate at which any culture is changing can be found by the derivative

$$\frac{dx}{dt} = \underset{t_1 - t_0 - 0}{\text{limit}} \quad \frac{D_{t_1} - D_{t_0}}{t_1 - t_0}.$$

While this matrix is an accurate representation of a set of cultural definitions, it is extremely cumbersome due to its size. The matrix is of

*If the time intervals between measurements are unequal, but they are known, the same information may be gained. However, a more complicated analysis is required.

order N, where N equals the number of concepts. N-1 is the maximum total number of dimensions used by the sum of the individuals of a society to differentiate the set of objects.* This is not the dimensionality shared by the members of the social system. Matrix $\overline{D}$ describes an implicit vector space V_k, where k (the dimensionality of the space), n-1. K equals the number of independent dimensions upon which the members of society differentiate the objects. These dimensions emerge from the data.

V_k is a spatial coordinate system defined by the distance relation among the cognitive objects which are its contents. It has the property that objects defined as similar by any culture will be located close to each other in the space, or, more precisely, that the distance between any pair of objects in the space is directly proportional to their perceived dissimilarity. The precise definition of any object, therefore, is given by its location in V_k, and any change of definition of any object is represented by its movement through V_k.

Matrix $\overline{D}$ may be collapsed to vector space V_k. This has the advantages of reducing the data to usable proportions and revealing the uniquely shared underlying cultural dimensions. This task can be performed by multidimensional scaling.

*Any two points (objects) may be connected by a line, yielding a single dimension differentiating the objects. Three objects may be connected by a plane. No information as to their differentiation would be lost by indicating the objects' scale values on the two dimensions. The same holds for four points in a cube (three dimensions) and on points in a hypersphere of n-1 dimension. It should be noted, however, that if any three or more points lie along a continuum, fewer dimensions would be needed to precisely describe the system.

According to Helm, Messick and Tucker (1959:14):

> . . . the fundamental concept in multidimensional scaling is psychological distance, which is usually estimated in terms of judgments of similarity among stimuli; i.e., two stimuli judged to be very similar are considered to be psychologically closer together than two stimuli judged to be very different. Given judgments of similarity among all the stimuli in a set, mathematical models exist which provide an interpretation of this psychological distance in terms of Euclidean geometry. The stimuli are treated as points in a Euclidean space, and analytical techniques are available to obtain the dimensionality of the space as well as stimulus scale values determined within a rotation and translation.

Multidimensional scaling models can be used in situations where the stimuli may vary simultaneously with respect to several underlying dimensions or attributes. According to Torgerson (1958:248):

> . . . the notion of a single unidimensional, underlying continuum is replaced by the notion of an underlying multidimensional space. Instead of considering the stimuli to be represented by points along a single dimension, the stimuli are represented by points in a space of several dimensions. Instead of assigning a single number (scale value) to represent the position of the point along the dimension, as many numbers are assigned to each stimulus as there are independent dimensions in the relevant multidimensional space. Each number corresponds to the projections (scale value) of the points on one of the axes (dimensions) of the space.

The process is analogous to converting a matrix of city to city mileages to a graphic representation such as the map itself. In this special case, an n x n table of cities would be reduced to a 2-dimensional plot. Some attributes are unidimensional, among them, weight and length. Spatial position, however, varies along three dimensions, height, length, and width. Spatial position on the surface of the earth is also measured with three dimensions; altitude, longitude and lattitude. Knowledge of

the position of an object along any one or two dimensions will not locate it precisely in the space. All three dimensions must be known. Likewise, color is said to possess several underlying qualities. The color green can vary simultaneously according to hue, chroma and any other of several different qualities.

It is not a distance between cognitive objects in some absolute sense which is to be measured, but perceived distance; i.e., the judgments of distances made by individuals and cultures. Consequently, what is needed are judgments of dissimilarities among objects made by respondents but expressed as ratios to some standard unit provided by the experimenter. This can be accomplished quite directly by a question worded in the form:

"If x and y are u units apart, how far apart are a and b?"

Such an item wording requests a dissimilarities judgment from a respondent ("...how far apart are a and b?"). However, it requests that this judgment be made as a proportion of a standard distance provided by the experimenter ("If x and y are u units apart...").

According to Woelfel (1974:13) this technique has several key advantages:

> First and foremost, no restrictions are placed upon the respondent, who may report any positive real value whatever for any pair. Thus, the scale is unbounded at the high end and continuous across its entire range. Secondly, because the unit of measure is always the same (i.e., the unit is provided by the investigator in the conditional, "If x and y are u units apart," and thus every scale unit is 1/u units), and because the condition of zero distance represents identity between concepts and is hence a true zero, not at all arbitrary, this scale is what social scientists usually call a ratio scale, which allows the full range of standard arithmetic operations. Third, since the unit of measure is provided by the experimenter it is possible to maintain the same unit of measure from one measurement to another, both across samples and across time periods, which is crucially

important since time is one of the primitive variables of scientific theory. These three characteristics taken together provide the capacity for comparative and time-series analyses at very high levels of precision.

While the technique suggested meets the scaling criterion quite exactly, and in fact will be the technique of choice in the measurement of aggregate cultural patterns, problems of unreliability make it unsuitable for the measurement of individual self-conceptions. The reliability of any scale is approximately proportional to the complexity of the judgmental task required of the respondent. The technique of direct paired distance estimates requires a highly complex set of judgments from the respondent while providing virtually no structure, and is consequently unreliable for measurement of individual psychological contents (typical test-retest reliability correlations range in the .70's for individuals). Barnett (1972) and Gillham (1972) have shown that the format is extremely reliable on large samples and that consistency of measure increases as a function of sample size. The reason for this is that the error which occurs in measurement is random error rather than systematic bias producing invalidity. Such random error will be normally distributed in a series of measures. The law of large numbers and the central limits theorem assure that the scores obtained will be normally distributed and that the sample mean will converge on the population mean as the sample size increases. Barnett (1972) reports test-retest reliability coefficients in the range of .90 with 75 cases. Thus, reliable measurement becomes only a function of the cost of gathering additional cases.

Obtaining the underlying vector space (V_k) from the matrix $\overline{D}$ is

straight-forward.* Procedurally, data collection yields a three-dimensional concepts x concepts x person matrix which is averaged across the n persons into a two dimensional concepts x concepts square symmetric matrix $\overline{D}$, where any entry d_{ij} represents the average distance between concepts i and j as seen by the respondents. This matrix $\overline{D}$ is transformed routinely into a scalar products matrix B (Young and Householder, 1939), although it is generally the practice of investigators to "double-center" this matrix by establishing an origin for the space at the centroid of the distribution. This can be done simply during the construction of the scalar products matrix, and the transformation for any cell b_{ij} is given by the equation

$$b_{ij} = 1/2 \left(\frac{\sum_{i=1}^{n} d^2_{ij}}{n} + \frac{\sum_{j=1}^{n} d^2_{ij}}{n} - \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} d^2_{ij}}{n^2} - d^2_{ij} \right)$$

which is a straight-forward linear transformation that sacrifices none of the information present in the original matrix D (Torgerson, 1958).

This new centroid scalar products matrix is such that any entry:

$b_{ij} = p_i p_j \cos\alpha_{ij}$ where p_i = the length of vector i, p_j = the length of vector j, α_{ij} = the angle between i and j.

*The technique outlined in the following pages is based on the classical multi-dimensional scaling model (Torgerson, 1958). Other non-metric scaling models are available, but these techniques apply principally to the reduction of matrices which are merely ordinal, and so are not applicable to the continuous, reliable ratio scaled data provided by the measurement system proposed in this article. While they provide an accurate description of the structure of the data, change in the space over time cannot be observed. The reason for this is that the metric has been destroyed by using ordinal data and bounding the space to gain reliability for the individual case. (see particularly Shepard, 1966, 1972).

Consequently, when matrix B is reduced to its base by routine factorization (i.e., the application of any standard eigen routine, such as principal axis or Jacobi), the result is a factor matrix F, whose columns $F_1, F_2, \ldots F_k$ are orthogonal vectors with their origin at the centroid of the vector space spanned by F and where any entry F_{ij} represents the projection (loading) of the ith variable on the jth factor. This matrix has the further properties such that:

$$p_i = \sqrt{\sum_{j=1}^{k} d^2}$$

That is, the square root of the sum of squared projections of the ith variable across all the k factors equals the length of the vector of the ith variable, and of central concern:

$$\bar{d}_{ij} = \sqrt{\sum_{f=1}^{k} (d_{if} - d_{jf})^2}$$

This last expression shows that the original distance matrix can be completely recovered from the factor matrix with no loss of information, by post-multiplying it by its transpose.

After a series of vector spaces has been generated at separate points in time, they can be rotated to a least square best fit congruence in order to calculate the change over time.*

By the simple subtraction of coordinates over time, motions through the spatial manifold over time may be expressed as velocities, as given by:

*Recent research indicates that an exact solution by rotation to stable criteria exists. This has the advantage of increasing stability of the vector space despite extreme movement by single concepts. This technique is analagous to the physical measurement of motion where fixed reference points are established, against which all change is measured.

$$v_i = \frac{d_i}{t} = \frac{\sum_{j=1}^{m}(a_{ij} - b_{ij})^2}{t_1 - t_0}$$

v_i = the velocity of concept i

d_i = the distance concept i has moved across the interval of time t

t = time

a_j = the coordinate value of concept i on the jth factor of the t_0 space

b_j = the coordinate value of concept i on the jth factor of the t_1 space.

Given multiple time periods, the accelerations of the objects in space may also be calculated:

$$A_i = \frac{\Delta V_i}{\Delta t} .$$

These velocities and accelerations, necessary components of process (Arundale, 1971, 1973), are unmistakably measures of cultural change of very high precision. This is so, since the culturally shared definition of any object is given by its location in the manifold V_k, and changes in location represent changes in definition.*

Multidimensional scaling has been used in the past to investigate the dimensions underlying the meaning of lexical items (Cliff, Pennell and Young, 1966; Henley, 1969; Miller, 1969; Fillenbaum and Rapoport, 1971), the perception of speech sounds (Miller and Nicely, 1955; Degerman, 1972),

*A Fortran IV computer program (Serota, 1974) which accomplishes the principle calculations described in this paper is available from the author on request.

and the processing of information (Schroder, Driver and Streufert, 1967; Rips, Shoben and Smith, 1973; Rumelhart and Abrahamson, 1973).

It has also been used to investigate political concepts. Klingberg (1941) found that perception of nations' relations changed as World War II approached. As the likelihood of two nations going to war increased, the countries were viewed as less similar, that is, their proximity decreased in the space. Abelson (1954) and Messick (1956) used MDS to study attitudes towards political issues, i.e., war, communism, capital punishment and the handling of criminals. Wish, Deutsch and Biener (1970) and Wish (1971) found two dimensions underly the perceived similarity of seventeen different nations. They were pro-communist--pro-western and economically developed--underdeveloped.

Data for these studies were all collected by methods which were non-metric in nature. They used a method of triad combinations, where the subjects were given three stimuli and asked to report which two were more similar; or a method of pair comparisons, where the subjects were told to record the similarity of the pair on a discrete Likert-type scale whose range was very limited, nine points at the most; or the proportion of responses who selected a pair as being the correct relation.

A Sample Research Project

Mass communication research has by-and-large failed to consistantly demonstrate that the media have direct effects on the attitudes of their users (Klapper, 1960, 1970; Weiss, 1969). Lazarsfeld, Berelson and Gaudet (1944) found that the mass media (pre-television) had little impact on the voter preferences of Erie County in the 1940 presidential election. Two

possible reasons for this are the lack of sensitive measurement tools and the preponderance of research designs borrowed from Sociology and Psychology which are antiprocessual in nature. Typically, an individual's attitudes are measured only once and the results correlated with exposure patterns to imply a cause and effect relation. Or, the subject's attitude may be measured twice, once prior to a single exposure of some valenced stimulus and once directly after. In the Lazarsfeld case, while they used a process oriented panel design, they failed to find a mass media effect. The reason is perhaps due to the dichotomous dependent variable, a vote for Roosevelt or Wilkie. This measurement is simply not sensitive enough to measure media effects. This trend recently has shown some signs of changing with researchers adopting path analytical tools to describe the communication process (Kline, 1973; Woelfel, et al, 1974).

Metric multidimensional scaling provides a measurement tool sensitive enough to detect the effect of messages and as indicated above, it is ideally suited to assess cultural changes over time due to the impact of a series of media messages.

If one were interested in the effects of political advertising, they might adopt a research design as follows:

Generate MDS spaces for a number of different social systems at six or more equal intervals in time; three points prior to an advertising campaign, at least one during and two after. The reason for the large number of observations is to gain data on the variation of the rate of change over time (acceleration). This may be positive or negative. In order to gain information about acceleration three points are the nec-

essary minimum. These must be gained prior to the manipulation in order to determine the "natural" acceleration of the system. At least one measurement would be taken during the manipulation. Additional data points may be collected during the advertising campaign in order to determine the rates at which attitudes toward the candidates change. Two measurements should be made after the treatment to observe the change in the rate due to the alterations of the society. These rates of change can be found by determining the change in the slopes (derivatives) between each measurement point.

Ordinarily, only four measurements are sufficient to determine changes in acceleration. However, when dealing with long term effects, as with political behavior, additional measures become necessary. Have the people made a decision on a candidate or are they going through a trial period only to switch to the other candidate? Is their "permanent" cultural change occurring or only short-term alterations in the cultural definitions of the issues? Another advantage of having at least two readings after the manipulation is to control for the effects of maturation. Was the system change caused by manipulation or was it produced by some other factors at the identical time (Campbell and Stanley, 1963: 37-42)?

Data would be gathered from a series of treatment groups, each subject to a media campaign in which the message is held constant but the channel is varied. A message, analogous across media, would appear in or be heard on only one medium, television, radio, newspapers or magazines, or some controlled combination of these media. In this way, it becomes possible to measure the independent effects of each separate medium and the possible interaction effects when they have been used in combination. The separate

groups could be cities matched by their size, past voting patterns, the SES of the residents, their use of the media and any other relevant variables. In addition, there should be a comparable control group in which no media campaign would take place.

Data would be gathered from separate random samples* of registered voters (as opposed to a panel design) at each point in time so as to avoid sensitization, a potentially destructive problem with such a large number of measurements. Typically, panel designs have been recommended to measure the effects of the media on voting behavior (Lazarsfeld, Berelson and Gaudet, 1944; Berelson, Lazarsfeld, and McPhee, 1954). However, since the unit of analysis proposed is not the individual but the culture of the respective social system, it makes little sense to use the same subjects in light of sensitivity and mortality.**

The spaces would be generated by having the subjects perform distance estimates on pairs of concepts which are of interest. For example, if a presidential candidate were one subject matter, then estimates could be made between the following concepts: trustworthy, competent, experience, warmth, honesty, my vote, political party labels, a number of different candidates' names including the one which is the subject matter of the advertising campaign, a number of issues which may be salient during the campaign and any other related constructs.

*These samples could vary in size from 100 to 400 cases depending on the level of reliability the researcher wishes. Thus, the cities chosen should have a minimum population of at least 50,000. Again, this may vary depending on the number of administrations collected and the need for a matched set of cities.

**The problems of a panel design, reflected in the conditions of sensitization, mortality, and maturation, were illuminated by the research discussed in the final section of this paper.

Ideally, the proposed research should take place during a primary campaign when there are many (more than two) candidates. At this point in time, they may not be very well known to the voters and their position on the various issues unclear. In terms of MDS this would mean that the issue and candidate concepts are not well defined in relation to all the scaled items. Thus, they would be less stable and be undergoing redefinition (movement) in the space as the campaign progresses.

Past research on attitude change would point towards one additional control, the number of messages (number of advertisements) transmitted. A number of researchers (Woelfel and Hernandez, 1970; Mettlin, 1973; and Mistretta, Miles and Barnett, 1973; Woelfel and Saltiel, 1974) have found that movement in space (in the unidimensional case) is related to the absolute number of messages the subject receives. In each case, the dependent variables were measured as a rate of behavior, such as the number of cigarettes smoked per day. This would suggest that one should control not only the content of the messages but their number as well.

The experimental manipulation could be a "standard" advertising campaign dealing with a known candidate. The reason for using an established candidate is that it would be impossible to generate the vector space if one concept were entirely unknown. This would go on for a designated time period in each of the sample sites.

After all cultural conceptual spaces have been generated, they would be rotated to congruence and the change scores and the rates of change of the entire space calculated. Then, the rates can be compared to see which medium was most effective in altering the subjects' attitudes

toward the candidate. This analysis could point toward two interesting questions. Which medium was most effective in achieving an immediate response to the candidate? And, which method of advertising had the greatest staying power, i.e., producing the longest lasting effects?

It is possible to observe change of the individual concepts in the space in order to determine how effective the campaign was at altering that term's definition or its rate of change. For example, if the goal of the ads were to promote a certain candidate, then one would be interested in the movement of that person in relation to the others in the space. At what rate does the candidate converge with the concept, my vote and is this rate greater than the other candidates in the space?

It is also possible to validate the movements in the space by comparing the rates of change with behavioral indicators, such as voting behavior or more typical attitude measures such as poll data. One could calculate the rates of change on poll data both for the candidate and the issues by measuring the slopes between any two points in time. These could then be compared with the slopes produced by the various media and the one or combination of channels which most highly correlated with the poll data would seem to be the most effective.* That is the one with the highest degree of correspondence between its exposure and the attitude change produced. This should not be confused with the behavioral indicator, voting. In that case, the medium which produces the greatest increment in voting for the candidate may be considered the most effec-

*This, of course, does not include the variable cost. While television (or some other medium) may be the single most effective medium in altering socially held attitudes, its rate of change per unit cost may make it less desirable.

tive. While the use of actual voting data has pragmatic value, it should be avoided in a discussion of the effects of the media because it is only a single dichotomous decision at one isolated point in time by a restricted portion of the population, that which is actually voting.

A Partial Empirical Example

The authors have collected the following example data set as part of a project to measure political attitudes and attitude change as a function of media messages prior to, during, and following a major election. Unfortunately, due to the problems discussed earlier (e.g., mortality with long term panel designs) as well as clerical and financial difficulties, the project was curtailed. However, it is our belief that this data provides an illustrative, if incomplete, example of the application of metric multidimensional scaling techniques for measuring changes in political conceptions.*

Hypotheses. Among the objectives of this project were the examination of changes in configuration of the spatial representation of conceptual distance, changes in the relationship of the vector space in its orientation to the concept "Me" (an aggregate measure of the distance reported between that concept and all other concepts across all subjects), and changes in the magnitude of the space relative to the amount of time prior to the election that the instrument was administered. Specifically,

*In addition, it has provided us with a pretest of the design (on a general population sample). A second study is currently being prepared to examine media effects and political prediction utilizing the recommended design changes. This study, co-occurring with the 1974 congressional elections in Michigan, will rely on the MDS measures in conjunction with poll data, trend data on media campaigns, and content analysis of general-political media messages.

the hypotheses were:

H_1 - Candidates will converge, or cluster in the vector space, over time, with the issues that they are publicly (in media presentation) associated with.

H_2 - The emergant candidates will diverge in space over time.

H_3 - The candidate whose distance from the aggregate "Me" is minimized at the time of the election will be the candidate chosen by the population represented by the sample. (The prediction of the election winner can be made from the trajectories of the two candidates and the concept "Me" adjusting for messages which impact the conceptual space during the interval between the last administration and the election).

H_4 - As the intervals between administrations and the election become shorter, the magnitude of the space will shrink (i.e., as the time of election becomes closer, concepts and candidates are viewed as more homogeneous).

Procedure. The authors collected data at five points in time, between May, 1972 and June, 1973, from a random sample of registered voters in each precinct of Champaign County, Illinois. Randomization among precincts rather than from the county as a whole was done to insure proportional representation of both urban and rural, university and non-university subjects. Because of the early emergence of high mortality and a general lack of funding, the panel received a limited administration in the months of May, June, August, and November. An additional follow-up measurement was made in June, 1973.

Distance judgments were performed on 528 pairs generated from 33

concepts during the first two waves; the questionnaire for these administrations was divided into two parts and randomly distributed among the subjects so that an individual response set was limited to 264 pairs. The third, fourth, and fifth waves were reduced to 16 concepts requiring only 120 judgment pairs. This was done to decrease the amount of time and effort required of a single respondent; it additionally allowed us to better utilize our sample by making it possible to administer the entire instrument to each subject.

Due to the incompatibility of the first wave it will not be discussed in this paper*, however, the second wave has been reduced in size from 33 to 16 concepts for comparative analysis with later data. A portion of the questionnaire has been attached with the tables at the end of the paper; the following is a list of the 16 concepts maintained across all waves:

1. Nixon
2. McGovern
3. Wallace
4. E. Kennedy
5. Agnew
6. Connally
7. Peace in Vietnam
8. Prosperity
9. Amnesty for Draft Resisters
10. Law and Order
11. Busing
12. Taxes
13. Demonstrating
14. Employment
15. Marijuana
16. Me

*This wave of data was analyzed at the University of Illinois - Urbana, where the study was originated. Since that time a more rapid and reliable form of computer analysis (Galileo 2.3, Serota, 1974) has been developed and has been applied to the later waves of the study. Because the first wave was preserved in a form incompatible with input for Galileo, direct comparison of results would be misleading.

The criterion pair for this instrument was Kennedy-Eisenhower. Judgment pairs were presented in the form, "If John F. Kennedy and Dwight D. Eisenhower are 50 Galileos apart, how far apart are [Nixon] and [McGovern]?" Gailieo is used here to represent an arbitrary unit for comparison.

The original panel consisted of 250 randomly selected voters yielding 125 complete response sets. There are 27 cases which are matched across all waves; these represent a somewhat urban, university-oriented bias and tend to skew the small data sets. The divided second wave provided 58 complete response sets, the third wave had 83 respondents, wave four had a greatly reduced 27, and wave five increased slightly to 34 respondents. While the composition of the sample was balanced between the rural and urban components, as has been noted the urban segment had a large number of subjects who were students or other individuals associated with the University of Illinois. This is significant because traditionally Republican Champaign County at the time of study was undergoing massive voter registration in the student sector, a fact which influences the relationship of the findings to actual voting behavior.

Results. The mean distance matrices for each point in time are presented in Tables 1 to 4. The spatial coordinates for each point in time are presented in Tables 5 to 8. In each case the solution is found to be approximately three dimensions, although a scree line test indicates a slight contraction of the space prior to the election followed by an expansion in the follow-up wave. This is most likely produced by the limiting of voter decision-making to a few, salient dimensions.

The four coordinate systems were rotated to a least-squares best fit

congruence using six dimensions (acco g for more than 93 per cent of the distance in real Euclidean space a roviding an accurate solution) and three dimensions were then plotted ures 1 to 4). Finally, selected concepts were graphed together across time o produce a plot of the concepts' trajectories (Figure 5).

Several major changes occurred in the configuration of the space; most importantly, the relationship of the candidates and the aggregate Me moved in what may be termed "ralatively lawful motion" through the space. Specifically, Nixon and Me were reported at t_2 as 114.21 units apart, at t_3 as 76.74, at t_4 as 114.57, and at t_5 as 101.18 units apart. Conversely, McGovern and Me are shown to diverge with distances reported as 39.15 for t_2, at t_3 as 57.98, at t_4 as 41.44, and at t_5 as 72.62 units.

During the periods prior to the election, the major conventions and the events of Watergate and the Eagleton affair occurred. It can be seen that change in the spatial relationships of the candidates is consistent with Nixon's public denouncement of political espionage, coupled with the Democratic party controversy. It should be noted that while t_4 data (November) breaks from the trend, it suffers from a poor response rate which tended to skew the distribution of the sample in favor of the urban, university-oriented segment of the population. Based on the trajectory of period t_{23}, the distance between Nixon and Me should have been reduced to about 20.0 units while McGovern and Me should have increased to about 80.0 at the time of the election. Some of the extremeness of the skewed data set seems to indicate a real change in Nixon's loss of relational strength as the voting results for Champaign County indicate that Nixon

won 17,937 to 17,918, a plurality of only 19 votes. The ensuing change for t_{45} indicates that Nixon suffered a much greater divergence following the elections; this is attributable to the heightened effect of Watergate during the spring of 1973.

The extent to which this instrument is able to yield a "correct" picture of the structure and changes of concept relationships becomes more apparent with the examination of several issue-related concepts that were scaled into the space. Several concepts, associated with one candidate or the other, remain particularly stable across time indicating a strong association with one candidate over the other. For example, while Peace in Vietnam changed no more than 8.0 units across any two points in time for either candidate, Nixon's distance from the issue (53 - 52 units) was about twice as far as McGovern's distance (20 - 29 units). The same pattern occurs with the concept Law and Order across t_2, t_3, and t_4; while neither candidate varies more than 6.0 units, Nixon (19 - 26 units) is perceived as being half as far as McGovern (37 - 41 units). Interestingly, in the period following the election, during which the Watergate affair gained media prominence, the distance between Law and Order and McGovern doubled but the distance between Law and Order and Nixon tripled. Similar comparisons may be drawn for other issues such as Marijuana or Bussing; Figure 5 portrays this outcome most graphically.

Finally, the identification of underlying dimensions yields some key to the salience of judgments being made. However, unlike factor analysis where rotations are made to dichotomize the concepts, metric multidimensional scaling provides indicators of an underlying continuum. Examination of

the coordinate values indicate that the first dimension is plainly a liberal-conservative division while less clearly, the second and third dimensions suggest factors of timeliness, traditionalness, and/or potency. Correlation of the loadings of a given dimension with stable unidimensional variables could be used to further identify (label) the underlying structure.

These findings clearly lack the rigor necessary to test the primary hypothesis that movement in the vector space is a function of the amount of information the subjects receive. We can only infer this from the results reported above. It is, however, possible to observe regular motion in the space reported here which maintains a high level of face validity with both current political polling practices and actual voting behavior for the population. To usefully apply these techniques and test our main hypotheses it will be necessary to control the information concerning the scaled concepts and/or perform a content analysis about those topics, while utilizing the metric multidimensional scaling instrument at a level of rigor consistent with the precision which it is able to achieve.

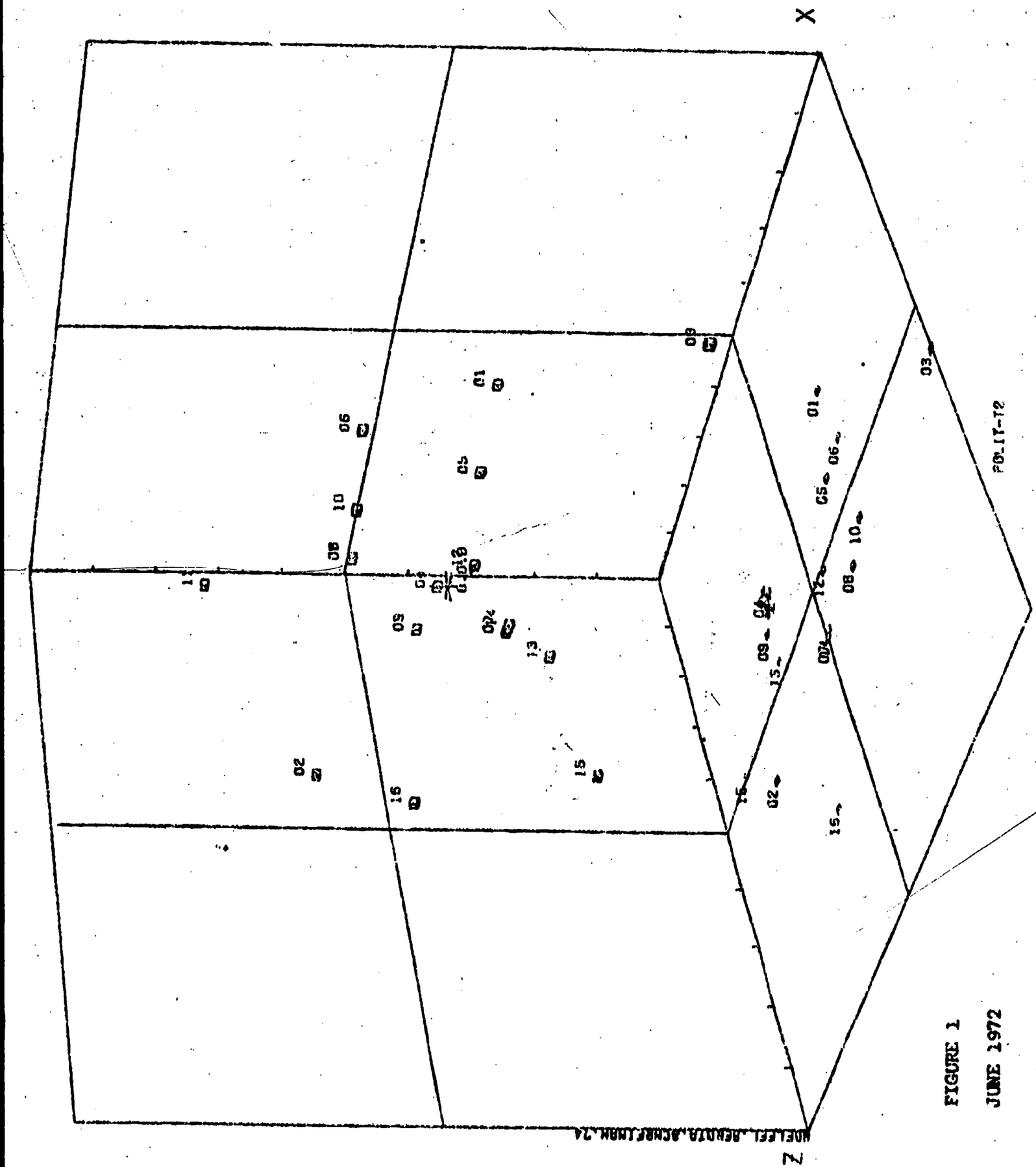


FIGURE 1

JUNE 1972

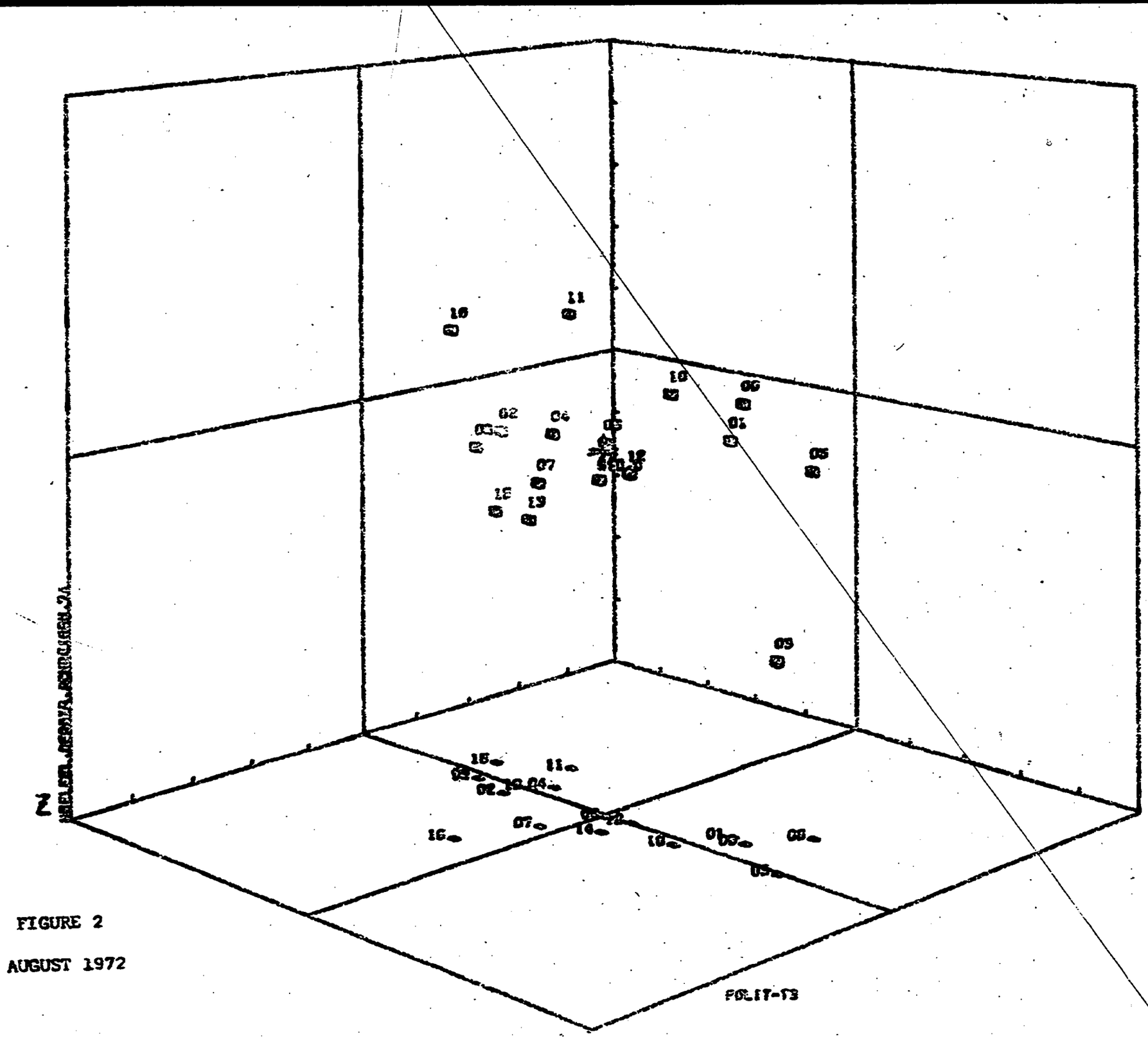
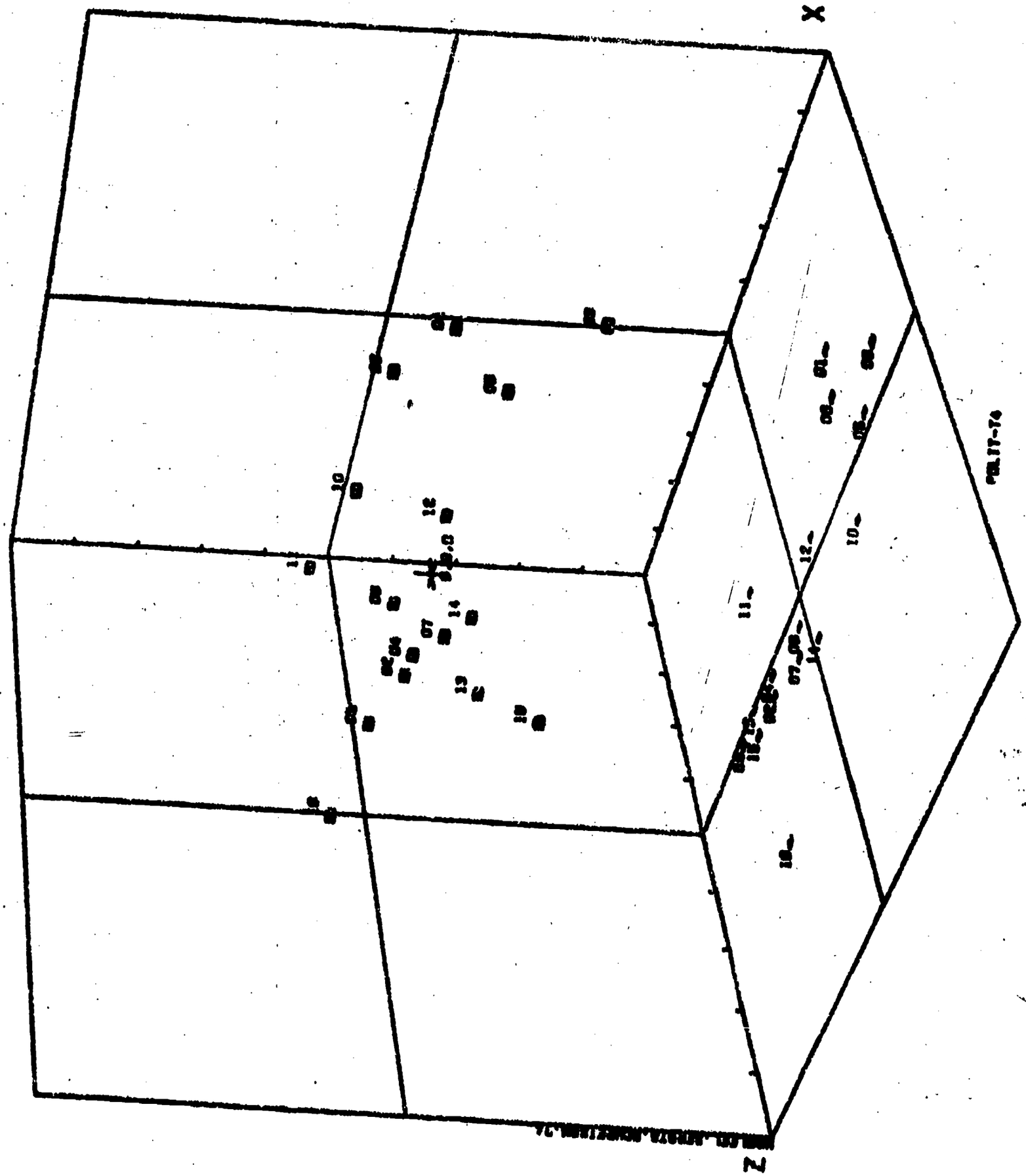


FIGURE 2

AUGUST 1972



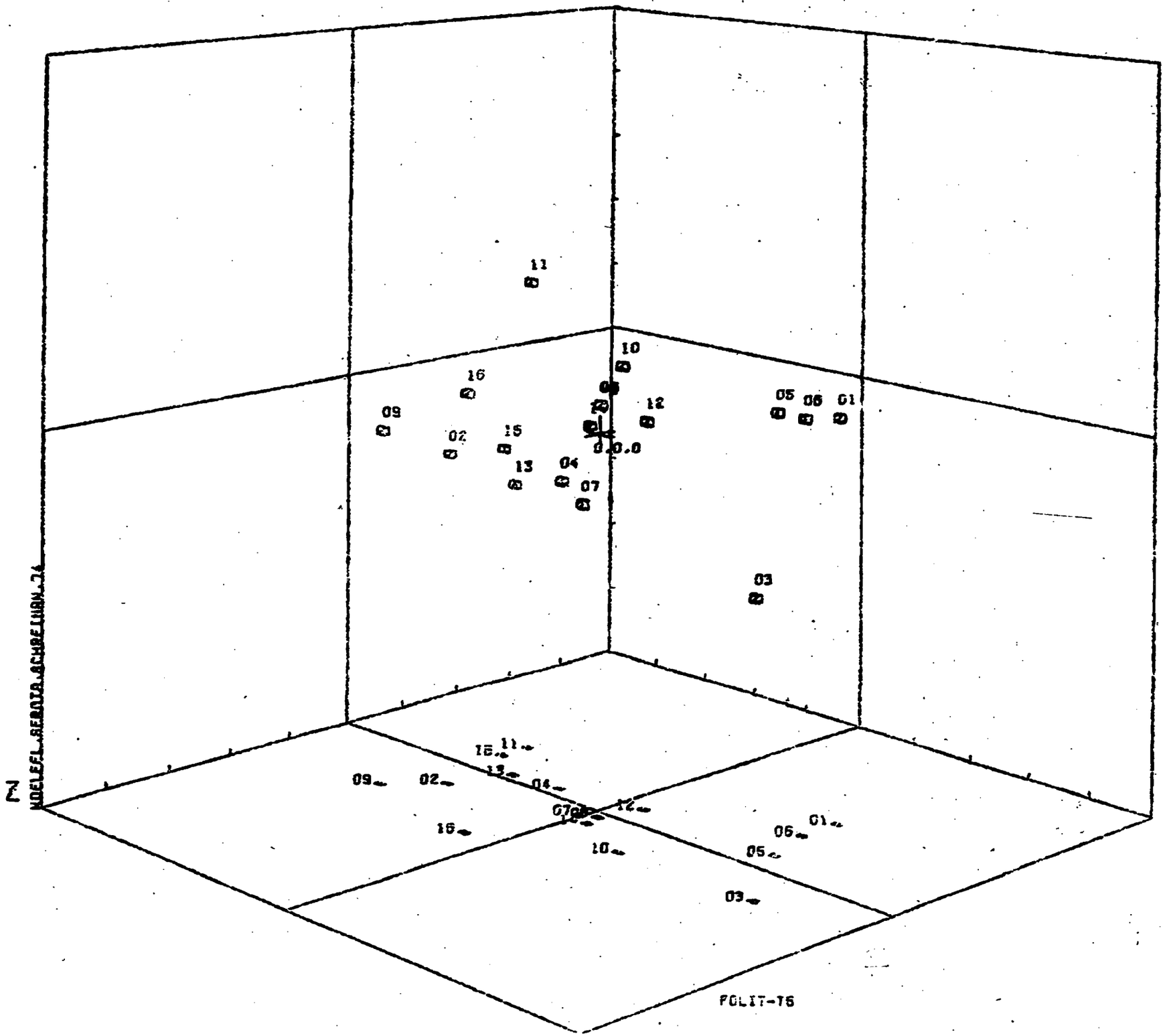


FIGURE 4

JUNE 1973

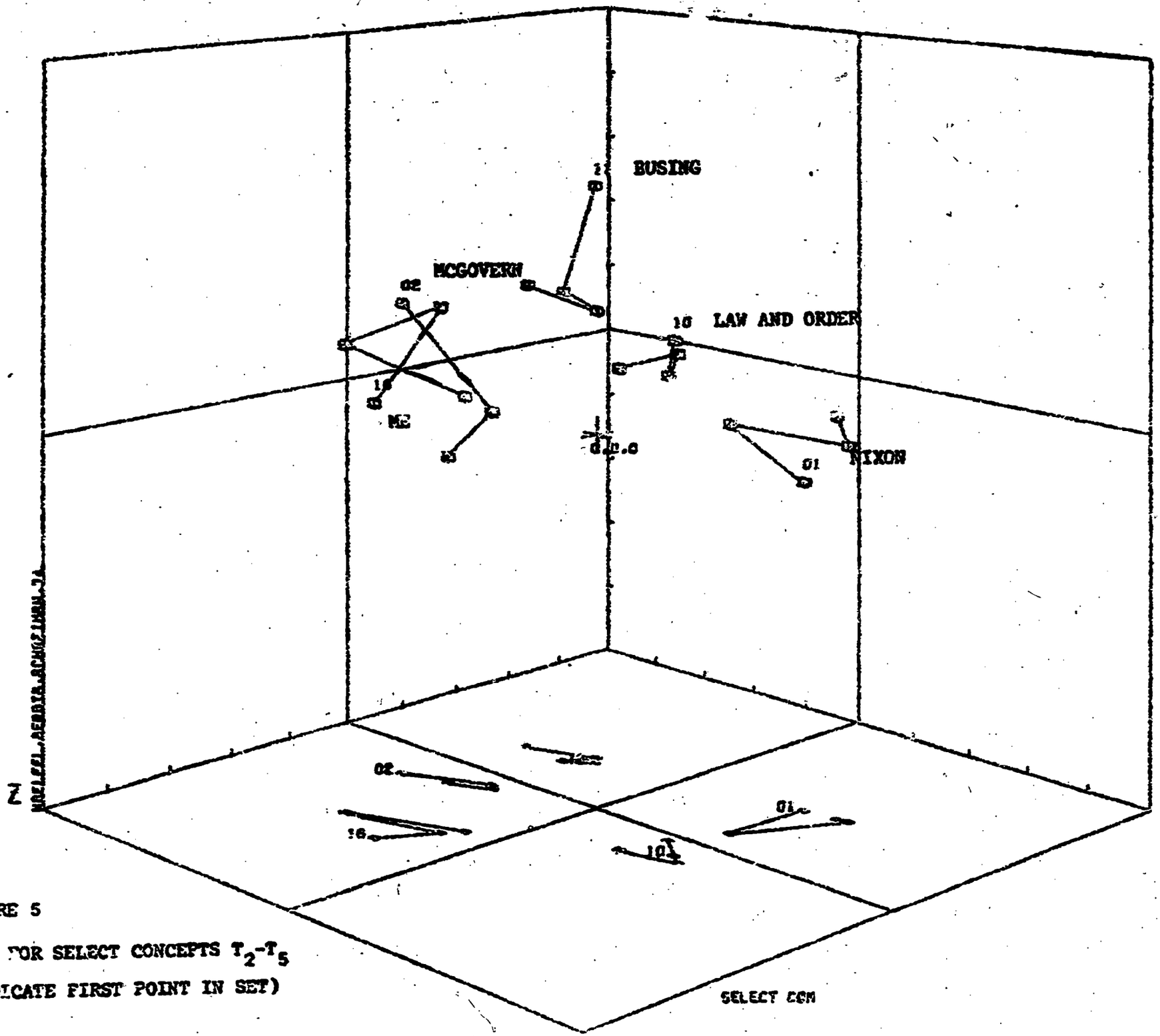


FIGURE 5

TRAJECTORIES FOR SELECT CONCEPTS T_2-T_5

(NUMBERS INDICATE FIRST POINT IN SET)

If JOHN F. KENNEDY and DWIGHT D. EISENHOWER are 50 GALILEOS apart, how far apart are:

Today's Date _____

	ID#	1-5		Duplicate:	1-6
	Wave:	4,6		Card 03:	7-8
	Card 01:	7-8			
Nixon and McGovern	0102-Gal.___	9-17	McGovern and Kennedy	0204-Gal.___	9-17
Nixon and Wallace	0103-Gal.___	18-26	McGovern and Agnew	0205-Gal.___	18-26
Nixon and E. Kennedy	0104-Gal.___	27-35	McGovern and Connally	0206-Gal.___	27-35
Nixon and Agnew	0105-Gal.___	36-44	McGovern and Peace in Viet Nam	0207-Gal.___	36-44
Nixon and Connally	0106-Gal.___	45-53	McGovern and Prosperity	0208-Gal.___	45-53
Nixon and Peace in Viet Nam	0107-Gal___	54-62	McGovern and Amnesty for Draft Resisters	0209-Gal___	54-62
Nixon and Prosperity	0108 Gal.___	63-71	McGovern and Law and Order	0210-Gal.___	63-71
Nixon and Amnesty for Draft Resisters	0109-Gal.___	72-80	McGovern and Busing	0211-Gal.___	72-80
	Duplicate	1-6		Duplicate.	1-6
	Card 02	7,8		Card #04	7-8
Nixon and Law and Order	0110-Gal.___	9-17	McGovern and Taxes	0212-Gal.___	9-17
Nixon and Busing	0111-Gal.___	18-26	McGovern and Demonstrating	0213-Gal.___	18-26
Nixon and Taxes	0112-Gal.___	27-35	McGovern and Employment	0214-Gal.___	27-35
Nixon and Demonstrating	0113-Gal.___	36-44	McGovern and Marijuana	0215-Gal.___	36-44
Nixon and Employment	0114-Gal.___	45-53	McGovern and Me	0216-Gal.___	45-53
Nixon and Marijuana	0115-Gal.___	54-62	Wallace and Kennedy	0304-Gal.___	54-62
Nixon and Me	0116-Gal.___	63-71	Wallace and Agnew	0305-Gal.___	63-71
McGovern and Wallace	0203-Gal.___	72-80	Wallace and Connally	0306-Gal.___	72-80

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0															
2	130.4	0.0														
3	68.5	178.7	0.0													
4	84.3	55.9	139.5	0.0												
5	21.5	81.4	53.2	94.5	0.0											
6	22.8	69.5	63.9	75.9	50.1	0.0										
7	54.7	29.1	78.2	36.3	49.7	52.9	0.0									
8	43.0	37.6	76.7	69.1	40.3	38.9	47.8	0.0								
9	77.8	20.7	142.2	33.6	83.3	79.1	98.6	74.7	0.0							
10	24.4	40.1	31.0	76.9	27.5	28.9	56.3	27.2	75.9	0.0						
11	75.7	29.6	180.9	60.3	58.5	57.8	66.5	51.3	65.4	43.5	0.0					
12	31.5	38.7	67.8	40.4	35.4	32.6	47.7	56.4	70.1	61.8	57.6	0.0				
13	101.0	30.7	91.7	45.2	105.6	97.1	46.9	122.0	40.7	111.8	38.0	68.0	0.0			
14	45.8	26.3	82.2	55.8	39.8	50.0	51.1	14.1	54.0	71.1	88.0	22.8	48.0	0.0		
15	103.0	43.4	182.4	52.6	86.7	156.6	65.3	135.7	53.6	146.4	138.7	92.8	38.4	82.1	0.0	
16	114.2	39.2	133.2	103.2	104.6	97.0	19.2	34.9	65.0	39.3	662.1	37.1	78.1	15.0	75.9	0.0

(column and row numbers refer to concept numbers used in the paper)

Table 1 -- Mean Distance Matrix for 16 Concepts

Wave II -- June 1972

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0															
2	88.3	0.0														
3	59.8	106.4	0.0													
4	82.2	24.4	98.2	0.0												
5	15.6	101.3	47.0	88.2	0.0											
6	14.7	85.8	54.6	76.7	26.2	0.0										
7	53.3	23.8	69.9	28.1	74.0	67.2	0.0									
8	35.7	44.4	69.4	36.3	46.1	34.3	39.3	0.0								
9	116.1	15.7	117.2	27.1	123.5	100.8	48.0	53.6	0.0							
10	19.5	41.9	24.5	41.2	24.5	27.2	55.0	26.2	82.9	0.0						
11	53.9	25.9	135.7	21.6	84.3	70.7	51.1	43.2	53.6	47.4	0.0					
12	24.5	29.5	39.0	29.0	32.9	33.5	36.9	27.3	63.0	36.4	43.4	0.0				
13	80.7	22.4	84.0	23.0	94.5	94.8	28.3	43.3	29.8	91.1	31.9	52.4	0.0			
14	32.9	29.0	40.0	25.4	41.2	32.1	35.1	18.5	64.4	39.5	49.4	28.6	56.4	0.0		
15	104.0	35.4	118.7	32.7	118.4	111.7	62.6	48.8	33.7	98.6	55.3	60.5	39.0	60.3	0.0	
16	76.7	57.9	129.4	63.1	106.0	76.3	13.6	23.2	78.6	32.7	50.4	33.0	61.7	18.1	94.6	0.0

Table 2 -- New Distance Matrix for 16 Concepts

Wave III -- August 1972

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0															
2	102.8	0.0														
3	48.4	112.2	0.0													
4	100.6	14.9	09.9	0.0												
5	11.2	112.3	35.8	107.1	0.0											
6	19.5	101.3	33.3	96.3	22.6	0.0										
7	60.3	20.2	90.5	27.6	80.3	83.0	0.0									
8	51.0	23.4	95.0	27.5	69.1	59.7	25.5	0.0								
9	135.2	15.4	149.4	17.0	140.3	104.4	42.4	59.4	0.0							
10	26.1	37.4	43.1	39.7	19.0	27.6	46.0	24.4	105.5	0.0						
11	78.2	30.8	128.0	31.5	102.7	73.0	43.4	46.7	50.7	82.1	0.0					
12	20.5	37.6	43.6	34.0	40.5	38.6	82.3	25.1	69.6	22.6	73.6	0.0				
13	105.6	32.7	132.2	30.0	103.1	103.5	34.3	48.9	23.7	121.3	58.2	78.4	0.0			
14	68.2	17.5	70.2	24.9	60.2	62.5	36.8	13.8	42.4	48.0	69.7	47.4	43.4	0.0		
15	127.5	35.4	121.6	33.7	123.9	118.9	42.3	62.2	30.3	120.8	74.5	71.0	30.5	59.8	0.0	
16	144.5	41.4	154.2	51.0	125.2	109.0	5.1	17.1	43.1	64.3	64.2	46.1	44.8	11.9	52.7	0.0

Table 3 -- Mean Distance Matrix for 16 Concepts

Wave IV -- November 72

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0															
2	133.8	0.0														
3	72.0	103.5	0.0													
4	87.9	27.2	63.8	0.0												
5	22.4	96.0	43.2	95.0	0.0											
6	21.4	127.1	41.2	94.6	30.2	0.0										
7	62.6	28.0	56.4	32.9	59.5	58.0	0.0									
8	71.2	62.1	54.5	34.0	52.7	53.0	29.3	0.0								
9	156.7	15.8	120.6	19.6	146.7	116.0	51.4	36.3	0.0							
10	63.4	65.2	20.6	48.1	25.8	39.1	51.1	42.1	79.0	0.0						
11	78.3	17.5	154.2	32.2	94.5	80.9	49.4	31.0	47.9	57.9	0.0					
12	31.0	29.1	42.5	28.3	33.4	33.5	32.9	23.0	53.7	28.9	27.5	0.0				
13	89.4	17.0	112.1	28.9	101.9	84.7	28.4	56.5	28.8	84.9	30.4	49.8	0.0			
14	50.8	54.6	54.8	27.9	38.9	47.7	34.4	16.9	48.3	36.8	35.6	39.4	46.1	0.0		
15	137.9	31.4	133.2	29.1	122.5	99.8	37.8	37.5	29.2	110.5	39.6	56.2	32.1	75.5	0.0	
16	101.1	72.6	100.2	70.5	78.7	93.4	9.8	14.2	67.1	32.5	51.1	27.0	44.1	13.0	73.1	0.0

Table 4 -- Mean Distance Matrix for 16 Concepts

Wave V -- June 1973

CONCEPT #		DIMENSION I	II	III
1	NIXON	40.86	-13.34	-38.84
2	MCGOVERN	-60.31	31.69	18.15
3	WALLACE	106.46	-48.06	15.66
4	E. KENNEDY	-32.39	-7.27	-30.72
5	AGNEW	29.35	-6.75	-15.58
6	CONNALLY	43.63	29.01	-17.03
7	PEACE IN VIETNAM	.34	-13.99	17.32
8	PROSPERITY	27.98	34.35	16.81
9	AMNESTY FOR DRAFT RESISTERS	-37.88	.02	-18.66
10	LAW AND ORDER	40.29	33.96	10.64
11	BUSING	-28.58	64.52	-26.41
12	TAXES	9.66	-5.86	1.08
13	DEMONSTRATING	34.62	-37.29	-5.53
14	EMPLOYMENT	1.799	-14.66	16.17
15	MARIJUANA	-81.58	-60.53	-.81
16	ME	-25.02	14.21	57.76

Table 5 - Spatial Coordinates

Wave II - June 1972

CONCEPT #		DIMENSION I	DIMENSION II	DIMENSION III	CHANGE
1	NIXON	38.88	7.32	-11.72	44.96
2	MCGOVERN	-35.23	1.93	6.86	49.70
3	WALLACE	67.62	-47.55	.66	44.34
4	E. KENNEDY	-27.71	-.17	-6.41	48.02
5	AGNEW	56.20	-1.29	-26.13	36.16
6	CONNALLY	45.21	19.06	-10.23	29.58
7	PEACE IN VIETNAM	-6.53	-6.88	18.85	36.67
8	PROSPERITY	1.95	3.08	.86	46.68
9	AMNESTY FOR DRAFT RESISTERS	-50.28	-5.94	3.12	46.30
10	LAW AND ORDER	31.16	22.06	3.79	24.22
11	BUSING	-36.18	32.94	-21.23	39.67
12	TAXES	10.19	-4.92	-.50	9.27
13	DEMONSTRATING	-32.51	-25.74	-1.20	40.10
14	EMPLOYMENT	9.86	-4.80	10.72	22.80
15	MARIJUANA	-56.33	-28.88	-9.51	49.14
16	ME	-16.30	39.77	42.08	40.28
	Average Change in the Space from Previous Time				37.99

Table 6 - Spatial Coordinates

Wave III - August 1972

CONCEPT #		DIMENSION I	DIMENSION II	DIMENSION III	CHANGE
1	NIXON	55.27	-1.04	-40.95	37.39
2	MCGOVERN	-32.66	2.65	8.78	6.85
3	WALLACE	81.34	-34.10	-16.31	27.74
4	E. KENNEDY	-30.69	-.13	2.77	14.06
5	AGNEW	65.52	-8.70	-5.71	30.94
6	CONNALLY	50.90	17.60	-26.70	21.76
7	PEACE IN VIETNAM	-10.54	-4.01	13.67	18.39
8	PROSPERITY	-5.61	10.73	6.65	27.10
9	AMNESTY FOR DRAFT RESISTERS	-61.31	7.21	2.85	20.69
10	LAW AND ORDER	44.60	31.45	13.67	22.09
11	BUSING	-31.32	26.73	-29.69	21.66
12	TAXES	15.79	-2.02	-7.38	39.38
13	DEMONSTRATING	-48.45	-23.59	.39	29.68
14	EMPLOYMENT	3.77	-8.09	19.09	22.01
15	MARIJUANA	-49.92	-40.80	8.86	31.14
16	ME	-46.69	26.11	49.97	41.70
Average Change in the Space from Previous Time					25.79

Table 7 - Spatial Coordinates

Wave IV - November 1972

CONCEPT #		DIMENSION I	DIMENSION II	DIMENSION III	CHANGE
1	NIXON	51.94	6.86	-39.84	35.48
2	MCGOVERN	-45.17	-11.40	14.27	29.38
3	WALLACE	75.86	-27.54	17.58	36.94
4	E. KENNEDY	-20.27	-17.97	-5.09	29.27
5	AGNEW	57.26	13.67	-9.89	47.90
6	CONNALLY	52.02	8.74	-26.17	11.10
7	PEACE IN VIETNAM	-1.36	-19.57	4.88	33.86
8	PROSPERITY	3.73	9.04	3.10	37.00
9	AMNESTY FOR DRAFT RESISTERS	-58.09	-4.53	27.74	37.57
10	LAW AND ORDER	27.01	25.70	17.81	23.60
11	BUSING	-52.81	32.56	-22.71	31.18
12	TAXES	7.64	2.99	-10.44	44.40
13	DEMONSTRATING	-38.11	-21.97	-3.95	22.78
14	EMPLOYMENT	5.35	4.22	8.64	28.05
15	MARIJUANA	-53.09	-15.72	-13.11	45.49
16	ME	-11.93	14.91	37.18	49.20
Average Change in the Space from Previous Time					33.95

Table 8 - Spatial Coordinates

Wave V - June 1973

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