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A MULTIDIMENSIONAL EXAMINATION OF POLITICAL ATTITUDE CHANGE

James A. Taylor

George A. Barnett

Kim B. Serota

Department of Communication
Michigan State University
East Lansing, Michigan 48824

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ABSTRACT

A Multidimensional Examination of Political Attitude Change

James A. Taylor, George A. Barnett, and Kim B. Serota

Michigan State University

The processes by which political attitude change occur have been examined extensively through various theoretical and methodological approaches (Lazarsfeld, Berelson, and Gaudet, 1944; Berelson, Lazarsfeld, and McPhee, 1954; and others). In this paper, the authors examine political attitudes as a subset of a general theory of attitude formation and attitude change proposed by Woelfel and Saltiel (1974). This theory states that messages constitute forces which move an attitude toward some intermediate position between the attitudes of source and receiver. This provides a balance formulation by treating an attitude as the mean of all advocated positions for the attitude such that the message forces sum to zero. The approach taken here differs from the traditional balance theories (Heider, 1946; Newcomb, 1956; Festinger, 1957; Osgood, Suci, and Tannenbaum, 1957) by suggesting a continuously scaled, least-squares balance point. Further, observation of attitude is treated as a longitudinal activity rather than a discrete event and change is treated mathematically as motion in a multidimensional space.

In a political context, the Woelfel-Saltiel theory facilitates identification of party preferences, candidate preferences, and issue interrelationships. It also makes possible the prediction of election outcomes. Applying a metric multidimensional scaling procedure in a longitudinal analysis prior to the 1974 Congressional election, the authors were able to use the relative positions of the candidates, parties, and issues, as well as the reported self position, to make predictions about the results of one Congressional race. By direct input into the campaign strategy, the multidimensional space was used to identify, for the candidate, issues which the polity viewed as salient and to suggest appropriate message strategies. The candiate's subsequent message campaign stresses attitudes designed to move the candidate, the salient issues, and the average of all respondents' self position together.

The combination of longitudinal data collection and a quasi-experimental treatment in the field setting provides strong indicators of the communicative influence of political information in the formation of political attitudes. Further, the voting situation provides a good behavioral measure against which to compare results of the study.

Analysis of the hypotheses and a critical examination of the methods used are reported by the authors. Further, results are considered with respect to previous studies and implications are drawn for current and future political communication research.

The process by which political attitudes form and change during an election campaign has been examined extensively by a number of researchers from a variety of theoretical and methodological approaches (Lazarsfeld, Berelson, and Gaudet, 1948; Berelson, Lazarsfeld, and McPhee, 1954; Campbell, Guria, and Miller, 1954; Campbell and Cooper, 1956; Campbell, Converse, Miller and Stokes, 1960, 1966). Central to this problem has been the question, "How does the information made available to the polity during the campaign affect their perceptions of the issues and candidates and their behaviors such as voting?"

In this paper, the authors examine political attitude change as a subset of the general theory of attitude change proposed by Woelfel and Saltiel (1974). This theory stipulates that messages constitute forces which cause an attitude toward a given object to move to some intermediate position between the attitude of the source and the receiver. The Woelfel-Saltiel treatment is a <u>balance</u> formulation since it defines an attitude as the mean of all advocated positions for the attitude such that the message forces sum to zero.

<u>Attitude Change Theory and Measurement</u>

The Woelfel-Saltiel theory differs from traditional theories of attitude change (Heider, 1946; Newcomb, 1956; Festinger, 1957; Osgood, Suci, and Tannenbaum, 1957) by suggesting a continuously scaled least-squares balance point. The least-squares balance point is a locus in an unstandardized factor matrix which minimizes the squared distance between a point representing an attitude-object and all other points lying in a multi-dimensional space. Note that attitude-objects are taken to be those phenomena in the environment to which an individual assigns a valence, either positive or negative, and a magnitude for evaluative purposes. Hence, the theory is appropriate to discussions of process and change over time (Barnett, 1974).

Unlike Heider (1956), the Woelfel-Saltiel theory specifies the relationship between message volume, the significance of the source, and attitude mass. While message volume is the quantity of input to receiver, attitude mass is that characteristic of an attitude whereby it is made resistant to change as a function of the number of messages a person has received about the objects of the attitude in the past. Further, Heider attributes attitude change to search processes initiated by the individual as a result of some internal state of attraction. The individual attempts to remain consonant with both his attraction to another person and an incongruent attitude between ego and the other. While this possibility is not excluded by the Woelfel-Saltiel formulation, it also includes other circumstances in which the individual is confronted by valanced information toward an attitude which have an effect on that attitude. In other words, under Woelfel and Saltiel's theory, <u>all</u> information, from <u>all</u> media are seen as contributing to the magnitude, valance, and mass of an attitude.[1]

Woelfel and Saltiel also deviate significantly from Festinger's (1950) notion of the role of dissonance and cognitive consistency as the impetus to attitude change. Again, internal states may initiate an information search which changes the locus of the balance point. However, other motives are not excluded by Woelfel and Saltiel. Similarly, Newcomb's A-B-X model may be seen to be a special case of the Woelfel-Saltiel theory. In dyadic interactions, particularly those taking place in a laboratory setting, the issues of discussion are not likely to have had a large message history (e.g., low mass). A great many messages may be exchanged rapidly which will induce considerable movement in the locus of the balance point in a relatively short period of time. Woelfel and Saltiel cover the individual attitude change case (c.f., Woelfel and Haller, 1972) and the generalized case of attitude change across an entire culture.

At its simplest level, the theory suggests that an attitude is the joint effect of a set of messages, $x_1, x_2, \ldots, x_n$. The consequent attitude $\underline{a}$ is the linear sum of the messages divided by the number $\underline{n}$ of messages. Attitude $\underline{a}$ can be represented as:

$$\underline{a} = \bar{x} = \frac{1}{n}x_1 + \frac{1}{n}x_2 + \ . \ . \ . + \frac{1}{n}x_n = \sum_{i=1}^{n} \frac{x_i}{n} \qquad [1]$$

This equation assumes that each incoming message stimulus has a unique effect equal to the effect of all other incoming stimuli. Further, it assumes that no other variables have a substantial effect.

Each message, x_i, is postulated to be a force which pulls the attitude in one direction or another. The mean ($\bar{x}$) of all forces constitutes the balance point at which all forces sum to zero since:

$$\sum_{i=1}^{n} (x_1 - \underline{a}) = 0 \qquad [2]$$

This conceptualization can be expanded to explain complex empirical phenomena at either the individual (Woelfel and Haller, 1972) or cultural level (Barnett and Wigand, 1975). Messages can be weighted either for the significance of the source (Woelfel and Haller, 1972; Woelfel and Hernandez, 1972), or the salience of the information for the receiver. In fact, the precise effect of an additional number of messages required to change an attitude where the message history, or the mass of an attitude, is known can be specified. In field studies such as the research described here, however, lack of experimental controls prevents adequate empirical examination of these equations.[2] Attitude change, then, is treated as a simple quantitative function of the number of messages an individual has received about a given attitude-object. Thus, the greater the information history about an attitude-object the more difficult it becomes to foster attitude change.

Four factors are causally related to attitude change according to this theory:

(1) the number of new messages,
(2) the number of messages comprising the initial balance point,
(3) the amount of discrepancy between the old attitude and the mean position advocated by the new messages, and
(4) the credibility or significance of the source and/or the salience of the information for the receiver.

Woelfel and Saltiel state:

> . . . the amount of attitude change is directly related to the product of the average discrepancy between incoming information and the old attitude (average change advocated) and the number of such messages, and inversely related to the sum of the number of messages out of which the change message and the original message is composed (p. 4-5).

The observation of attitude can be treated as a longitudinal activity rather than a discrete event and change can be treated, mathematically, as motion in a multidimensional space. As Woelfel and Saltiel (1974) have shown in their discussion of cognitive processes, and as Woelfel (1972) details in his presentation of Linear Force Aggregation Theory, the concept of attitude may be treated as the set of interrelationships which define any cognitive element's proxemity to all other cognitive elements. That is, the attribution of value to any element will be done on the basis of what other elements are associated with it and the evaluation placed upon those elements. Definition and evaluation of elements must be viewed as a function of the information an individual receives. This information acts to associate, cognitively, the object of the message with existing, or previously defined, elements. Since information processes can be viewed as continuous and ever-present, any attempt at static assessment of attitude will, by definition, be incomplete. Therefore, it is necessary to treat attitudes as processual, develop assessment techniques which take this characteristic into account, and interpret the results using a model of sufficient descriptive and predictive power.

One such assessment technique (which provides a framework for the Woelfel-Saltiel model) is longitudinal metric multidimensional scaling (Woelfel, 1972; Serota, 1974; Barnett, Serota, and Taylor, 1974). Based in the psychophysical work of Gulliksen (1946) and Torgerson (1951, 1958), multidimensional scaling uses judgments of distance, or dissimilarity, between concepts or stimuli to place the concepts into a spatial representation. Further, the more recent version of this technique, in addition to its definitional quality, utilizes paired ratio judgments to achieve a metric which makes the space directly comparable to similar structures at different points in time.

The significance of a multidimensional technique is its power for representing various influences in the projection of structure, simultaneously. Unlike unidimensional scaling, in which error is often better attributed to multiple influences upon judgment (Thurstone, 1927), multidimensional scaling accounts for all of the influences inherent and necessary in a specific set of judgments. According to Torgerson (1958):

> . . . 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.

By repeating the spatial representation through several points in time it becomes possible to observe simultaneous changes and use the trajectories of motion (across time changes in position) to make mathematically descriptive statements about those changes.

The procedures for generating a metric MDS analysis, which are described in detail by Barnett, Serota, and Taylor (1974) and Woelfel and Barnett (1974), are presented here, briefly.

The subjects are given a complete (n(n-1)/2) list of pair comparisons for the set of concepts being scaled. They are asked to make ratio judgments of the dissimilarity between concepts using the form:

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

Such an item wording requests a distance 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 researcher ("if x and y are u units apart . . ."). This format allows the respondent to report any positive value; the scale is thus unbounded at the high end, continuous, and grounded with a true zero (identity - two concepts are perceived to be the same).

Since the data for an individual case is highly unreliable (reliability being inversely proportional to the difficulty of the judgment task), and since our goal here is a measure of social or cultural conceptions (Serota et al., 1975), we may use aggregation techniques to improve our measurements. By applying the Central Limits Theorem and Law of Large Numbers we find that the arithmatic average of all responses for any cell in the matrix will converge on the true mean for the population as the sample grows large. Since the sample size for this study is well within tolerances for acceptable metric application (see Barnett, 1972), aggregating yields greater accuracy while transforming the data for later analysis.

The mean distance matrix is further transformed to a scalar-products matrix which has been double-centered (Torgerson, 1958) to establish the origin at the centroid of the distribution. This matrix is subsequently factored (using a direct iterative, unstandardized procedure) to achieve a coordinate matrix whose columns are orthogonal axes and whose rows are the projections of the concept location on each of the axes (see Tables 2, 3, and 6). This space has the property of representing the average distance judgments for all possible pairs simultaneously. Additionally, the multidimensional space is constructed from the unstandardized distance vectors between all possible pairs, and all variance in the sample population is thus accounted for by the n-dimensional space.

Finally, this procedure is repeated at each point in time and the spaces are rotated about the centroid to a least-squares best fit to provide approximations of the concept motions over time.[3] From these resultant cross-time coordinate matrices we can fit curves (trajectories) of motion which describe the relational changes from the set. Further, the cross-time loadings provide values for the equations of the Woelfel-Saltiel theory, thus allowing us to make predictions of consequent attitude change.

In a political context, the Woelfel-Saltiel theory facilitates the identification of party preferences, candidate preferences, and issue interrelationships. Since aggregated data sets for each pair of items represents the least-squares balance point for both items in the pair with respect to each other and all other pairs, distances between objects may be taken to be the degree of conceptual similarity between the items. Thus, the greater the reported distance, the greater the conceptual differentiation.

As an example of this application, the candidate or party closest to "Me," the averaged position for self, would be the candidate or party most preferred by the polity. The sum of the magnitudes of the distance vectors between the candidates and Me will equal the variance in voting preference (Einhorn and Gonedes, 1971; Aldrich and McKelvey, 1971). Prediction of a candidate's vote can be derived by:

$$\mathrm{Vote}_{c_1} = 1 - \frac{S_{c_1(\mathrm{Me})}}{S_{c_1(\mathrm{Me})} + S_{c_1(\mathrm{Me})}} \qquad [3]$$

Where "Vote" is the predicted vote percentage, S is distance, and c_1 and c_2 are the candidates.[4] In this same way, the relative importance of a political party can also be derived.

Issue interrelationships, represented graphically (see Figures 1-4), can be used to deduce message strategies. The distances reflect the relative degree of relationship between concepts scaled into the space. By looking at the distances between issues, candidates, and the collective Me it is possible to identify the vector which will enable the candidate's point to converge with Me. From Woelfel and Saltiel, we can predict that messages asserting a relationship between, or associating, concept x and concept y will move those concepts closer together. Further, by asserting that candidate z is related to the issues x and y, candidate z can be moved through the space to some optimal position between x and y. Finally, if concept x is correlated with some additional concept w which has been scaled into the space, then any motion of x will also create motion in w (Diagram 1). Hence, the underlying relationships between various components of a conceptual or attitudinal domain can be deduced from the initial measurement, and predicted for future points in time.

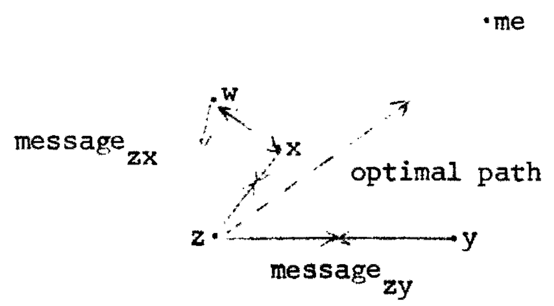

Diagram One.

Examination of the 1974 Congressional Election

The authors applied metric multidimensional scaling to investigate political attitude formation in a longitudinal study prior to the 1974 Congressional elections. This allowed us to test the utility of metric MDS analysis and certain aspects of the Woelfel-Saltiel theory. The following hypotheses were derived from their theory:

H_1: Candidates will converge, in a multidimensional space, with those issues with which they are publicly associated, i.e., campaign messages and news items identifying a candidate with certain issues act as forces to move the candidate toward those issues.

H_2: Identification of a candidate with the issues clustering closest to the averaged position for the respondents (me) will cause that candidate to converge with the average position for "me."

H_3: The candidate whose distance from the averaged position of the respondents is minimized at the time of the election will be the candidate chosen by the population represented.

H_4: As the interval between time of observation and the election becomes smaller, the volume of the multidimensional space will shrink.

Data were collected at three points in time (September 17-19, October 1-3, and October 29-31) from separate stratified random samples of registered voters.[5] The reason that separate random samples were employed rather than a single panel was to insure against sensitization and subject mortality.[6] Personal interviews were conducted by trained, professional interviewers using the format below to generate ratio distance judgments for all possible pairs of concepts.

IF JOHN F. KENNEDY AND DWIGHT D. EISENHOWER ARE 10 POLITICAL INCHES APART, HOW FAR APART ARE:

Crime Prevention and the Republican Party _____
Crime Prevention and Inflation _____

Concepts used in this analysis were selected either for theoretical reasons (party labels, candidate names, and Me) or because they were identified in a pretest as being issues which the population under study was going to use to decide whom to vote for. The concepts scaled were:

1. Crime Prevention
2. Integrity and Honesty in Government
3. The Republican Party
4. Inflation
5. The Democratic Party
6. Democratic Candidate
7. Campaign Reform
8. Bussing
9. Me
10. Republican Candidate

Additionally, several unidimensional measures were made for party and candidate preference, issue orientation and political message exposure. These provided comparative data for assessing the validity of the spatial manifold. The bulk of this data will be presented in a later paper.

The setting for this research was north-suburban Detroit. The area sampled is almost entirely white (99%) and many of its residents are part of a mass exodus from the racially troubled central city which has been occurring since the late 1960s. The ethnic composition includes large minorities, particularly Jews, Italians and Eastern Europeans, and recently, there have been large numbers of migrants from the rural South. The median age of the district is 39.9 years and the median education for registered voters is 12.4 years (Barone, 1974).

The district has been traditionally Democratic. In 1968, Nixon received 35% of the vote, Wallace 10% and Humphrey 54%. However, in 1972, Nixon captured 63% (McGovern 37%) and carried the rest of the Republican ticket with him. The incumbent Republican Congressman received 53% of the vote in 1972 (Barone, 1974). He was very conservative and strongly identified with limiting government spending and opposition to bussing to achieve racial integration. In addition, he had close ties with corporate business interests and was an ardent supporter of former President Nixon.

The Democratic challenger (now Congressman) was a former assistant to a very popular attorney general. The 1974 campaign was his first attempt at elected office. Virtually unknown six months before the election, he won a hotly contested primary against three other candidates with 34% of the vote.

Results

The results of the September 17-19 data collection (sample size = 79) produced the mean distance matrix presented in Table 1, and the spatial coordinate matrix presented in Table 2. The graphic representation of this spatial manifold is presented in Figure 1.

The multidimensional space displays a number of properties which are of significance in the description of the Congressional race.

First, the subjects had considerable difficulty in locating the Democratic challenger in the space. The average proportion of responses to pair comparisons with the candidate's name was .56.[7] The range was .50 to .61. For the incumbent Congressman, the average was .69 and his range was .60 to .78. This indicates that the people knew the incumbent better than the challenger. This finding is also suggested by the Democrat's distance vector in the imaginary portion of the space, 13.41, compared to 10.38 for the Republican.[8] It is also borne out by the results of an open-ended question asking for the names of the Congressional candidates. Free recall produced identification of the incumbent by 14.5% of the sample but only 9.4% for the Democratic challenger.

The multidimensional space can best be described with four dimensions; 94.43% of the "real" variance is explained by these factors. For graphic purposes a three-dimensional solution is presented in Figure 1. This representation explains 77.88% of the "real" variance. The first dimension is the only one readily interpretable; it indicates that the subjects used a party identification dimension to differentiate the concepts. On this dimension, Me is quite close to the Democratic Party, 4.3 units apart as opposed to 34.73 units from the Republican Party.

The second dimension runs from the Democratic candidate to Crime Prevention, with Me being the closest concept to Crime Prevention. The challenger was not perceived as a crime fighter. In fact, he was located quite close to bussing, a highly undesirable position for this constituency.

Overall, the space describes the Democratic candidate's position as closer to Me than the Republican; 13.32 units as opposed to 20.68. However, it must be noted that the Democrat's position is quite unstable. This is indicated by his high loading in imaginary space and the low proportion of responses, only 61% completed the comparison with Me.

Based upon the above data, the authors made the following recommendation to the Democratic challenger. He was told to campaign using the

Democratic Party label while simultaneously providing messages which would describe him as a crime fighter. They should be presented together in order to avoid any movement in the direction of bussing. This message campaign would maximize his movement along a vector toward the collective Me (Diagram 2).

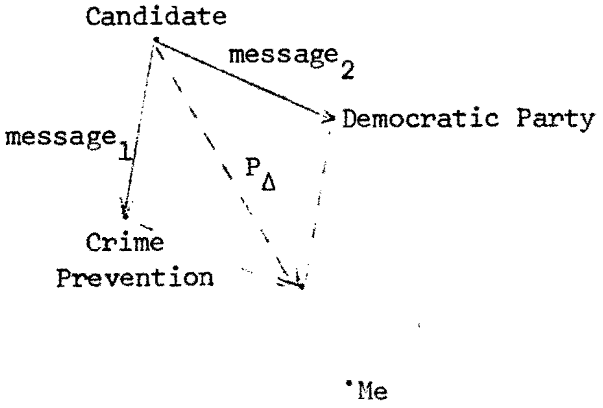

Diagram Two.

While this may seem to be conventional wisdom, the candidate's initial intention was to discuss inflation and to identify himself with anti-bussing forces. Inflation was rejected because of its high mass. In other words, because of the quantity of information that was available to each voter about inflation, the candidate could not expect to provide enough new information to differentiate himself from his opponent.

Further, it was emphasized that the challenger should work to associate himself with desired concepts rather than attacking his opponent. Since the challenger was relatively unknown, his mass, or information history, was much less than the incumbent and therefore much less resistent to change. The ramifications of this strategy include the possibility that the public may actually have agenda-setting powers commonly thought to have been usurped by the media and politicians, and that political advantage may belong to those candidates who orient themselves to entering the political process consonant with dominant public opinion.

Between the first and second data collection the Democratic challenger distributed 145,000 leaflets, 100,000 of which went to areas of lowest awareness. This message dealt with his experience as an assistant attorney general and his position in law enforcement. It also identified him as a loyal member of the Democratic Party by pairing him with popular party figures.

The results of the October 1-3 data collection (sample size = 104) are presented in Table 3 (mean distance matrix) and Table 4 (spatial coordinate matrix). Figure 2 provides a graphic representation of the locations of the concepts at this point in time. The results indicate that the subjects still had some difficulty in locating the Democratic candidate. The average proportion of responses to pair comparisons with the challenger's name was .50 with a range of .40 to .65. This is down somewhat from the first point in time. The difference may be attributable to sampling error and the polity's lack of knowledge of the proper position held by the candidates. By this time, more people could differentiate the candidates, 64.5% up from 59.3% at time one. The incumbent's average proportion of responses was .60, with a range of .43 to .69. Both the candidates' distance vector in imaginary space dropped substantially in magnitude at this point in time. The Democrat was 4.95, while the Republican was 5.90. This appeared due to an increased knowledge about the candidate and issues and the stabilization of political attitudes as the campaign progressed.

Again, the multidimensional space can best be described with four dimensions. Of the "real" variance, 90.27% is explained by those factors. For graphic purposes a three-dimensional solution is presented in Figure 2. This representation explains 77.36% of the "real" variance in the space. The first dimension differentiates the candidates while the second separates Me from Bussing. In this second space, the mean distance of Me from the Republican candidate is 13.87, while the distance from the Democratic candidate is 12.51. This indicates that of the people who could differentiate the candidates, they preferred the Democrat.

The space shrank considerably from time one accounting for the movement of all the concepts except the Republican candidate and Bussing toward the center of the space. This movement is represented in Figure 4. The average change in spatial position was 9.24 units. Concepts which moved more than the average were Crime Prevention (11.71), the Republican Party (15.15), the Democratic candidate (12.90) and Me (10.81). These motions can be explained in terms of significant news events and the campaign of the Democratic challenger. The Republican Party may have moved because the reaction to the pardoning of Richard Nixon had subsided and the people were moving back toward their traditional party affiliations. The Democratic candidate's motion was a function of his campaigning which had somewhat stabilized his position in the space. His net movement was toward Me, the Democratic Party, and Crime Prevention which reflected his campaign and messages stressing the fact that he was a crime fighter and a Democrat. Me moved as the subjects progressed toward the decision about how to vote. The Republican incumbent was the most stable concept in the space, moving only 3.81 units. At this point, a prediction was made that if rates of change remained constant with those of late September, the Democratic challenger would be the new Congressman.

Based on the above discussion the following recommendations were made to the Democratic candidate. First, reference should be made to the opponent as a Republican; this would reinforce his deviation from the Democratic plurality. Second, messages which would move the Republican away from Integrity and Honesty in Government and Campaign Reform would also facilitate his movement away from Me. Third, messages should be sent stating that the Democrat is "like you" (the voter) and that the Republican is not. Fourth, additional messages which identify the challenger as a crime fighter should be given, as well as a separate message showing that the candidate was in favor of campaign reform. It should be noted that no mention of campaigning on the issues of inflation or bussing was made. Their positions in the space could not be used to facilitate the challenger's motion in the direction of the collective Me.

By and large, these later recommendations were not implemented due to the challenger's lack of funds. He had spent over $70,000 by October 10. Forty thousand dollars was spent prior to the primary (August 6) and only $10,000 in October.[9] The incumbent Republican put all of his effort and resources into the campaign during the month of October, his one-month spending exceeding the challenger's expenditures for the entire campaign. Despite massive financing this effort may have been too little, too late.

Support for this contention is supplied by an examination of the results at time three (October 29-31). This data collection (sample size = 124) was made seven to five days prior to the election. The subjects had considerably less trouble making pair comparisons at this time. The Democratic candidate's average proportion of responses was .65, with a range of .54 to .81. The Republican's average was .75, with a range of .57 to .87 (the change in these coefficients over the three waves is summarized in Table 7). The Democrat's distance in imaginary space remained stable (4.95 at t_2 to 4.70 at t_3) while the Republican's rose slightly to 6.11 (this change is summarized in Table 8).

At this point in time, the first four dimensions account for 89.93% of the real variance, while the graphic representation, Figure 3, accounts for 80.24% of this variance. Complete descriptions of this data set are provided in Table 5 (mean distance matrix), Table 6 (spatial coordinate matrix), and Figure 3 (representing the first three dimensions of Table 6). Perhaps the most apparent thing about this data set is that the first dimension explains over half the real variance. It differentiates the candidates and the parties, with the Democratic Party and its candidate at one extreme and the Republican standard bearer and his party label at the other. This indicates that party label was the most salient factor in the final determination of vote. In this last aggregate space, Me is 8.577 units from the Democrat and 10.846 from the Republican. From this, we predicted that the Democrat would win the election.

One notable observation was that the space increased in volume, slightly, between the second and third points in time. This appears primarily due to the increased clarification of the distinction between the candidates along the first dimension. However, we had expected, based on previous research (Barnett, Serota and Taylor, 1974), that the volume of the space would shrink as the election drew near. We postulated that the increased salience of politics which precedes an election would produce a reduction in all adjudged pairs of political concepts.

The average motion in the space between t_2 and t_3 was 3.95 units; this was considerably less than between the first and second points in time. This indicates that by the second measurement the concepts had stabilized in the space. Those concepts with movement greater than the mean were the Republican Party, the Democratic Party, the Democratic candidate, and Me. Again, the Republican incumbent was the most stable concept in the space. If one examines Figure 4 it becomes apparent that Me had changed direction and was approaching the position of the Republican candidate; further, the little movement of the incumbent is in the direction of Me. This is a marked change from the earlier points in time and leads the authors to speculate that if the election were held a few weeks later the plurality might have been much smaller or the challenger might have lost.

H_1: The hypothesis that candidates will converge with those issues with which they are publicly associated is supported from the data. The Democrat came out in favor of crime prevention between the first and second points in time. At time one, the mean distance between the candidate and Crime Prevention was 32.42 units. At time two the distance, or discrepancy, had dropped to 8.85 units, a change of 23.57 units. The average motion for all concepts in the space was 9.23 units, and both concepts showed great movement toward each other in excess of the mean.

Between the second and third points in time his campaign stagnated. This is reflected in the stable relationship between the candidate and crime prevention. On bussing and inflation the challenger had made no public statements. His distance relative to these concepts, accordingly, remained stable throughout the campaign. These results are summarized in Tab.e 9.[10]

H_2: The hypothesis that the candidate clustering most closely to the position that the respondents identify as central to themselves (Me) will converge with the average self position is supported. At time one, Crime Prevention was the issue located closest to the collective Me. Bussing was the furthest concept from Me. In order for the hypothesis to be supported, the Democrat would have to move in the direction of Crime Prevention and away from Bussing. If one examines the plots (see Figure 4) this can be seen in the trajectories of the three concepts; the Democratic candidate moved past Bussing, in the direction of Crime Prevention.[11]

H_3: The hypothesis that the candidate whose distance from the position of respondents (Me) is minimized at the time of the election will be the candidate chosen by the population represented, is supported. At time three the distance between Me and the Democrat was 8.6 units while Me was 10.8 from the Republican. According to equation [3], if one sums the magnitudes of these vectors, then divides each individual distance by this total, and finally, subtracts this proportion from one, the result is the predicted vote. In the above case, the predicted percentage of the vote was 55.7% for the Democratic candidate and 44.3% for the Republican. The actual vote total for the area of study was 57.7% for the Democrat, 41.3% for the Republican and 1.09% for the independent candidates.[12]

H_4: The hypothesis stating that as the interval between time of observation and the election becomes smaller, the volume of the multidimensional space will shrink has not been supported. If one examines the trace (the sum of the eigenroots) of the spatial coordinate matrices over time, it becomes clear that the volume has not decreased in size. The trace at time one was 3,575.37, at time two it was 858.33, and at time three it increased to 1004.48. Since the trace serves both as a summary statistic and an index of "size" for the hyperspatial configuration described by the matrix loadings, a test of rank ordering serves to reject this hypothesis.

Discussion

The results of this study are significant to a number of issues. They suggest answers to two important methodological conflicts: metric determinancy versus nonmetric accessibility and the utility of multidimensional scaling for the prediction of human behavior. The findings offer a challenge to the dominant research on electoral behavior and the categorization of activation, conversion, and reinforcement. On all three topics the Woelfel-Saltiel theory and this test work together to provide potentially powerful alternatives to the traditional view.

In multidimensional studies of political perceptions, a key construct is the change in structure of public opinion. The nature of political activity is such that, without this construct, study is virtually useless. Most traditional public opinion researchers have realized this and developed their models around such dynamic designs as trend analysis (McPhee, 1963) and computer simulation (Pool, Abelson, and Popkin, 1971). However, the nonmetric MDS models which have achieved recent popularity in political attitude study often fail to adequately treat change without violating major assumptions of scaling (c.f., Rusk and Weisberg, 1972). In Rusk and Weisberg's work on perceptions of presidential candidates, the scaling technique uses a non-zero double anchoring which at best yields an approximated interval scale. Since this approach necessitates the use of a nonmetric algorithm, the "distances" reported are inherently monotonic in relationship. The monotonic solution is elastic and can be compared only in terms of rank ordering. Unfortunately, Rusk and Weisberg (and numerous others) ignore this and report configural changes which may often be meaningless.

The present study does not suffer this disability. While the data was significantly more difficult to gather (therefore, introducing greater possibility of unreliability) it has the advantage of satisfying the full set of assumptions for ratio level scaling. By utilizing the aggregation procedure described, the unreliability problem is overcome, allowing us to work with a fully metric, and therefore directly comparable, space. This significant advantage allows us to rotate the time-series measurements into congruence and apply the motion equations suggested by Woelfel and Saltiel. Indeed, by doing this the authors were able to predict later configurations from the changes in earlier ones by controlling for the information present in the system.

From this test of the methodological refinement of attitude assessment and prediction, the move into the realm of behavior prediction can be made. Past research has focused heavily on behavior change as a function of information campaigns. This research has argued that the function of campaigning is to seek reinforcement and activation among sympathetic voters. Further, it has been argued that political methodology is insufficiently accurate to make predictions about conversion. It has been the authors' experience, using the metric MDS model, that these distinctions are artifacts of the inability to distinguish the processes involved in political decision-making. By working with various analytic techniques (such as the vote prediction equation) and seeking improvements from experience with prior studies, it has been possible to begin to make the transition from attitude measurement to behavioral prediction.

For example, projection of election results based upon the distance vectors was within 2% of the actual vote (55.7% and 57.4%, respectively). Calculating the acceleration of the candidate during the period between the final measurement point and the election and the inclusion of the independent candidates would have further reduced the margin of error. Comparing the derived prediction with a unidimensional measure ("If the election were held today who would you vote for?") was even more informative. The prediction from this measure of the Democratic candidate's strength would give him a maximum 53% ($n \approx 400$) of the total vote (averaging undecideds). The presence of undecided voters seems to inhibit accuracy in highly uncertain election situations. In this case, five days before the election, 23% of the electorate still classified themselves as undecided. Yet, with the MDS paired-comparison method, which eliminates the option of an "undecided" response and its attendant difficulties, fairly precise distribution of "problem" voters was achieved.

There are four implications for future research based upon the findings of this study. First, better controls should be applied to the information measures. This would make possible an actual test of the equations of the Woelfel-Saltiel theory. One way this could be accomplished would be through a content analysis of the mass media and campaign messages. Second, data should be gathered at many more points in time both prior to and directly after the election. This would help describe the effects of the election "event" on public opinion, while providing a better opportunity to test the predictive power of the equations generated by the theory. Third, experimental control of the information that certain sections of the polity receives should be attempted in order to gain confidences in the conclusions. This would help move the area of research away from the confines of case-study status. Fourth, a replication of the study should be performed in a multiparty-multicandidate contest in order to determine the generalizability of the theory.

Indeed, present research is not complete. The study reported here contains gaps which the authors intend to fill in the near future. Forthcoming reports will provide detailed analysis of impact of media and interpersonal messages present during this campaign as well as careful consideration of structural factors present. Future research will attempt to incorporate solutions to the questions raised by this study.

In summary, this paper has outlined the Woelfel-Saltiel attitude theory, and showed its application to political opinion research. A study was carried out which tested a number of hypotheses derived from this theory; generally, these hypotheses were supported. Finally, the advantages of the multidimensional methodology over traditional approaches were discussed. This research points to a promising future for the Woelfel-Saltiel conceptualization for the prediction of socially held attitudes and metric scaling for the measurement of the processes by which public opinion is altered.

Footnotes

[1]In other of Professor Woelfel's works, he suggests that each medium is capable of creating variable attitude change. One consistent finding is that interpersonal interaction is responsible for altering one's attitude to a greater degree than the mass media (Woelfel and Hernandez, 1972).

[2]Data on information history for this study is presently being compiled and will be presented in a forthcoming research report.

[3]A number of rotational algorithms exist which provide variable quality of solution. At present, the least-squares best-fit seems to provide an optimum result compared to other routines. Inherent in this procedure is the problem of overestimating some changes while underestimating others. The authors are currently testing a new procedure in which a theoretical defined set of concepts are held constant (i.e., this subset is rotated to least-squares best-fit) and the remaining concepts are positioned accordingly.

[4]Equation [3] is one of a number of possible predictive formulations. While others may be shown to have more correct mathematical form, this equation has been shown to be the most accurate within the domain of our public opinion studies. In addition, the inclusion of third party or independent candidates in the denominator would provide a functional increase in accuracy.

[5]The population was stratified by municipality, and the proportion of each geographical unit in the sample matched a proportion of voters in the district. Names were drawn from the voter registration rolls according to a computerized list of random digits.

[6]For an in-depth discussion of the advantages of this sampling procedure, see Barnett, Serota and Taylor (1974).

[7]The average proportion of responses is calculated by averaging the actual number of responses to each pair comparison and dividing by the total number of subjects.

[8]These values are equal to the square-root of the sum of the loadings for a candidate across all imaginary vectors. Imaginary vectors, or dimensions of imaginary space, are those vectors with a sum of squared loadings less than zero (e.g., with complex numbers as loadings). At time one, the last <u>four</u> dimensions are imaginary, at times two and three the last <u>two</u> are imaginary.

[9]These are approximations based on the campaign spending reports.

[10]While it is possible to test this hypothesis with traditional inferential statistics, for practical and heuristic reasons this has not been the choice of the authors. Software for cell statistics on the MDS mean distance matrix is currently being developed and results could not be guaranteed.

[11]Examination of the judgments on these concepts (Tables 1, 3, and 5) will show that change in distance occurred between Crime Prevention and the Democrat but that Bussing and the Democratic candidate did not change. This is an artifact of examining a single judgment pair outside the context of the set. While this single relationship did not change, it may be seen that the two concepts rotated position in relationship to the remainder of the concept set. Therefore, one should be careful in distinguishing between the ideas of change and motion in a multidimensional space.

[12]This prediction and the results to which it is compared are based on a subset of the congressional district.

	1	2	3	4	5	6	7	8	9	10
1	.00									
2	11.58	.00								
3	24.55	26.98	.00							
4	14.39	27.94	24.92	.00						
5	22.48	25.76	31.02	10.45	.00					
6	32.41	6.97	13.04	8.15	5.81	.00				
7	27.13	12.07	26.95	15.68	11.43	7.52	.00			
8	15.01	16.33	28.28	14.09	9.70	9.44	16.28	.00		
9	22.22	8.90	34.98	9.90	12.53	14.23	24.06	33.02	.00	
10	6.68	8.35	5.03	7.83	18.35	18.82	9.20	13.54	18.22	.00

Table One. Mean Distance Matrix, September 17-19, 1974.

	1	2	3	4	5	6	7	8	9	10
1	6.55	16.28	6.10	-.57	-1.06	.01	.19	-4.78	-1.54	9.07
2	-.06	6.37	-8.33	12.49	-1.77	-.00	-.17	-.20	-7.37	-9.15
3	18.73	-6.42	-6.89	-8.53	-1.25	.04	.43	-2.21	4.37	-5.88
4	-4.09	-.17	5.30	-10.72	.82	-.01	-1.20	-1.09	-5.87	-6.73
5	-10.54	-4.25	7.04	-2.85	-.58	-.02	1.42	.24	-5.49	-4.07
6	-9.44	-12.70	-5.70	.82	-4.45	-.00	-.32	-.32	-4.77	12.52
7	-3.21	-7.16	.16	6.31	8.42	-.00	-.09	-4.30	3.80	1.79
8	2.73	-3.68	13.15	7.28	-3.67	.00	-.35	2.83	9.31	-2.31
9	-14.32	8.10	-9.66	-4.72	-1.00	-.03	.02	1.24	11.01	.07
10	7.66	3.63	-1.17	-1.50	4.56	.01	.07	8.61	-3.43	4.68

Table Two. Spatial Coordinate Matrix, September 17-19, 1974.

	1	2	3	4	5	6	7	8	9	10
1	.00									
2	10.34	.00								
3	11.85	13.24	.00							
4	10.10	12.60	10.52	.00						
5	8.92	10.12	10.47	8.73	.00					
6	8.84	10.64	10.28	8.81	4.52	.00				
7	16.49	9.23	11.63	10.65	9.16	7.82	.00			
8	8.83	11.21	10.82	12.66	8.17	9.30	11.27	.00		
9	4.26	8.66	14.80	6.13	7.69	12.51	5.93	15.43	.00	
10	9.16	8.45	5.63	10.59	15.98	19.07	9.74	11.57	13.87	.00

Table Three. Mean Distance Matrix, October 1-3, 1974.

	1	2	3	4	5	6	7	8	9	10
1	.20	.31	8.30	.66	-.37	.16	-.69	.02	-2.00	-4.76
2	1.50	2.61	-.80	5.87	-2.72	-1.09	.79	-.00	1.23	-1.75
3	4.08	-5.18	-1.43	-4.25	-2.60	1.35	-.10	-.00	2.65	-1.77
4	-.74	2.25	.64	-5.66	1.49	-2.33	.78	.00	.31	-1.97
5	-5.49	-1.16	.19	.04	.57	2.49	1.09	.00	-2.41	.75
6	-7.63	-3.51	-1.00	-.35	-1.94	-1.58	-.60	-.00	-1.39	4.75
7	-.51	2.41	-7.97	.69	1.15	.28	-.71	-.02	-1.63	-4.58
8	.28	-6.53	.77	3.56	3.47	-.37	-.07	.00	2.69	.48
9	-2.44	8.02	1.45	-.54	.47	1.17	-.47	.00	3.28	3.63
10	10.75	.77	-.14	-.02	.46	-.08	-.01	-.00	-2.74	5.23

Table Four. Spatial Coordinate **Matrix**, October 1-3, 1974.

	1	2	3	4	5	6	7	8	9	10
1	.00									
2	10.52	.00								
3	11.61	14.11	.00							
4	9.22	10.24	10.47	.00						
5	9.56	9.76	21.00	7.67	.00					
6	9.21	8.39	19.46	8.31	4.86	.00				
7	12.67	8.74	11.28	10.74	7.02	8.17	.00			
8	10.65	12.59	9.90	12.67	12.41	9.31	12.63	.00		
9	5.44	3.96	11.38	7.66	16.23	8.57	5.45	12.07	.00	
10	8.45	9.16	5.45	8.27	23.04	19.16	7.71	11.25	10.84	.00

Table Five. Mean Distance Matrix, October 29-31, 1974.

	1	2	3	4	5	6	7	8	9	10
1	-.01	1.47	-5.36	1.99	1.00	3.20	-.29	.00	.76	-3.91
2	1.20	-4.61	-.30	-1.88	3.64	-1.49	1.46	.00	.88	-3.10
3	-9.78	3.25	1.93	.99	-1.55	.42	1.84	.00	2.57	1.88
4	.44	-.08	.02	5.81	-1.16	-2.88	-.44	-.00	-.89	-4.23
5	11.74	1.81	2.24	2.42	1.31	1.07	.63	-.00	-1.57	6.32
6	8.50	-.15	-1.65	-2.34	-1.81	-1.24	-.96	.01	4.02	2.43
7	.71	-3.13	5.81	-1.16	-1.04	2.11	-.89	.00	.01	-5.02
8	-.59	7.51	.14	-4.16	.56	-1.10	-.33	-.00	-2.26	-2.85
9	-1.52	-4.43	-2.99	-2.02	-3.06	.21	.74	-.00	-3.30	2.36
10	-10.70	-1.63	.16	.35	2.11	-.31	-1.76	-.00	-.21	6.11

Table Six. Spatial Coordinate Matrix, October 29-31, 1974.

Table Seven. Proportion of responses to pairs with a candidate as one of the concepts.

	Time 1			Time 2			Time 3		
	Low	$\bar{x}$	High	Low	$\bar{x}$	High	Low	$\bar{x}$	High
Democratic Candidate	.50	.56	.61	.40	.50	.65	.54	.65	.81
Republican Candidate	.60	.69	.78	.43	.66	.69	.57	.75	.87

Table Eight. Vector sum of candidates' loadings in imaginary space.

	Time 1	Time 2	Time 3
Democratic Candidate	13.41	4.95	4.70
Republican Candidate	10.38	5.90	6.11

Table Nine. Distance and change in distance for select concepts and the Democratic candidate.

Democratic Candidate and:	Time 1	Time 2		Time 3	
	$\bar{x}$ Distance	$\bar{x}$	ΔDistance	$\bar{x}$	ΔDistance
Inflation	10.45	8.73	-1.73	8.31	-0.42
Bussing	9.45	9.31	-0.14	9.31	0.00
Crime Prevention	32.42	8.85	-23.57	9.22	+0.37
	Average Movement:		9.33		3.94

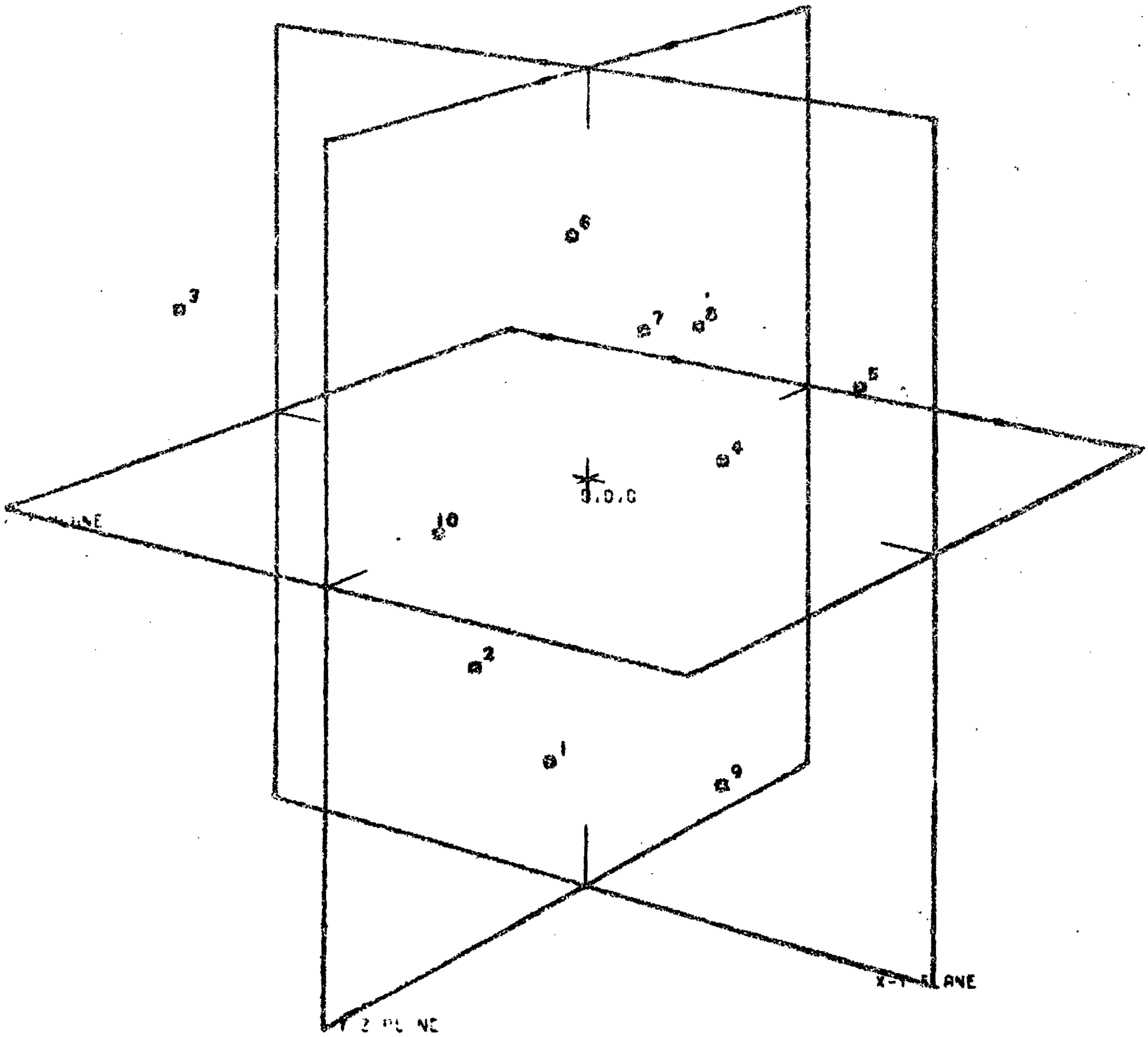

Figure I

Configuration of Political Concepts at Time One, September 17-19

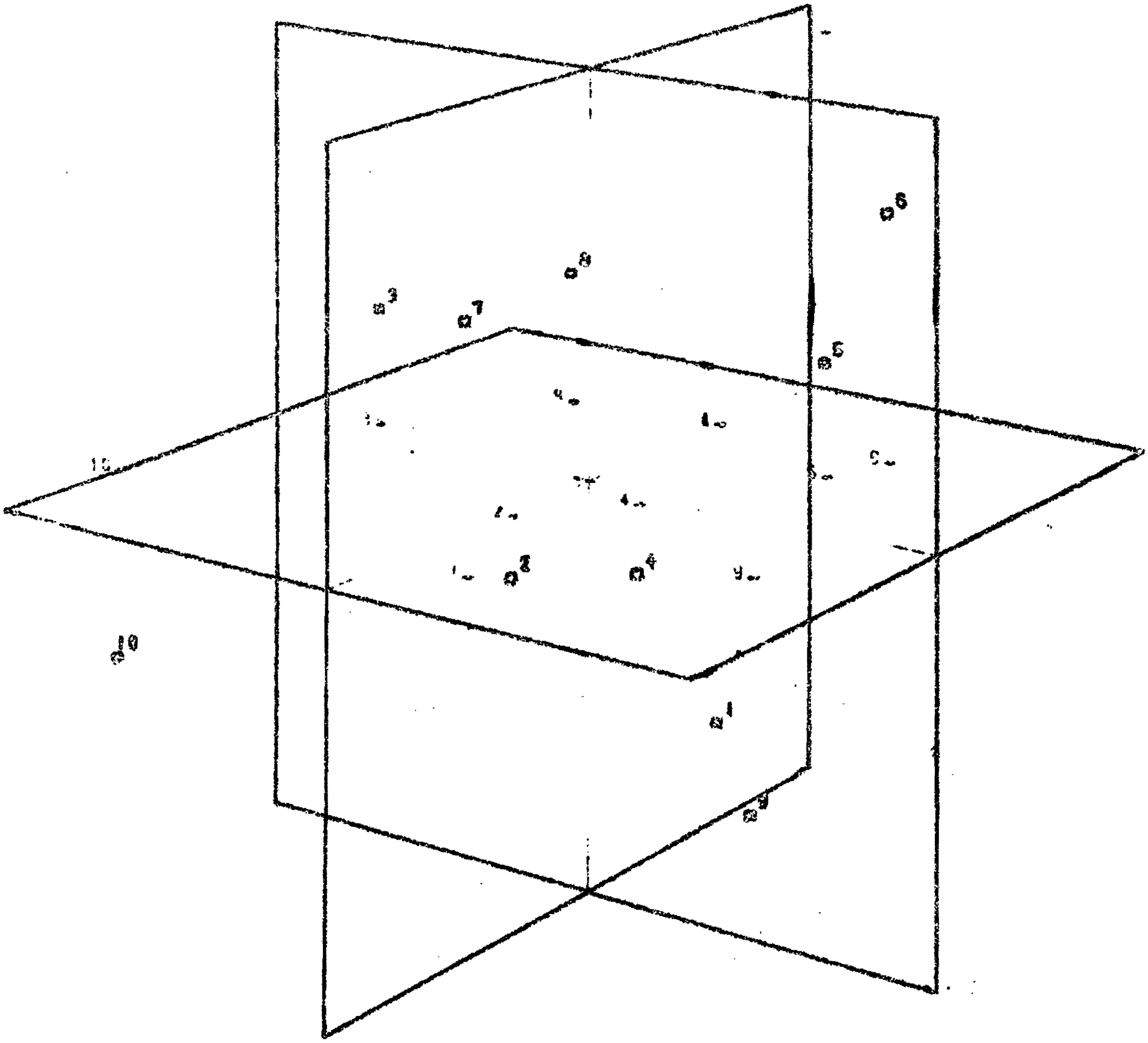

Figure II

Configuration of Political Concepts at Time Two, October 1-3

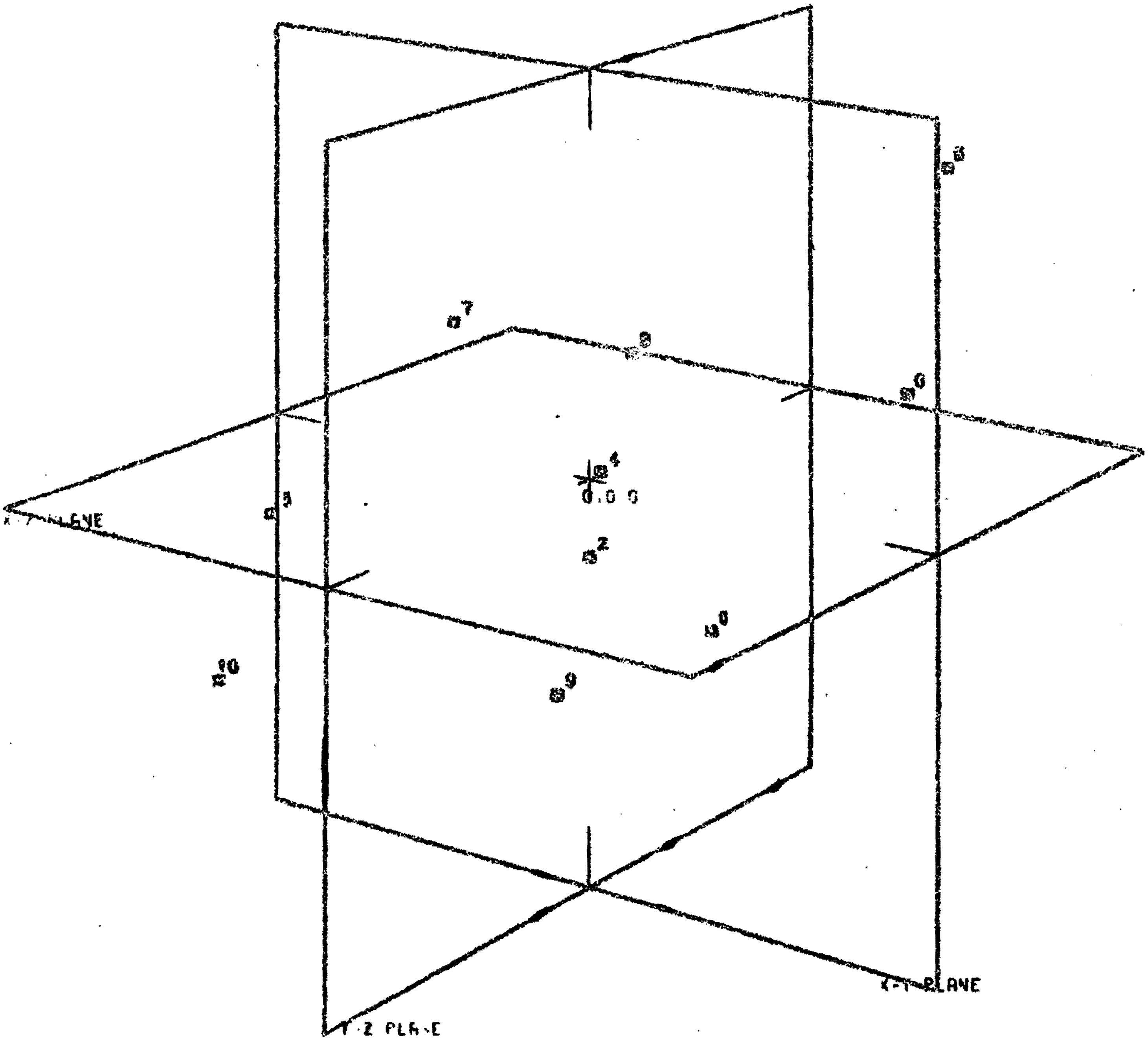

Figure III

Configuration of Political Concepts at Time Three, October 29-31

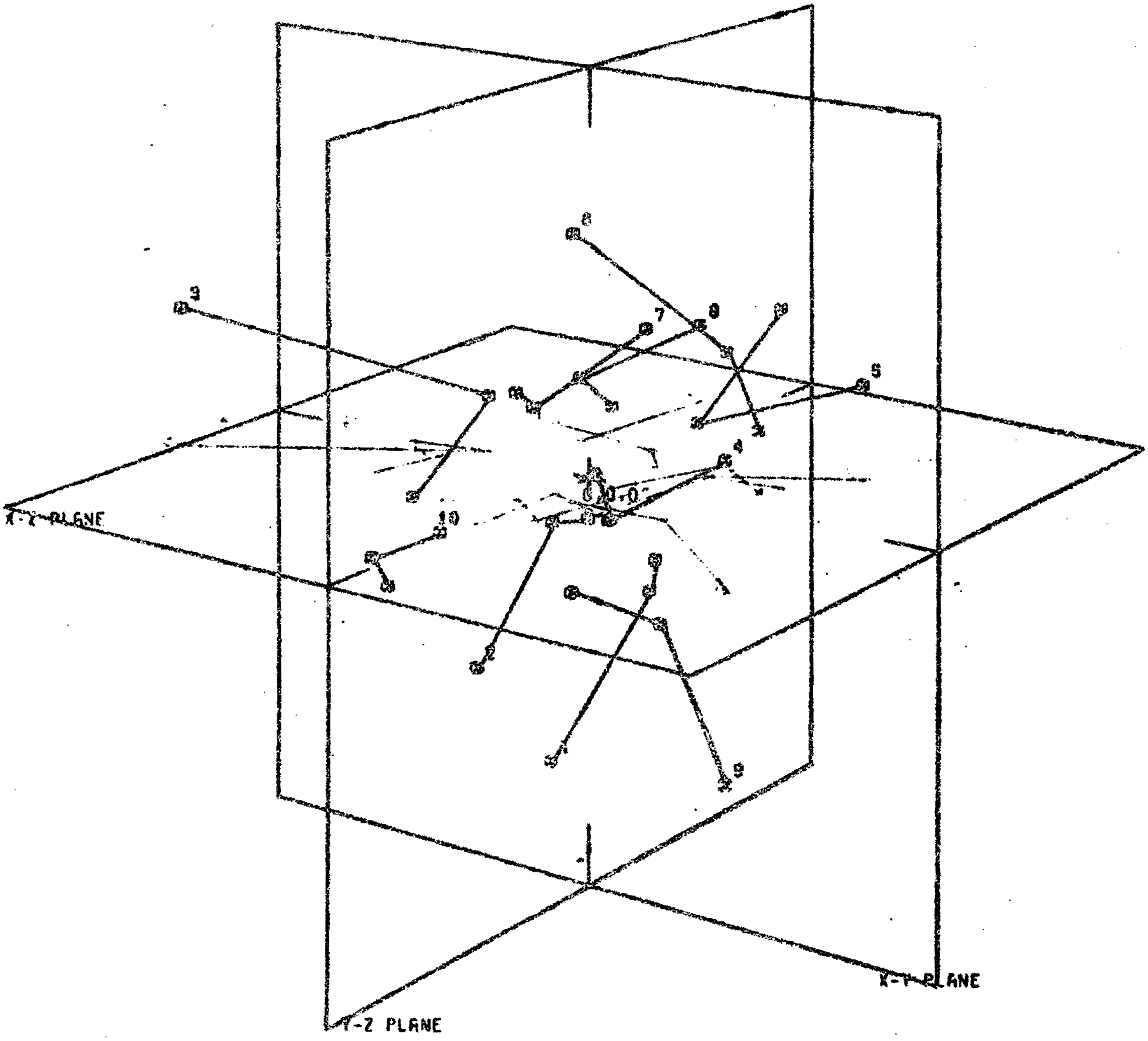

Figure IV

Motions of Political Concepts Prior to the 1974 Congressional Election (Numbers Located at the Start of Trajectories).

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