

AD-764 870

THEORETICAL UNDERPINNINGS OF THE
EVENT DATA MOVEMENT

Warren R. Phillips

Ohio State University

Prepared for:

Advanced Research Projects Agency

30 July 1973

DISTRIBUTED BY:

NTIS

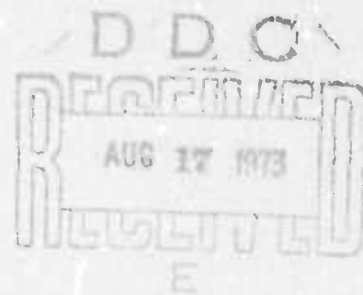
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

AD 764870

THEORETICAL UNDERPINNINGS OF THE EVENT DATA MOVEMENT

Warren R. Phillips
Project for Theoretical Politics
The Ohio State University

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151



Paper prepared for delivery at the ISA Meetings in New York, March 13-17, 1973.

Prepared in connection with research supported by the Advanced Research Projects Agency, ARPA Order No. 2345-3D20, Contract No. DAHC15 73 C 0197, RF 3527-A1.

This document has been approved for public release and sale; its distribution is unlimited and reproduction in whole or in part is permitted for any purpose of the United States Government.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)

Project for Theoretical Politics
The Ohio State University
053 Administration Building

2a. REPORT SECURITY CLASSIFICATION

UNCLASSIFIED

2b. GROUP

3. REPORT TITLE

"Theoretical Underpinnings of the Event Data Movement"

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Research Report # 1

5. AUTHOR(S) (First name, middle initial, last name)

Warren R. Phillips

6. REPORT DATE

July 30, 1973

7a. TOTAL NO. OF PAGES

5633

7b. NO. OF REFS

117

8a. CONTRACT OR GRANT NO

DAHC15 73 C 0197

b. PROJECT NO

A.O. 2345-3D20

c.

d.

9a. ORIGINATOR'S REPORT NUMBER(S)

1

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. DISTRIBUTION STATEMENT

This document has been approved for public release and sale; its distribution is unlimited and production in whole or in part is permitted for any purpose of the United States Government.

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY

Advanced Research Projects Agency
Washington, D.C.

13. ABSTRACT

A review and critique of the international events literature is provided in this paper in an effort to assess the state of theorizing by those who employ international events data. More precisely the attempt is made here to establish what are the basic underlying assumptions accepted by those who collect event interaction data. The conclusion of this review is that while the substantive interests of event data collectors seems developed well enough to characterize this body of literature as comprising a field, the theoretical basis of the field remains largely lacking. Thus, there is a clear need for more work in the area of theoretical explanations. Both the scholar and the policy-maker must recognize that international events are or should be simply indicators of substantive concepts bounded with theoretical frameworks, indicators of their particular perspective of nations and the behavior between nations. Some possible avenues to further theoretical development are suggested.

DD FORM 1473

1 NOV 65

UNCLASSIFIED

Security Classification

The Theoretical Approaches in the Events Data Movement

The purpose of this paper is to review and critique theoretical activity in the events data movement. The task is certainly not an easy one and it is made more difficult by the fact that the material to be reviewed stems primarily from a data movement and not a theoretically homogeneous brotherhood. Nevertheless, the movement does exhibit some common elements which have a strong philosophical background. This paper will trace the historical roots of the events approach, review the current state of theorizing by those who use this data, and attempt to suggest a few potential avenues for further pursuit.

Alberico Gentili, a sixteenth century professor of law, is credited as the founder of modern thought about international relations. This attribution rests on his determination to examine international relations from a secular rather than a theological standpoint. His celebrated cry 'let theologians keep quiet about matters outside their province' marks Gentili off sharply from his scholastic predecessors and signaled the advent of a new era. His position was that Plato, Aristotle and the followers of Justinian ethics give no account of the laws of war except with reference to the needs of their own states. Thus, while they did talk about the cause of war, prisoners, and slaves and some other topics relating to the subject of conflict, they considered them all from the standpoint of a particular state and explained them with reference to that state's requirements; for example, the status of a prisoner and his relation to the citizen. "It remains however, to investigate the intricate question, what the law is and how we shall prove that it is this or that. For obviously we must not only teach in the manner of Plato, but because of conflicting opinions we must also demonstrate it in the manner of Aristotle . . . " (Gentili, 1612, as quoted in Forsyth, et. al., p. 20). Gentili's position is that we cannot accept the Augustinian principle that the injustice of an adver-

sary makes wars just, (Augustine, On the City of God, i.v.). Instead, we must develop a set of principles based upon natural law which lay down the basis for interactions between nations.

Gentili (1583-1643) further developed the arguments of Gentili by looking at the character of the international society in which states are subject to restraint through law. According to Gentili, the restraints were a combination of rules, some of which--the laws of nature--are derived from man's rational and social nature which demands order and justice, while others--like the laws of nations--are based on the will and consent of states. The second laws, the laws of nations, according to Gentili, are to be discovered by studying the relations between nations. Methodologically, Gentili confused natural law appropriate for individuals with natural law appropriate for the relations between states. Vattel, in 1758, pointed out that the natural law appropriate for individuals cannot be directly applied to states.

"There is no doubt that the existence of a natural law of nations, in as much as the law of nature is no less binding upon states, where men are united in a political society, than it is upon the individuals themselves. As an exact knowledge of this law cannot be had by a mere understanding of what the law of nature prescribes for individual persons. When a law is applied to different subjects it must be applied in a manner suited to the nature of each subject. Hence it follows that the natural law of nations is a special science which consists in a just and reasonable application of the law of nature to the affairs and conduct of nations and of sovereigns. All those treaties, therefore, which confuse the law of nations with the ordinary natural law must fail to convey a distinct idea and a thorough knowledge of the sacred law of nations (Vattel, 1758, as quoted in Forsyth p. 89.).

But in addition to the law of nations which is deducible from certain principles of natural law, there is a much larger group of laws

which govern the relations between nations. These laws, potentially demonstrable from the behavior of nations, are not to be confused with the natural laws.

These three divisions of the law of nations, the voluntary, the conventional, and the customary law form together the positive law of nations, they proceed from the agreement of nations; the voluntary law from the presumed consent; the conventional law from the expressed consent; and the customary law from their tacit consent. And since there are not other modes of deducing a law from the agreement of nations, there are but these three divisions of the positive law of nations. (Vattel, *ibid*)

The voluntary, customary, and conventional laws of nations govern the relations between nations over the period of time in which it can be agreed that these positive laws exist. The problem becomes one of delineating these commonly accepted patterns of behavior between nations. All three authors argue that it is through a combination of historical chronology and philosophical introspection that we can come to know the laws which govern the way nations deal with each other. The attack on the earlier scholastics is not in the realm of statements about what we can know, but it is about how we can know the laws that govern the relations between nations. And it is in this position on how we can come to a better understanding of the positive laws of nature that the early secular movement in international relations shows great affinities to the current systematic group of international relations scholars. Consider the following two quotes from Norton Kaplan and Richard Rosecrance, advocates of the popular systems approach.

Norton Kaplan: "The crux of the matter is whether regularities can be discovered which permit the organization of the materials of international politics within a simple framework of reasonable explanatory or predictive power." (System and Process in International Politics, New York, Wiley, 1957, p. 3.)

Richard Rosecrance: "The essential works of diplomatic and political history could provide the raw material from which systematic characterizations could be derived." (Action and Reaction in World Politics, 1964, p. 5.)

This new philosophy of the systemists¹ is indeed an old position traceable back to the very beginnings of modern international relations. And its solution is the modest proposal that we consider systematically the actions between nations in an attempt to delineate the voluntary, customary, and conventional ways in which nations deal with each other. Perhaps a distinction between the two groups is worth pointing out however. The early philosophers were interested in much more than simply understanding the normal modes of behavior; they were interested in describing a set of laws for the correct application of international relations principles to the international society. It is not clear that the fathers of the current systems approach are that ambitious.

To be sure, not all of the systemists have moved to the events data approach. But many have. An early advocate of this approach was Charles McClelland (1961) who argued that we need more than a perusal of diplomatic history as written by historians. Their works suffered from at least their difficulties: (1) On the whole, historians had not been concerned to take particular note of reoccurring forms in the sequences of exchanges between nations; (2) The historians place too much emphasis on a search of motives of actors and the decision-making activities that occur within foreign offices; and (3) Published diplomatic history is not rich enough in the presentation of exact interaction sequences. Rather it is the historian's research notes that current analysts would be interested in (McClelland, 1961, p. 191).

With special reference to crisis setting, McClelland argues that:

"Without any reference to the setting of a crisis or to its larger meanings in the politics of international relations, the coding of events of a crisis in chains of interactions sequences makes possible the identification of patterns and the comparison of forms of crisis behavior. Almost immediately, inferences are drawn and labels for many kinds of sequences are brought to mind. In the due course of an analytical study, a mapping of the complete crisis from its dramatic initial 'input' events to its tailing off into the 'normalcy' of routine international relations becomes possible. Studies which are limited to such charting and immediate analysis will have value in putting historical data to new use and in developing limited explanations of an aspect of international behavior. The ambition is greater, however: We wish to cope with the matter of peace and war and with the problem of control. . . . (1961, p. 193).

Thus we can see that the events data movement is an attempt to systematically refine the collection and codification of the actions and reaction of nations with each other. It is an old basic idea that by studying the interactions between nations we can come to know what is customarily accepted behavior between nations. We can also make assumptions about the voluntary agreement to limit certain types of interactions to specific events or sequences of events. The major difference, some would argue, advance, in the events data collection over earlier chronicling of exchanges between nations is the quantitative nature of the current enterprise. This quantification makes for more reliable, repeatable and testable assertions. What underlies this approach is a desire to specify how national decision-makers tend to select types of action and reaction from an inventory of foreign policy outputs to meet different kinds of non-routine and routine international situations? Three basic assumptions can be identified in the events data movement:

- a) The concept of foreign policy as a set of decisions by officials is adopted. This foreign policy activity implies actions which can be delineated.
- b) The behavior of one actor towards another actor (foreign policy) is responsive to the actions of other nations and involves efforts to influence who the leaders of these nations will be, what decisions they will take, and how they will define the relations between their nation and others.
- c) Foreign policy is made in an environment by decision-makers who have mixed desires and domestic constraints to cope with. Their activity is essentially a process of adaptation to the external and internal environment which they seek to coordinate in an effort to maintain the autonomy and the sovereignty of the nation-state.

Certainly this perspective demands that we look at the patterns of action and reaction between nations and therefore systematic data collection efforts such as HIES, DON, and MECCA have a justification in the search for the positive laws governing the relations between nations.

On a still more abstract level it is argued that national decision-makers consciously choose policy which may affect the overall patterns of cooperation and conflict in the international system. This type of explanation generally assumes that there is at least one individual within the nation who understands the dynamics of cooperation and conflict in the system. Who knows how other statesmen and his own constituents will react to a given policy and who uses this knowledge to get around the constraints which these reactions impose. This is the argument made by Stanley Hoffman (1969) in his delineation of roles in American foreign policy. It is also the type of argument made by William Langer in his discussion of the policies and motivations of Otto von Bismarck (1931).

As is the case with any new movement more time has been spent in specifying the relations between nations, the foreign policy actions and responses, than in coming to grips with the explanatory assumptions which

are also attributable to this approach. Let us begin by describing the current approach and findings emerging from the purely inductive studies which form the basis of work in the events movement.

The Description of Foreign Policy

Every act of a nation can be considered as a potential piece of information communicating to other nations the intense desires or dislikes of the acting nation. In addition, the variety of behavior is itself an important aspect of the study of event interactions. If the multitude of international behaviors are structured into a basic set of patterns, the variety of international interactions can be shown to reduce to the knowledge gain from each of these patterns of behavior. If, for instance, the behavior of nations reduces to five basic patterns, then there are five areas in which information is being transmitted. The class of nations exhibiting frequent behavior in one pattern is not likely to be the same class of nations participating extensively along other patterns. In adapting this approach, researchers have rejected the notion that international behavior can be measured by a single indicator. Such indicators represent only aspects of behavior, although important ones perhaps. They are looking for dimensions of behavior that are found to be independent of each other and searching for the smallest number of dimensions that accurately describe the variety of behavior between nations. Given the difficulty of using single variable indices for any one concept, i.e., poor data with unknown sources of error--random and systematic--in validity problems of the definitions, students of international relations are faced with a situation similar to Heisenberg's Indeterminacy Principle in Quantum Physics.³ They cannot measure the precise position or charge of

the nation in the system. Instead, they have moved to methods that deal with probability densities--that define stable structure among arrays of behavior. In those areas where several variables tend to provide dense clusters of information, they are most likely to find the best measures for describing international behavior.

A number of specific questions guided this form analysis: (1) What are the dimensions of variation among nations with respect to their dyadic behavior over a continuous series of time points; (2) What is the relationship of these dimensions to those dimensions found by studying other time slices; (3) What are the groups of nation dyads that exhibit similar conflict behavior over time, and (4) What are the profiles of each group's conflict behavior?

Current research efforts have concentrated quite heavily upon analyzing the patterns of behavior in events data. Previous work has provided a good deal of information about behavior between select pairs of nations over time (McClelland *et al* (1965), McClelland (1966), North, *et al* (1967), Smoker (1967), Burrows (1970), and Azar (1970)) or for all nations at single point in time (Rummel (1967) and Tanter (1966)), and to combine the longitudinal approach of case studies with the all inclusive approach of the cross-sectional studies (Phillips, 1969).

Perhaps the most significant finding of this research is the similarity in the dimensions between all such studies. The implications of this similarity are that the parameters which identify patterns of behavior over time do not change when the length of a time slice is varied. This should enable the calculation of pattern scores employing any time frame once the weights (factor loadings) were known from a single study with the results that realistic patterns of behavior would emerge.⁴

Comparison between different points in time tends to confirm the fact that the patterns of behavior remain quite stable. It appears to be the case, however, that while the patterns, or strategies of behavior, remain constant from one point in time to another the behavior of individual dyads are not predictable using simple linear transformations from one point in time to another (Rummel and Hall (1968a & b), Phillips and Lorimer (1972), and Burrows *et al* (1972)). These findings ought to confirm the philosophically strong position that it is highly unlikely that a nation's behavior is a simple function of time. Thus, simple extrapolation techniques, while likely to be accurate in short range forecasting (Young, 1970a) are not likely to provide good predictions for longer term behavior performance.

Several attempts to provide taxonomies for classifying nations have been suggested (Rosenau and Heggard (1971), Phillips (1969), Young (1970b)). While a number of taxonomic attempts have been made based either upon grouping nations according to behavioral similarities (Phillips, 1969) or grouping of nations according to attribute characteristics (Rosenau and Heggard, 1971) no single taxonomy seems to be firmly grounded in theoretical expectations and sufficiently well accepted by members of the movement to command complete acceptance.⁵

It is quite clear that the early forefathers of this approach to describing positive relations between nations had in mind much more than the delineating of patterns and the classifying of actors or typing of nations. They wanted to use these general patterns to delineate the basic material from which philosophical introspection would produce universals for explaining and prescribing the relations between nations.

McClelland in the quote provided earlier has suggested the same thing. A prevalent strategy to the events movement has been the delineation of a set of patterns such as those discussed above and then the search for other variables which correlate highly with these patterns. Unfortunately Brunner (1970) has demonstrated very convincingly that the data analysis strategies presently employed by political scientists (such as correlation and regression analysis) will usually not reveal the underlying structure of a theoretical system. This will be the case regardless of whether the systems are analyzed cross nationally at a point in time or individually as a time series. Thus, there are several important problems facing analysts in the explanation of foreign policy exchanges. First, there is the very broad data analysis problem. To what extent can data--even time series data--be used to identify the basic structure of a theory of international interaction? Since most analysts' strategies cannot be used to distinguish between the structure of a theory and the parameters in that theory, it is the responsibility of the analyst to impose a basic structure on his observations prior to statistical manipulation.⁶ Cain and Watts point out, "Without a theoretical framework to provide order and rationale for the large number of variables, we have no way of interpreting the statistical results." Regression and correlations analysis is properly used to estimate parameters for a model only when the structure of that model and the elements which make up the theory are already well specified. This specification of the structure must precede the application of statistical techniques" (1970, p. 227).

The reader may wonder by this time why I introduce an analogy to Gentili and other early secularists? The answer is really quite simple.

Sorokin (1956) has suggested that two of the most serious ills that can befall a social science are the cult of Columbus syndrome and the malady of amnesia. He points out that too frequently, social scientists have been willing to suggest that what one is about to read in an article is a Brave New World discovered, thereby claiming to have discovered something for the first time and ignoring--hopelessly unintentionally--previous work on the same problem by others. These are dangerous ills which can befall any science. They are dangerous, not because they cause personal animosity--"Why wasn't I cited?"--but because they cause us to waste time with concepts, approaches, or theories which have already shown to be arid and fruitless.

Classical international relations has shown that what is needed is a set of expectations based upon the interaction between nations. But they have also shown that much more is necessary than ontological discussions about how we can know (natural law versus positive law). They have demonstrated that a charting of what has transpired between nations is not enough. Rousseau advanced the deductive theory of the nature of the relations between nations and the essential state of war which exists. Authors such as Brougham and Gertz suggested that we could recognize underlying principles in the exchanges between states which guided their behavior such as the balance of power. To be sure, there are attempts to pursue the deductive approach to a comprehensive theory about the relations between nations as well as attempts to discern underlying universals in the study of relations between nations in today's literature. But far too much time is spent in the realm of ontology (Rogowski (1968), Levi (1969)) or in the charting of patterns. These

chartings are certainly an interesting early attempt to demarcate the boundaries of performance for any new set of concepts. That is perfectly legitimate and probably to be encouraged. But as classicists found out we must quickly move on to answer or attempt to explain some of the underlying problems which face students of international relations today.⁷

A survey of current theoretical attempts to explain foreign policy actions or situations using concepts which could be operationalized by event data point to two specific schools of thought, a systems school and a national attributes school. Both paradigms are not well developed in terms of a formal theoretical system. The components of each paradigm include some discussion of the basic unit of analysis, the organizing concepts and a dominant inferential pattern, but they do not tend to provide a complete delineation of the structure of their system. Nor do they frequently proceed to the state of deducing theorems or propositions from a set of universal statements. To articulate a largely implicit framework as an explicit system it is necessary, of course, to caricature. But it is hoped that this caricature can be instructive.

The Systems Approach

One of the early advocates of the systems approach to international interaction was Charles A. McClelland. He suggested that once the relations of international politics were broken down to their most elementary form they take on the basic patterns of Figure 1. He follows that the facts of international relations can be selected and organized according to the two references of actors and interactions (McClelland (1966), p. 18). For McClelland, interaction analysts or demand response pattern analysis has a preoccupation, tracing the resulting patterns and trajectories of

actions. He suggests that functional systems have access to only a limited inventory of demand response actions in coping with the situations produced by system disturbances. Now the government of a national system tends to select types of actions from the inventory to meet different kinds of non-routine international situations provides evidence of its operational code in international politics (1966, p. 105). Recently several theorists have underscored the importance of considering the total interactions, especially those between antagonists. Burton (1968) asserts that the progression towards war depends upon the equal contributions from both sides, each being governed by perceptions of threat. North and his colleagues assert that war may occur in a number of ways, but the chances of its occurrence are increased by the hostility in the atmosphere of crisis generated by the joint exchanges of the parties involved (1968). Zinn has been concerned both with the expression of the hostility and with its perception and the ensuing responses (1968). The authors all emphasize the process of exchanges that underscore the symmetric importance of both participants and actions. Thus the flow of foreign policy exchanges between nations has certainly been the topic of much discussion, debate, and analysis. It has infrequently been the target of formal theoretical development, however. One of the more important aspects of the above literature is that it tends to mix prescription with description. Since this is the case, prediction is often dependent upon the effectiveness of role-playing. This principle is well recognized in administrative theory: Administration is not unlike play acting. The task of the good actor is to know and play

his role, although different roles may differ greatly in content. The effectiveness of the performance will depend upon the effectiveness of the play and the effectiveness with which it is played. The effectiveness of the administrative process will vary with the effectiveness of the organization and the effectiveness with which its members play their parts (Simon, 1958).

The task becomes one of constructing a theory of foreign policy which would be more than a set of normative rules for good diplomacy. Specifically, how could one construct an empirical theory? This is especially difficult in human systems (frequently termed artificial systems) where we are faced with an inability of the system to adapt perfectly to its environment (Simon, 1969). Let us begin with several rather simple automatic reaction models. The first is a no-lag immediate reaction to the foreign policy behavior received from another nation. This simple model follows closely with the work of Lewis Fry Richardson (1960), and his contention that the rate of change and hostility of one nation towards a second depends upon the level of hostility which the second harbors towards the first. This idea has been generalized by Dean Pruitt (1969) with the introduction of the concept of reciprocity. "Change in one party's level of output on the same or another dimension." (Emphasis added; note that to be considered reciprocal in this use the behavior need not be of the same type or magnitude as that received.) To further develop this approach to the explanation of foreign policy outputs, consider the competitive international environment in which the nation

operates. The behavior of one actor towards an object state is in part a response to the strategic problems which that actor faces with respect to its object, goals, and activities. The actor's behavior is considered in its attempt to affect the object nations future behavior. These thoughts can be expressed in the following statement: An actor's behavior towards a specific object is a function of the behavior which it receives from the object; more simply put, behavior begets behavior. Mathematically this statement is represented by the following equation:

$$B_{nq,m,t} = \sum_{m=1}^p \alpha_m B_{mq,n,m,t} + G, \quad (1)$$

where

$B_{nq,m,t}$ is the behavior of nation n directed toward nation q on dimension m at time t;

$$\sum_{m=1}^p \alpha_m B_{mq,n,m,t}$$

is the weighted sum of each of nation q's behavior toward n as measured, respectively, along the p dimensions of behavior. The weights (α 's) used in computing the sum are the relative importance of nation q's behavior, on each dimension, in influencing the behavior of nation n on dimension m;

and G is the projection, on dimension m, of the general level of activity which n holds toward q regardless of q's initiatives.

This equation states as a working hypothesis an actor's behavior results from the patterns of actions of its object. Tests of this statement (Phillips, 1971, 1972) tended to confirm its assertion. Other works in international relations (Tantar (1972), Bartos (1966), Azat (1970)) suggest similar hypothesis.

This can be called a tit for tat modal of the relations between nations. But international relations must certainly be more than a tennis match in which each actor's response is to his object's service. There are forces at work over time within a nation which work to insure specific strategies be employed when dealing with specific object nations. Halperin suggests that "most of the actions taken by bureaucracies involve doing again or continuing to do what was done in the past. In the absence of some reason to change their behavior, organizations keep doing what they have been doing" (1970, p. 9). Bureaucratic inertia, as an explanation of performance in organizations, is appealing and leads to the working hypothesis that a nation's behavior in foreign policy results, in part, from its own prior patterns of action. Stated formally:

A given nation's behavior toward a specific object is a function of its previous behavior toward that object. Mathematically this can be translated into the linear equation:

$$B_{nq,m,t} = \alpha B_{nq,m,t-1} + G \quad (2)$$

where the symbolization is identical to the first equation and t-1 is a time period earlier. Combining the two approaches together to form a single equation:

$$B_{nq,m,t} = \alpha B_{nq,m,t-1} + \sum_{m=1}^p \alpha_m B_{mq,n,m,t} + G \quad (3)$$

But the meaning of the individual terms remains the same as in the two preceding equations, the new equation expresses mathematically the contention that foreign policy dynamics are powerfully influenced by both bureaucratic inertia and reciprocity.

McClalland (1961) suggests that the workings of a modern foreign office resemble the day to day operations of a well run industrial plant. Following this suggestion, we may develop the tit for tat models somewhat further. Multitudes of difficulties and problems would be received and dispatched in the daily flow by specialists in handling foreign affairs. To cope with this complexity, experts reassign responsibility for monitoring the exchanges with specific countries. The ability of these experts to deal with their assigned tasks is in part a function of their understanding of the intent underlying the patterns of behavior which are admitted by object nations in response to various behavior received during a given time period. In order to know the appropriate response to make to an object nation, the experts must be able to understand clearly and unambiguously the messages which they are receiving from that object.

Thus diplomacy is communication as is the activity of the military and intelligence network. The transmission and reception of information is a major feature of the behavioral exchanges between nations. However, the amount of information conveyed between nations during the period of time must depend upon both the number of signals transmitted from nation to nation and the amount of information per signal transmitted. Approaches have been developed to measure and account for both the variety of signals transmitted and the amount of information transmitted.

One may count the number and types of signals which are sent from one nation to another. The heterogeneity of these signals at any point in time is a measure of the uncertainty which would attend any attempts to specify the sending selection processes (Cherry, (1957), Shannon and Weaver (1949), Ashby (1952)).

Information theory provides an excellent measure of the uncertainty, h , present in a set of signals:

$$H = - \sum_{i=1}^N P_i \log_2 P_i$$

the P_i symbol is the independent probability of the occurrence of signal type i , where there are n types of signals. Thus, from the probabilities P_i of different types of signals occurring in a given time period (same month), the uncertainty associated with the score for that period can be ascertained. If all outputs are equally likely, uncertainty is at a maximum. It is common to divide the actual uncertainty by the maximum value, deriving as a result the percentage of (maximum) uncertainty, which is more easily comparable across sources with differing sets of signals.

The work of Charles A. McClalland (1965, 1968, 1973) has shown that relative uncertainty values in excess of .700 signaled the threshold of a crisis. He has shown that the mix of behavior types does indeed change in a crisis toward greater variety. The literature on communications in international relations argues that in periods of crisis, system overload occurs and actors display an ^{over}ability to respond consistently to their foreign policy inputs (Holsti (1965), Burton (1968)). It seems to be the case that in periods of relative uncertainty less than this level (.700) the higher the relative uncertainty the more reciprocal the response (Phillips and Crafin (1972)).

Other studies have attempted to analyze the intent or the amount of information in an event. In order to check for the relationship between the intention of a message and the interpretation of the message.

the Stanford study group extended McClelland's original two actors in the reaction model. They state:

"We are interested not only in what national decision-makers perceive or say they perceive about themselves and others. We are also interested in what they actually do. How are these perceptual and actional elements to be brought together systematically and correlated for meaningful analysis? Basically, we are interested in the international 'communication' in the sense that this communication can be used to characterize all transactions between nations. This indicates that both the verbal and the physical acts have information potential. The acts of one nation can be considered as inputs to other nations. The basic problem is this: Given some input to a nation, what additional information do we need to account for the nation's foreign policy response? (1968, p. 133)

Primarily these studies examined the 1914 crisis and compared perception with action (Holsti, North, and Brody, 1968), the expression and perception of hostility (Zinnes, 1963), and the conflict spiral of increasing hostility (North, Brody, and Holsti, 1964). The analysis of the Stanford group has also contributed information on the Cuban Missile Crisis (Holsti, Brody, North, 1964), the Sino-Soviet Debate (Holsti, 1965 and 1966) as well as the public pronouncements of John Foster Dulles (Holsti, 1962).

The above leads to the conclusion: In terms of the frequency or intensity of threats or action, when a state perceives itself to be the object of another's hostility, it identifies and expresses hostility toward the offending state. The perception of hostility seems to require both communications and actions. This relationship is tempered, however, by the degree of involvement in a conflict. Highly involved nations tend to exaggerate the amount of hostility being expressed toward them

Thus, the more involved the nation becomes in conflict the more sensitive it becomes, even over-estimating the intended hostility from the environment.

A few studies have attempted to add intervening variables in this basic communication model. Time has been considered an important situation variable such that when time pressures are great, decisions must be made more quickly without considering multiple alternatives (Holsti, 1965). The pressure of domestic events has also been hypothesized as an important instrument or force in influencing a nation to over or under respond to the receipt of behavior (Phillips, 1973). Third party actions are also considered as influencing the action and reaction model that has been set out here. At the data collection level Hermann and Salmore point out the need for considering the indirect object of a behavioral action (1970). Phillips and Mainline (1973) have studied the secondary impact of actions or the stimulus response models developed here for the triad, Soviet Union, United States and China.

All the work discussed to this point has two specific characteristics in common. They are all based upon linear equations and they are all determinant in nature. The former condition raises an empirical problem and the latter state of affairs raises the question of the specificity of theoretical work in this area. Linear equations assume that, in the simplest case of equation (1) a nation will respond to the inputs of another nation with the same strength of response throughout the range of the frequency of inputs. Thus, the sensitivity to a single threat from one nation to another is identical to the sensitivities to a hundred threats in a given time period from the object to the actor. Perhaps more importantly there

is no possibility for a change in the importance of the parameters over time. For instance, the relations between two nations may be based upon historical feelings of animosity which, because of a recent change in the relations between the two nations or because of a change in the domestic type of government of one nation, may have undergone a change which effects the ways in which the two nations interact. More simply, the recent past may provide important changes in the likelihood of certain forms of reaction in the present period. Karl Deutsch (1968) suggests that the highest of a nation's basic functions is its ability to self-transformation: "To respond to events in its environment in new ways, or at least in different and more rewarding ways" (p. 17). Burton (1969) argues that states as political systems operate within an environment of other states to which they are adapting and responding: National interests are not fixed goals and include their adaptive processes (p.10). Laying aside for a moment the difficult task of defining national interests, the notions of adaptation and response do suggest that the actions of nations are based upon expectations of future responses gained by experience in the past of dealing with an environment which can most certainly be differentiated into objects of behavior. Holsti, North and Brody share this view:

"Especially, then, it is by projecting past event into the future that human beings make decisions; and statesmen, in this respect are not exceptions. Foreign policy decision, like other human decisions, imply not only an abstraction from history, but also the making of 'predictions' -- the assessment of probable outcomes. These two operations may be understood almost unconsciously, but they are nonetheless real and inseparable. The Marshall Plan was based upon a prediction, derived from some combination

of experience, that systematic aid to European nations would bring about certain consequences. Viewed in retrospect, this prediction seems to have been generally sound. The basic prediction inherent in Khrushchev's decision to establish long-range missiles in Cuba, on the other hand, was much less accurate (1968, p. 175).

All too frequently, analysis of the processes of demand and response patterning has led to conclusions about the tendency of a lock-in effect.⁹ Whether the process tends to adjust in certain issues and lock-in in others has yet to be discovered. In any event, it can be argued that the long series of crises since 1946 is part of this process of experimenting with new politics of international relations.¹⁰ Without reference to a setting of the relationship or the larger meaning of politics in international relations, a theory may be developed which attempts to predict the future patterns of interaction and to compare the forms of the patterns of behavior between nations.

Since 1967, Rosenau has been advocating work and development on an adaptation paradigm. McGowan, (1970) has taken some of these notions and attempted to formalize them in a mathematical theory which takes into account the notions of adaptation previously suggested by Rosenau. McGowan states that:

"In his most recent exploration of the adaptation paradigm, Rosenau argues as follows: First, 'ConSIDERABLE insight' can be gained from viewing national societies, like the cell in an organism, 'as entities that must adapt to their environment to survive and prosper. That is, if an entity is to maintain its boundaries that separate it from other entities it must act toward the other entities in such a way to keep its essential structures intact (Rosenau, 1970, p. 2). Second, for a national society 'adaptation means that fluctuations in the basic interactions patterns that sustain its social, economic, and political life must be kept within limits minimally

acceptable to its members (Rosenau (1970) p. 2).
Third, since there can be considerable disagreement over what are acceptable limits of variation in the performance of a society's economy or politics, the politics of national adaptation is infused with an intensity and drama unknown to other entities' and processes (Rosenau (1970) p. 2). Fourth, the performance of essential societal structures is conditioned by external environment is a basic source of variation in its essential structure, 'the need for foreign policy rises--out of the fact that the essential structures cannot be kept within acceptable limits unless some kind of behavior is undertaken toward the environment (Rosenau(1970) p.3)."

The problem now becomes how to encompass the notions of adaptation and/or learning into our expectations of the way nations interact. At least two possibilities are immediately recognizable. The one is the development of a learning theory for how nations continue to change and adapt their relations and the second is the development of control theory and its application to the process of adaptation of nation-states.

Mathematical Learning Theory

Mathematical learning theory has been developed to understand such tasks as signal detection and two person interaction. 11 The basic notions seem ideally suited for formalizing the dynamics of the processes developed in equations (1-3). One of the most applicable models has been developed by Rainio (1968). Rainio's basic idea for constructing a stochastic model is to consider social interaction as a process derived from the learning of the individuals participating in it. The fundamental assumption underlying his model is that a sequence of behavior is a series of choices between various alternatives, and certain probabilities are associated with the choice of the behavior alternatives by the mathematical law developed by Bush and Mosteller (1955). The purpose of his model is to

find in each particular choice situation the probabilities from which the choice between the alternatives is taken.

The social interaction process is assumed to take place according to the following model.

- 1) Social contacts may occur between the individuals under consideration, the number of whom is limited.

$$G = X_1, X_2, \dots, X_6$$

- 2) The individual who makes the contact is determined by a vector involving the probabilities with which each individual occurs as the contact; the sum of the probabilities involved in the vector is unity.

$$\begin{array}{c} P_1 \\ K = P_2 \\ \vdots \\ P_6 \end{array} \quad \begin{array}{c} 6 \\ \sum_{i=1}^6 P_i = 1 \end{array}$$

- 3) The individual with whom the contact is made is determined by a vector that involves the probabilities with which each individual occurs as the contactee when the contactor is determined; thus there is one such vector for each individual and the probabilities in each vector add up to unity.

$$\begin{array}{c} X_1 \\ X_2 \\ \vdots \\ X_6 \end{array} \quad \begin{array}{c} P_{11}, P_{12}, \dots, P_{16} \\ P_{21} \\ \vdots \\ P_{61}, P_{62}, \dots, P_{66} \end{array} \quad \begin{array}{c} X_1, X_2, \dots, X_6 \\ \sum_{j=1}^6 P_{ij} = 1 \end{array}$$

4) Once the individual who makes the contact with the individual with whom the contact is made have been determined, the contact is always realized with the probability 1.

5) When a contact between two individuals is realized, each one experiences the behavior of the other as A or $\bar{A}$, and the perception corresponds to the behavior of the individual concerned.

6) The behavior of the individual in the manner A or $\bar{A}$ in connection with the contact is determined by the probabilities P_A and $P_{\bar{A}}$, which add up to the unity.

7) A contact is always either rewarding or punishing to the individual.

8) If the contact is rewarding, the probability of making contact with the same individual increases according to the mathematical law $P_{n+1} = P_n + \alpha (1 - P_n)$ involved in Bush & Mosteller's learning model. If the contact is punishing the probability of making contact with the same individual diminishes according to the mathematical law $P_{n+1} = P_n - \beta P_n$.

9) If the contact is rewarding, the probability of behavior in the same manner as in connection with this contact increases according to the mathematical law mentioned under (8), and if the contact is punishing, the probability diminishes correspondingly according to the second law presented under (8). (However, the coefficients α and β need not be the same as those employed in the transformations dealt with under (8)).¹²

Revision of Rainio's Model

The applicability of Rainio's model to the field of international relations seems to be restricted by his assumption mentioned under (8), i.e. both $A_i A_j$ and $\bar{A}_i \bar{A}_j$ were defined as "rewarding" to both i and j . When we attempt to explain relationships between i and j in terms of their common views about a third individual k who is not participating in the interactions between i and j , Rainio's identification of rewarding contacts with common opinions seems to be meaningful.

But when the relationships between i and j are to be explained in terms of their direct behavior toward each other, Rainio's definition of rewarding contact provides an untenable result. For instance, the uncooperative behavior of i and j toward each other can be defined as rewarding contact by Rainio's definition. But we cannot think of mutually uncooperative behavior as rewarding to both i and j . Therefore, we need to modify his model to make it applicable to the study of international relations.

A revised definition of rewarding and punishing contacts between i and j might be:

$A_i A_j$: rewarding to both i and j

$A_i \bar{A}_j$: punishing to i and rewarding to j

$\bar{A}_i A_j$: rewarding to i and punishing to j

$\bar{A}_i \bar{A}_j$: punishing to both i and j

A_i : favorable behavior of i toward j

$\bar{A}_i$: unfavorable behavior of i toward j .¹³

Such a model could provide the basis for Monte Carlo simulations of the interaction between nations. The learning goal in this model is

to maximize the rewarding actions received from the environment. Such a model is being developed at Ohio State University for both teaching and research exercises. The impact of relative uncertainty, third party interactions, domestic events and the level of the bureaucracy involved in a decision to act are all being considered as having an impact upon "learning" in the model.

Such a procedure allows for the development of a microanalytic model which can serve as a hypothetical real world. Computer simulation of such a "world" can be employed to generate aggregated data for selected intervals of time. The data generated from such an experimental situation is not employed as a model of reality but a reality to be modeled. The history which is generated is designed to test hypothesis about real foreign policy interactions which have been adapted to this artificial world.¹⁴

Hierarchical Control Theory

Recent attention in theory and research on the bureaucratic handling of foreign policy questions has focused upon dealing with problems of the transfer of knowledge to action, criticizing policy, and describing governmental behavior. Finding a mutually agreeable approach to understanding the bureaucratic decision-making apparatus is difficult, however. Allison has underscored this problem: "... bureaucracy is the least understood source of unhappy outcomes produced by the U.S. government. Calls for the elimination of bureaucracy are, however, non solutions. Large organizations that function according to routines, and politics among individuals who share power, are inevitable features of the exercise of public authority in modern society" (1971, p. 265).

The United States experience in recent years suggests that the relationship between foreign policy decision-making on the one hand and information collecting and forecasting on the other is an integral aspect of effective organizational performance. The process suggests that there are patterns of behavior which are strongly influenced by organizational position and expectations. Milman, for instance, describes organizations in terms of the network of interpersonal relations at various levels (1971). There seems to be a recognized agreement between policy makers and academics on the existence of levels of behavior, on the interaction of motivation and goals, and of the impact of perceptions on preferred modes of action at different levels of the policy process. Some of the elements of these concerns can be made explicit if we introduce modern systems theories which seek to treat organizations as hierarchical multi-level control systems.¹⁵ The concept of a multi-level, hierarchical structure cannot be defined by short, succinct statements. What I propose to do at this point is to 1) introduce some basic concepts for classification and study of hierarchical systems in general, 2) provide a conceptual foundation for the problem of coordination and 3) indicate some features of hierarchical systems which make them attractive for use in the study of foreign policy decision making.¹⁶

To begin with, the total system can be designated as the simple schematic in Figure 2. The ongoing process is that of foreign policy inputs and outputs: events. The operation of a subsystem on any level is influenced directly and explicitly from the higher levels, mostly from the immediately superseding level. This influence, while not always binding, tends to reflect a priority of importance in actions and goals of the higher level. This influence will be termed intervention. The

Priority of action is oriented downward in a command fashion, but the success of the overall foreign policy system and indeed of the units on any level depends upon the performance of all units in the system. Since the priority of action tacitly assumes that intervention precedes the actions of lower units, the success of the higher units depends upon that action or the resulting performance of the lower level units. Performance can be viewed, therefore, as feedback and response to intervention. Feedback is oriented upward, as shown by the upward arrows in Figure 2.

I have termed these upward arrows the performance feedback channels. The layers that have been laid out can be broken down into functional decision hierarchies. The functional hierarchy should contain three layers as shown in Figure 3. The lowest level, the selective level, accepts the information from outside the unit and applies a decision algorithm to derive a course of action. The algorithm is defined as an organizational means of reaching a solution usually provided by a specific intervention from above.

The inherent goals of the second layer activity, the learning and adaptation level, 'a to reduce uncertainty. Given a set of priorities and goals and the importance of actions from a higher level, this learning or adaptation layer must decide how to respond to the needs prescribed from above. This layer must reduce the uncertainty in making responses and initiatives as much as possible providing a simplified job for the selection level.

The self-organizing layer must select and structure functions and strategies which should be used on the lower layers so that an overall goal or set of national interest can be pursued as closely as possible. It can change the directives for action to the first level if the overall

goal is not accomplished, or it can change the learning strategy used on the second layer if the estimation of uncertainties turns out to be unsatisfactory.

We can formalize the coordination of activities at this point. Consider the process P; it has two inputs: a control or intervention input from the second level (m from a given set M) and an input w from a given set Ω , called the input. It also has an output Y in a given set Y . The process P is assumed to be a mapping

$$P : M \times \Omega \rightarrow Y.$$

Looked at in foreign policy terms the process or selection level concerns the working out of daily actions in each of the bureaucracies involved in foreign policy. The tasks here are to apply an algorithm for responding to stimulus from the environment which has been provided by the second level. While it is true that some policy is "made in the cables" these changes in the algorithm for responding must be in harmony with the general outlines of objectives passed down from above or there is likely to be requests for a change in activity.

Next consider the second level in our control system. It has two inputs: coordination Y provided by the higher level from a given set Y , and the feedback z from a given set Z coming from the process. The output is the control intervention m selected from the set M . The system is a mapping

$$C_1 : Y \times Z \rightarrow M.$$

At the managerial level the task of coordinating the organizing goals of the Administration with the realities of the daily routine must be carried out. It is here that decisions about the feasibility of particular plans is decided. These levels must provide policy plans for

operators to use as algorithms in acting. It is the general case that this level must suggest plans, get them accepted by the Administration and implement them at this selection level.

The highest level is charged with the responsibility of coordination. It has only one set of inputs, namely the feedback information w from the second levels which it uses to arrive at the coordination output Y . The system is assumed to be a mapping

$$C_0 : W \rightarrow Y,$$

where W is the set of feedback inputs w . Except in rare instances, such as a crisis, the Administration sets national interest, chooses a policy plan or combines and suggests several plans from the managerial level and assigns responsibility to a lead bureau at the second level, but it does not involve itself in the process directly.

To complete the description of this system we must specify the nature of the feedback information. The feedback information z to the second level contains direct information on the process P ; it is therefore a function of the control u , the disturbance w and the output y , given by the mapping

$$f_1 : M \times Q \times Y \rightarrow Z.$$

Similarly the feedback information v received by the highest level contains information concerning the behavior of the second level and therefore assumed to be given by a mapping

$$f_0 : Y \times Z \times M \rightarrow W,$$

which is a function of the coordination Y , feedback z and output u .

It should be pointed out that this functional hierarchy is based on the conceptual recognition of the essential functions in a complex

decision system. It provides only a starting point for a rational approach to assign proper functions to different layers. In fact, each functional layer can be implemented by further decomposition. For our purposes it is only essential to lay out the elements of the decision-making process and to borrow this functional hierarchy of levels or tasks so that we can demonstrate at what place a specific form of forecasting might be beneficially used. In order to do this, we need to make a set of assertions about the types of planning that each of these levels in a hierarchy must normally concern.

In spite of several common features the tasks and roles of the systems can be delimitated by levels at this point.

- (1) A higher level unit is concerned with the larger portion or broader aspects of the overall foreign policy behavior. In hierarchical systems terms this is reflected in the fact that a higher level unit is superior to two or more units and the decision of the higher level coordinates the lower levels in accordance with the goal or objective defined over the domains of all the units subordinate to it.
- (2) The decision period of a higher unit is longer than that of lower units. Simply put, the lower level units are responsible for today's decisions, whether to respond to previous actions or to initiate new actions. The time frame of these decisions are quite limited. However, to evaluate the effect of coordination, higher levels cannot --> more often than the lower levels, whose behavior is conditioned by this coordination. Therefore, it is

essential to recognize inherent differences of the time frames in most decisions as we proceed up the decision hierarchy. Certainly there are specific strategies or issues such as the Cuban Missile crisis when the normal process is short-circuited by making most decisions operative at a much higher level in the hierarchy.

- (3) A higher level unit is concerned with the slower aspects of the overall system's behavior. The lower levels of this decision tree are concerned with more particular local changes in the foreign policy process. The higher levels cannot respond to variations either in the environment or in the process itself which are faster than the variations of concern to the lower levels.

- (4) Descriptions and problems of higher levels are less structured with more uncertainties and more difficult to formalize quantitatively. Decision problems in the higher levels can be considered as more complex and an approximation can be used to derive a solution to a higher level problem, but accuracy is then reduced. One has to be cautious when interpreting the results (Mesarovic (1970) pp. 54-55).

In general, for any level there is a specific set of techniques suitable for the solution of respective problems. As we have laid out the system characteristics, units of the higher echelons are concerned with broader aspects of the foreign policy task and therefore have a more complex decision problem than those on the lower levels. They have a

longer time frame with which to look at problems, and therefore are concerned with slower aspects of the overall foreign policy behavior. Among the most immediate potential benefits of applying this approach in research, the following are worth mentioning:

- (1) It provides a unified basis for different approaches through a framework in which the various approaches can be compared, contrasted, and used to complement each other.
- (2) It offers mathematical precision in defining both concepts and issues.
- (3) It provides a starting point for mathematical and computer simulation studies of various issues and problems both in analysis and design of decision-making systems.

The approach being based on mathematical methods is primarily concerned with structural considerations such as communication, control, command, coordination, etc. However, it should be emphasized that the basic building block, a decision-making unit, is adaptable to multiple uses in foreign policy and event interaction analysis.

The Explanation of National Behavior by Resort to National Attributes

This area is perhaps the most well developed arena for theoretical explanation in international relations. Several authors have developed theories which attempt to explain behavior between nations. In their empirical definitions of behavior some have resorted to the events data. The primary use of events data in these approaches is to aggregate behaviors between nations over the time span of a year. There are several major approaches in this area and they can be briefly summarized. No extensive discussion of individual approaches will be attempted here, however, since this work is well cited in existing literature.

R.J. Rummel has attempted to link the international behavior of nations to differences and similarities in national attributes between nations. Rummel's field theory asserts that nations interact in a social field. This field is analytically divided into two spaces: a behavior space and a space of attributes. The field is a system defined by analytical coordinates and by the properties, relations and movements of the entities along the coordinates. The concept of field assumes that the characteristics of the field and the entities within it reciprocally influence one another.¹⁷ Description of the field, therefore provides a basis for explaining the past, and in a measure, predicting the future (Wright (1955) p. 524). Conceptualizing international relations behavior as being located in a field begins with assumptions about time and space within which nations exist and events occur.¹⁸ Geometry and linear algebra are the language for rewriting natural views of the world as a field. This conception has an intellectual heritage in the physical sciences but it has also found support in the social sciences (Levin (1966), Wright (1965) and Sontly, (1954)).

For Rummel, nations are located within the attribute space in terms of their characteristics, such as economic; within the behavior space, dyads (such as USA-USSR) are located in terms of their behaviors such as trade. Then national attributes' similarities, and differences are field forces creating social time-space-motion; attribute distances between nations cause international behavior. Thus, for field theory, a social concept attribute distance--is a basic force (Rummel (1971), p. 5).

Leaving mathematical considerations aside, Rummel's field theory says simply that nations will behave toward each other in terms of their social, economic, geographic and political differences or similarities.

Test of the theory has so far been encouraging. In particular one analysis of the linkage of behavior between nations to their differences shows different levels of economic development to be a specifically important force in influencing the direction of behavior (Rummel, 1969).

Rummel is moving in the direction of increasing the number of axioms in such a way as to explain in more detail the relationship between behavior and attribute distances. This work relies heavily on the sociological concepts of rank and status previously used to explain international relations by Galtung (1966 a & b).

In contrast to Rummel's belief that it is the relative differences and similarities between nations which explain international relations, other analysts stress that the external behavior of society stems primarily from the effort to satisfy needs and wants. Thus the value structure and coherence of society are viewed as crucial to its external behavior irrespective of similarities or differences between the nation and other nations. Hostile alliances forming or trade wars brewing. Nils Petter Gleditsch has suggested that we group all those who take this position under the title, Attribute Theorists (Gleditsch, 1970). Rosenau has suggested that three attributes of national societies--their size, their economic development, and their political accountability--are so basic to their way of life as to lead to fundamental differences in their foreign policy (1966, p. 27-92).

The eight types of societies that result from a dichotomization of the three national attributes are considered to be so different from each other that the impact of individual, governmental, societal and systemic variables would not be so great as to confuse distinctions in

behavior for each of the eight geno-types.¹⁹ Propositions deriving from this taxonomy have been tested (Hermann and Salmore (1971), Rosenau and Heggard (1971), Rummel (1968), Hermann (1972)). The results so far have been checked indeed. It appears that cooperative behavior, trade, aid, and participation in the international system can be understood from knowledge of the attributes of an individual nation (Rummel, 1972). On the other hand, conflict behavior seems to be more complex than this theory would expect.

The common belief that internal strain on political instability within a state is related to its foreign conflict behavior has been seriously questioned by empirical analyses (Rummel (1963, 1966, 1968), Jantner (1966), Haas (1965)). Wilkenfeld had demonstrated that when one breaks down nations into groups based upon bureaucratic decision style, certain groups show a strong relation between domestic conflict and foreign conflict (Wilkenfeld, 1963 1969). Zinnes and Wilkenfeld (1969) have developed a model which attempts to account for the relationship internal political instability and foreign conflict activity. This model has been extended by Gillespie, Zinnes, and Wilkenfeld (1969). Another interesting attempt to demonstrate that there is a relationship between domestic unrest and foreign conflict behavior but that it is not a simple mapping of domestic unrest onto foreign conflict has been developed by Leo Haseelwood (1973).

Zinnes feel that a particular type of social structure or regime has an impact upon the making of foreign policy. Whether a political system is open or closed, stable or unstable, assertions about the highest leaders of such systems and the impact on the decision-making of these leaders is currently being investigated. The Salmore's hypothesized

that the regime type has an important influence upon the foreign policy behaviors of the government (1972). Phillips and Hall (1969) demonstrated classification of nations according to bureaucratic characteristics does have an ability to distinguish between other characteristics of the nations lending credence to the possibility that difference of regime types have an impact upon foreign policy behavior.

The idiosyncratic characteristics of several decision makers is being investigated by Peg Hermann in an attempt to explain foreign policy behavior. It is her premise that the higher in the hierarchy of foreign policy organizations an individual's role is, the more likely are his personality characteristics to effect foreign policy decision. She feels that the most relevant personality variables to foreign policy making are the influences on the way the leader or head of state process information (1972).

The set of approaches to the explanation of international relations based upon the attribute characteristics of the relations between the attributes of two or more nations is progressing quite well from an empirical standpoint. These authors have frequently relied upon event data to test their propositions. In their use of event data they have aggregated individual recordings of actions to yearly totals. Aggregation tends to cumulate the systematic components of data and cancel the random ones,²⁰ however, aggregation may increase the difficulty of choosing between alternative theories.²¹ More importantly, while the data that is being used in testing these field and attribute theories relies in part upon events data as a source of empirical observation, the process of aggregating this data rejects the basic assumptions of the event movement.

We began this paper by a simple delineation of the assumptions implicit in those who prefer to collect what is termed event interaction data. They are, in slightly enlarged form: (1) That must be explained are the individual actions of nations states. (2) Behavior reflects purpose or intention. (3) Action is chosen as a calculated solution to a strategic problem. (4) Explicit statements and tactical moves of nations constitute strategic signals. Adversaries watch and interpret each others behavior, each aware that his own actions are being interpreted and each acting with the consciousness of the expectations which he creates. (5) Actions chosen are in response to strategic problems the nation faces. Threats and opportunities arising in the international strategic market place move the nation to act.²² If these are agreed upon as the basic premises of those who choose to collect events data, aggregations of that data into yearly form provides measures of the total amount of exchange between nations in the same way that trade data, aid data, or any other transaction data would provide. That event analysts wish to consider their data different than transactions can be seen in the way they organize and record the information on an act by act basis.²³

It can be argued that foreign policy decision systems such as those envisioned in the hierarchical systems model or the learning models are really recursive. It is difficult, for instance, to find examples of decisions where policy input and output are simultaneously determined. More realistically one must usually specify some sort of adjustment process at work. A nation sets the stage by making an act, another nation reacts. Interaction may be accumulated or ignored, third nations react to these nations or not, the activity becomes important enough to move

up the hierarchy of decision-makers or not. A crucial factor, however, is the time period involved. If the unit of time implied in the substantive model is each event, but the data is aggregated over periods larger than the substantive unity, then identification of the true explanatory variables is not possible. The aggregated year or monthly data is an approximation, but Johnson (1972) has shown that without further variables the model would not now even be unidentified. Even if identifying variables were present, enforced aggregation over time periods turns a truly recursive model to a fully simultaneous one with all the resultant estimation problems (1972, Chapter 13).

The impact of such an argument is that while the data is being appropriately employed in attribute analyses which aggregate at the monthly or yearly level, the model which underlies the data collection efforts of the event field is not being tested by attribute or field theories. Rummel has argued that without knowing the theory which underlies the collection of data it is inappropriate to discuss the implications of a particular data collection.²⁴ He is clearly not arguing that he would not accept events data to test his theory. On the other hand, the emphasis on the events data collection has confused the distinction between those who have developed a rationalization for collecting the data and those who have been most visible in employing the data to test their theories.

Thus international events data are no more than measures of some forms of international interactions. They are, or should be, simply indicators of substantive concepts bounded within theoretical frameworks. Trade, mail flows, hours of cross national radio broadcasts, and the number of tourists are legitimate measures of international

exchanges as are events. Previous preoccupation with events data per se has tended to confuse this issue. When actions are considered discrete signals of a national decision making bureaucracy, as most events data collectors argue, then systems models as developed in this paper are applicable. When events are aggregated and considered as indicators of the linkage between nations or as means of characterizing the foreign policy output of a nation, as the field and attribute theories view them, then the analysis employed by followers of those paradigms is correct. On the other hand, we cannot mix the systems paradigm with the aggregate analysis of the attribute/field theorists as this results in an inability to distinguish between differing systems theories.

Conclusion

This paper has attempted to identify the basic underlying assumptions accepted by those who collect events interaction data. While no single theory has been accepted by this group of data collectors, enough evidence seems available that it is possible to characterize the field. It is interested in the dynamics of foreign policy process. Emphasis is placed upon the development of algorithms for matching inputs and outputs. Simple linear models characterized as fit for tat models were reviewed and identified in the literature. Dynamic extensions of this approach to cover adaptation and learning were demonstrated and recommended. Use of events data by other theorists was briefly reviewed. The conclusions of this review were that while event data was appropriate for testing these field and attribute theories, the assumptions which underlie the collection of events data are not being tested when the data is employed

in the field or attribute theories since the time frame of the aggregation is monthly or yearly.

The implications of the review are that a good deal more work needs to be pursued in the area of theoretical explanations for the normal relations between nations. The process of foreign policy making is not yet the subject of formal theoretical explanation while the substantive interests of events data collectors seems well developed explanations of the process delineated in the data have not reached maturity.

FOOTNOTES

1. The adjective was suggested by Rogowski (1968) and it is meant to comprehend both general systems theory and its derivatives or cognates as these have been applied to the study of international politics.
2. For propositions similar to the three assumptions stated here see McClelland (1961), Hermann (1972), Allison (1970).
3. For a solution to this problem see Phillips (1969).
4. It is important to keep in mind that this finding does not mean there will be no variation in a nation's or dyad's scores over time. Rather the dimensions along which nation's or dyad's behavior varies remain stable, i.e. the same, irregardless of the time slice used.
5. For a review of classification attempts in international relations see Swanson (1971).
6. For empirical proof of this point see Hilton (1971).
7. It is most distressing today that events data analysts must worry over the presentation of any paper. On the one hand, if their paper is an investigation into reliability or validity of their data they are attacked for being atheoretical. On the other hand, if they propose theoretical explanations to international phenomena they are attacked for not giving enough concern to the empirical questions. It is unfortunately the case that most statistical analyses precede without appropriate theory and most theoretical analyses are being criticized for the wrong reasons.
8. "The nations affect the actions of one another less by physically compelling changes in behavior than by acting on one another's perceptions and expectations: Interaction among nations is primarily a matter of threats, promises, and warnings designed to influence behavior by persuasion. Accordingly the primary vehicle for the exercise of international influence takes the form of 'signals' among international actors. Actions - the outputs of the national security bureaucracy - are the 'signals' designed to persuade another nation to alter its behavior in the preferred direction." (Halperin and Kanter, 1973, p. 40).
9. The term was originally suggested by Rapoport (1960).
10. Aton has raised the question as follows: "Is the cold war a preparation or substitute for total war?" If the former, the two camps are simply maneuvering for position until the day of final settlement. If the latter, the propaganda battles become the struggles among national parties, dividing localized in Greece and Korea, correlative the war itself--inevitably because of the ravages of violence (1954, p. 226).
11. The reader interested in pursuing mathematical learning theory might consult Atkinson, Bower, and Crothers (1965); Bush and Mosteller (1955); or Coombs, Daves and Tversky (1970).
12. For procedures used in identifying specific values for alpha and beta see Bush and Mosteller (1955) or Mainio (1968).
13. These revisions were suggested by Yong-Ok Park.
14. This position is well developed in Ackoff and Emery (1972), Chapter 13.
15. For an introduction see Mesarovic, Mucko, and Tackahara, (1970).
16. This development follows that of Mesarovic, et al.
17. Field theory assumes, first, that international behavior and attributes form a social space - a field of complex and changing interrelationships between nations, their characteristics, and their behavior. Isolating a particular variable or two is not sufficient to understand behavior. Rather, the whole field must be specified to provide the context and causal environment of interactions. For example, knowledge that a country with a left democratic government is poor and a Catholic will not generally be sufficient to explain a nation's international behavior. These characteristics have different behavioral consequences depending on their distribution in the system, behavioral expectations and norms, and on who is the behavioral object (Rumel, (1971), p. 4).
18. "... absolute characteristics are assumed outside of a nation's behaviorally relevant field and it is assumed that the principle of relative values governs nations: attributes and behavior must be understood by their interrelations, comparatively. Behavior cannot be explained in isolation and a nation's attributes become relevant only in relation to other attributes and to behavior. "... social time is assumed to be part of the international relations social space - the field. Nation behavior and attributes have extensional and durational relationships; the passage of time is relative to the nations and the context." (Rumel (1971), p. 4-5).
19. See Kendall (1950).
20. See Yula, Orcutt, Watts and Edwards (1968).
21. I have enlarged upon the original set of three assumptions so as to make clear the act by act characterization of these assumptions.
22. All coda sheets that I am aware of are specific to an individual act.
23. Public discussion at International Studies Association meetings in Dallas, 1972.

BIBLIOGRAPHY

- Ackoff, Russell L. and Fred E. Emery (1972) On Purposeful Systems. Chicago: Aldine.
- Aliisen, Graham (1971) The Essence of Decision: Explaining the Cuban Missile Crisis. Boston: Little, Brown.
- Aron, Raymond (1954) The Century of Total War. Garden City, N.Y.: Doubleday and Co.
- Ashby, W. Ross (1969) Introduction to Cybernetics. New York: Barnes and Noble.
- Atkinson, R.C., Bower, G.H. and Crothers, E.J. (1965) An Introduction to Mathematical Learning Theory. New York: Wiley.
- Azar, Edward A. (1970b) "Profiling and Predicting Patterns of Inter-Nation Interactions: A Signal Accounting Model." Paper presented at the American Political Science Association Annual Meeting, Los Angeles, California, September.
- _____. (1971a) "The Conflict Escalation-Reduction Cycle: A Statistical Assessment of International Shifts." University of North Carolina, Studies of Conflict and Peace Report No. 2, November 1.
- Baughman, Henry (1972) Dissertations: Historical and Political.
- Bartos, Qumar (1966) "Concession-Making in Experimental Negotiations." in Joseph Berger, Morris Zelditch, Jr., and Bo Anderson (eds.), Sociological Theories in Progress. New York: Houghton Mifflin.
- Bentley, Arthur F. (1954) "Inquiry into Inquiries" in Sidney Butner (ed.), Essays in Sociological Theory. Boston: Beacon Press.
- Brunner, Ronald P. (1970) "Data Analysis, Proven Analysis and System Change." Paper prepared for the 66th Annual Meeting of APSA.
- _____. and Gary D. Brewer (1970) "Policy and the Study of the Future: Some Reflections on Method." Paper presented at the Annual Meeting of the International Studies Association, Pittsburgh.
- Burrows, Robert (1969) "Conflict and Cooperation Within and Between Nations: Israel, the United Arab Republic and the Major Arab States of Southwest Asia, 1949-1969." Paper presented at the Annual Meeting of the American Political Science Association, New York City, September.
- _____. (1970a) "Multiple Time-Series Analysis of Nation-Level Data." Comparative Political Studies. II (January): 465-480.
- _____. (1970b) "Conflict and Cooperation Within and Among Nations: Enumerative Profiles of Syria, Jordan and the United Arab Republic, January 1965 to May 1967." Paper presented at the Annual Meeting of the International Studies Association, Pittsburgh, April.
- _____. and Jose Garriga, Jose Musio and Bert Spector (1970) "The Road to the Six Day War: A Relational Analysis of Conflict and Cooperation Within and Between the Arab-Israeli and Inter-Arab Political Domains." Paper presented at the Annual Meeting of the Middle East Studies Association, Ohio State University, Columbus, Ohio, September.
- _____. and Bert Spector (1969) "The Strength and Direction of Relationships Between Domestic and External Conflict and Cooperation: Syria, 1961-1967." Paper presented at the Annual Meeting of the American Political Science Association, New York City, September.
- Burton, John (1968) Conflict and Communication. New York: The Free Press.
- _____. (1969) Systems, States, Diplomacy and Rules. Cambridge: Cambridge University Press.
- Bush, Robert and Fredrick Mosteller (1950) Stochastic Models for Learning. New York: John Wiley and Sons.
- Cain, G. and H. Watts (1970) "Problems in Making Policy Inference from the Coleman Report." American Sociological Review. (April) pp. 228-232.
- Cherry, Colin (1957) On Human Communications. Cambridge: MIT Press.
- Coombs, C. H., R. M. Dawes and A. Tversky (1970) Mathematical Psychology. Englewood Cliffs, Prentice Hall.
- Corson, Walter (1970a) "Conflict and Cooperation in East-West Crisis: Measurement and Prediction." Paper presented at the Michigan State University International Events Data Conference, East Lansing, April.
- Denton, Frank H. and Warren R. Phillips (1968) "Some Patterns in the History of Violence." Journal of Conflict Resolution, XII (June) pp. 182-195.
- Deutsch, Karl (1968) The Analysis of International Relations. Englewood Cliffs: Prentice Hall.
- Driver, Michael J. (1968) "Crisis and Reciprocity in Soviet American Interactions: A Newspaper Headline Analysis." University of Southern California, August.

East, Maurice and Charles F. Hermann (1972) "Do Nation-Types Affect Foreign Policy Behavior?" Paper presented for Annual Meeting of the American Political Science Meeting, Washington, D. C., September 5-9.

Forsyth, M. C., et.al. (1970) The Theory of International Relations. New York: Atherton.

Galtung, Johan (1965a) "International Relations and International Conflicts: A Sociological Approach." Transactions of the Sixth World Conference of Sociology, Evion.

____ (1966b) "Rank and Social Integration: A Multidimensional Approach." In Berger, Zelditch and Anderson (eds.) Sociological Theories in Progress. New York: Houghton Mifflin.

Gentili (1959) On the Law of War.

Geertz, Fredrick Von (1906) Fragments Upon the Present State of the Political Balance of Europe.

Gillespie, John, Dina Zinnes and Jonathan Wilkenfeld (1969) "Consistency and Inconsistency of Foreign Policy." Paper prepared for the annual meeting of the American Political Science Association, New York.

Gleditsch, Nils Petter (1970) "Rank Theory, Field Theory, Attribute Theory: Three Approaches to Interaction in the International System." Honolulu: University of Hawaii. DON Project Research Report # 47.

Haas, Michael (1965) "Sociatal Approaches to the Study of War." Journal of Peace Research, pp. 308-323.

Hall, Dennis and Rudolph J. Rummel (1968a) "The Dynamics of Dyadic Foreign Conflict Behavior: 1955 to 1963." Dimensionality of Nations Project Research Report, University of Hawaii.

____ and ____ (1968b) "The Patterns of Dyadic Foreign Conflict Behavior for 1963." DON Report no. 12, University of Hawaii, June.

Kalperin, Norton N. (1970) Bureaucratic Politics and Foreign Policy. Washington: The Brookings Institution.

____ and Arnold Kanter (1973) Readings in American Foreign Policy. Boston: Little, Brown.

Hazelwood, Leo (1973) "Externalizing Systematic Stress: International Conflict as Adaptive Behavior." In Wilkenfeld (ed.) Conflict Behavior and Linkage Politics. New York: McKay.

Hermann, Charles F. (1970b) "What is a Foreign Policy Event?" Paper presented at the Michigan State University International Events Data Conference. East Lansing, April.

____ (1972) "Policy Classification: A Key to the Comparative Study of Foreign Policy." In Rosenau, David and East, The Analysis of International Politics. New York: The Free Press.

____ and Stephen Salmore (1971) "The Recipients of Foreign Policy Events." The Ohio State University.

Hermann, Margaret G. (1972) "How Leaders Process Information and the Effects on Foreign Policy." Paper prepared for Annual Meeting of the American Political Science Association, Washington, D. C., September 5-9.

Hill, Gary A. (1971) "The Flow of International Events." WZIS Project Technical Report, January.

Hilsman, Roger (1971) The Politics of Policy Making in Defense and Foreign Affairs. New York: Harper and Row.

Hilton, Gordon (1972) Causal Inference Analysis: A Seductive Process. Printed in Administrative Science Quarterly, pp. 44-57.

Hoffman, Stanley (1968) Gulliver's Trouble or the Setting of American Foreign Policy. New York: McGraw-Hill.

Holsti, Ole R. (1965) "Perceptions of Time, Perceptions of Alternatives and Patterns of Communication as Factors in Crisis Decision-Making." American Political Science Review, LXI.

____, Richard A. Brody and Robert C. North (1964) "Measuring Affect and Action in International Reaction Models: Empirical Materials from the 1962 Cuban Crisis." Journal of Peace Research, I, pp. 170-189.

____, Robert C. North and Richard Brody (1969) "Perception and Action in the 1914 Crisis." In J. David Singer (ed.) Quantitative International Politics: Insights and Evidence. New York: The Free Press.

Johnston, J. (1972) Econometric Methods. New York: McGraw-Hill.

Kaplan, Morton (1957) System and Process in International Politics. New York: John Wiley and Sons, Inc.

Langer, William L. (1931) European Alliance and Alignments. New York: Knopf.

Levy, Marion J. (1969) "Does it Matter in He's Naked Bawled the Child." In Kwarr and Rosenau (ed.) Contending Approaches to International Politics. Princeton: Princeton University Press.

Levin, Kurt (1964) Field Theory in Social Science. D. Cartwright, (ed.) New York: Harper Torchbooks.

- McClelland, Charles A. (1961) "The Acute International Crisis." World Politics. 14 (October): 182-204.
- _____. (1964) "Action Structures and Communication in Two International Crises: Quemoy and Berlin." Background, VII (February): 201-215.
- _____. (1966) Theory and the International System. New York: MacMillan.
- _____. (1968a) "Access to Berlin: The Quantity and Variety of Events, 1943-1963." In J. David Singer (ed.) Quantitative International Politics: Insights and Evidence, pp. 159-186. New York: The Free Press.
- _____. (1973) "The Beginning, Duration, and Abatement of International Crises: Comparisons in Two Conflict Arenas." In Charles P. Hermann (ed.) International Crises.
- _____. and Anne Arcolf. 1970. "An Interaction Survey of The Middle East." University of Southern California, March.
- _____. Daniel P. Harrison, Wayne R. Martin, Warren R. Phillips and Robert A. Young (1968) The Communist Chinese Performance in Crises and Non-Crises: Quantitative Studies of the Taiwan Straits Confrontation, 1950-1964. China Lake, California: U.S. Naval Ordnance Test Station, "JTS TP 4138, May.
- _____. and Gary Hogstad (1969) "Conflict Patterns in the Interactions Among Nations." In J. Rosenau (ed.) International Politics and Foreign Policy, pp. 711-724. New York: The Free Press.
- _____. Rodney G. Tomlinson, Robert G. Sherwin, Gary A. Hill, Herbert L. Calhoun, Peter H. Fenn, and J. David Martin (1971) The Management and Analysis of International Event Data, September.
- _____. and Robert A. Young (1969) "Some Preliminary Short-Term Predictions of International Interaction." World Event/Interaction Survey Working Paper #1. University of Southern California, September.
- McGowan, Patrick (1970) "A Formal Theory of Foreign Policy Behavior as Adaptive Behavior." Paper delivered at The 66th Meetings of the APSA.
- Mesarovic, M. D. et al. (1971) Theory of Hierarchy Multilevel Systems. New York: Academic Press.
- Morse, Edward (1970) "The Transformation of Foreign Policy." World Politics. Vol. 43, pp. 371-392.

- North, Robert C., Richard A. Brody and Ole Holsti (1964) "Some Empirical Data on the Conflict Spiral." Peace Research Society Papers, I: 1-14.
- Oliva, Gary and Rudolph J. Rummel (1969) "Foreign Conflict Patterns and Types for 1963." Dimensionality of Nations Project Research Report No. 22. University of Hawaii, April.
- Orcutt, Guy H., Harold W. Watta, and John B. Edwards (1968) "Data Aggregation and Information Loss." American Economic Review. Vol. 68. (September) pp. 773-787.
- Phillips, Warren R. (1969) Dynamic Patterns of International Conflict. Ph.D. Dissertation and Dimensionality of Nations Project Research Report No. 33. University of Hawaii.
- _____. (1970a) "A Mathematical Theory of Conflict Dynamics." Dimensionality of Nations Project Research Report No. 39. University of Hawaii.
- _____. (1971) "The Dynamics of Behavioral Action and Reaction in International Conflict." Papers of the Peace Research Society.
- _____. (1973) "The Conflict Environment of Nations: A Study of Conflict Inputs to Nations in 1963" in J. Wilkenfeld (ed.) Conflict Behavior and Linkage Politics. New York: McKay.
- _____. and Robert C. Grahn (1972) "Dynamic Foreign Policy Interactions: Reciprocity and Uncertainty in Foreign Policy." To be published in the International Yearbook of Foreign Policy Studies (1974). Los Angeles: Sage Publications, Inc.
- _____. and Michael Mainline (1972) "Crises Typologies." The Ohio State University (mimeo).
- _____. and Michael Mainline (1973) "Major Power Conflict Exchanges in the Sixties: A Triadic Analysis of the Soviet, U.S. and Chinese Subsystem." Behavioral Sciences Laboratory Memo.
- _____. and Theron Lofmore (1972) "The Effect of Crises Upon The Stability of International System." The Ohio State University. (mimeo).
- Pruitt, Dean (1969) "Stability and Sudden Change in Interpersonal and International Affairs." In James N. Rosenau (ed.) International Politics and Foreign Policy: A Reader in Research and Theory. New York: Free Press.
- Reisio, Kullervo (1966) "A Study of Sociometric Group Structure: An Application of a Stochastic Theory of Social Interaction" in Berger, Zelditch, and Swanson, Sociological Theories in Progress. New York: Houghton Mifflin.

- Rapoport, Anatol (1960) Fights, Games and Debates. Ann Arbor: University of Michigan Press.
- Richardson, Lewis F. (1960) Arms and Insecurity. Pittsburgh: Boxwood Press.
- Rogowski, Ronald (1966) "International Politics: The Past as Science." International Studies Quarterly, Vol. 12 No. 4 (Dec).
- Rosenance, Richard (1964) Action and Reaction in World Politics. New York: Little Brown.
- Rosenau, James N. and Gary D. Hogbard (1971) "Foreign Policy Behavior in Dyadic Relationships: Testing A Pre-Theoretical Extension." Paper Presented at Annual Meeting of International Studies Association, San Juan, March 17.
- Rummel, Rudolph J. (1963) "Dimensions of Conflict Behavior Within and Between Nations." General Systems: Yearbook of the Society for General Systems Research, VIII: 1-50.
- _____, (1964) "Testing Some Possible Predictors of Conflict Behavior Within and Between Nations." Peace Research Society Papers, pp. 79-111.
- _____, (1965) "A Field Theory of Foreign Conflict Behavior." Peace Research Society: Papers IV. Crazoo Conference.
- _____, (1965) "A Field Theory of Social Action with Application to Conflict Within Nations." General Systems: Yearbook of the Society for General Systems Research, X.
- _____, (1966) "Dimensions of Conflict Behavior Within Nations." Journal of Conflict Resolution, X, March: pp. 65-73.
- _____, (1968) "The Relationship Between National Attributives and Foreign Conflict Behavior," in J. David Singer (ed.) Quantitative International Politics: Insights and Evidence. New York: The MacMillan Press.
- _____, (1970a) "U.S. Foreign Relations: Conflict, Cooperation and Attribute Distances." Dimensionality of Nations Project Research Report No. 41. University of Hawaii, July.
- _____, (1970b) "New Developments in Field Theory: The 1963 Behavior Space of Nations." Paper presented at the Seventh European Peace Research Society (International) Conference. Rome, Italy. August.
- _____, (1972) The Dimensionality of Nations. Los Angeles: Sage Publishing Co.
- Salmore, Barbara and Stephen Salmore (1972) "Structure and Change in Regimes--Their Effect on Foreign Policy." Paper prepared for Annual Meeting of the American Political Science Association, Washington, D.C., September 5-9.

- Shannon, Claude E. and Warren Weaver (1949) The Mathematical Theory of Communication. Urbana: University of Illinois Press.
- Simon, Herbert A. (1958) Administrative Behavior. New York: MacMillan.
- _____, (1969). The Sciences of the Artificial. Cambridge: MIT Press.
- Smoker, Paul (1964) "Fear and the Arms Race: A Mathematical Study." Journal of Peace Research, Vol. 1, pp. 55-64.
- _____, (1969) "A Time Series Analysis of Sino-Indian Relations." Journal of Conflict Resolution, XIII, (June), pp. 172-191.
- Sorokin, Pitirim (1936) Fads and Foibles. Chicago: Henry Regency.
- Sullivan, John D. (1964) "Quemey and Mateau: A Systematic Analysis." San Francisco State College mimeo.
- Swanson, Dean (1972) "The Construction and Use of Nation Typologies in I.R." Ohio State University mimeo.
- Tanter, Raymond (1965) "Dimensions of Conflict Behavior Within Nations 1955-1960: Turmoil and Internal War." Peace Research Society Papers, III, pp. 147-156.
- _____, (1966) "Dimensions of Conflict Behavior Within and Between Nations, 1958-1960." Journal of Conflict Resolution, X (March), pp. 41-64.
- _____, (1972) "International System and Foreign Policy Approaches: Implications for Conflict Modeling and Management." World Politics, XXIV, pp. 7-39.
- Vattel (1758) The Law of Nations.
- Wilkenfeld, Jonathan (1968) "Domestic and Foreign Conflict Behavior of Nations." Journal of Peace Research, Vol. V No. 1, p. 56-69.
- _____, (1969) "Some Further Findings Regarding the Domestic and Foreign Conflict Behavior of Nations." Journal of Peace Research, Vol. VI No. 2, pp. 147-156.
- Wright, Quincy (1955) The Study of International Relations. New York: Appleton-Century-Crofts.
- Young, Robert A. (1970) "An Events-Based Nation Typology." Consolidated Analysis Center, Inc. mimeo.
- _____, (1970) "Prediction and Forecasting in International Relations: Some Theoretical Issues." WPIS Technical Report #5. University of Southern California.

Yule, G.V. and M.C. Fendall (1950) Introduction to the Theory of Statistics, London: Griffin.

Zinnes, Dina A. and Jonathan Wilkenfeld (1972) "An Analysis of Foreign Conflict Behavior of Nations." in W. Hanreider (ed.) Comparative Foreign Policy: Theoretical Essays. David McKay, Inc.

(1963) "The Expression and Perception of Hostility in Prewar Crises: 1914." in J. David Singer (ed.). Quantitative International Politics. New York: The Free Press.

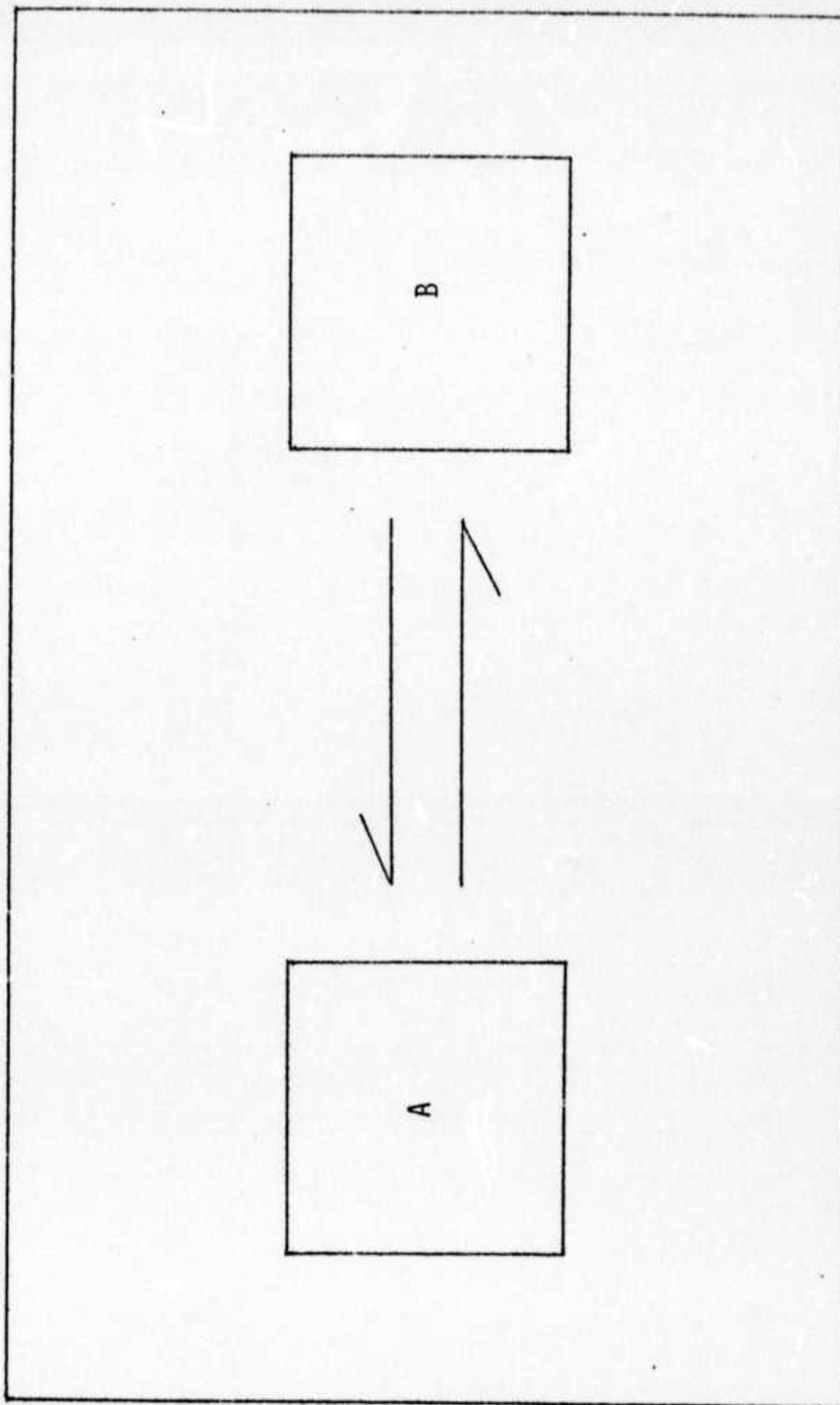


FIGURE I - BASIC PATTERN OF INTERACTION

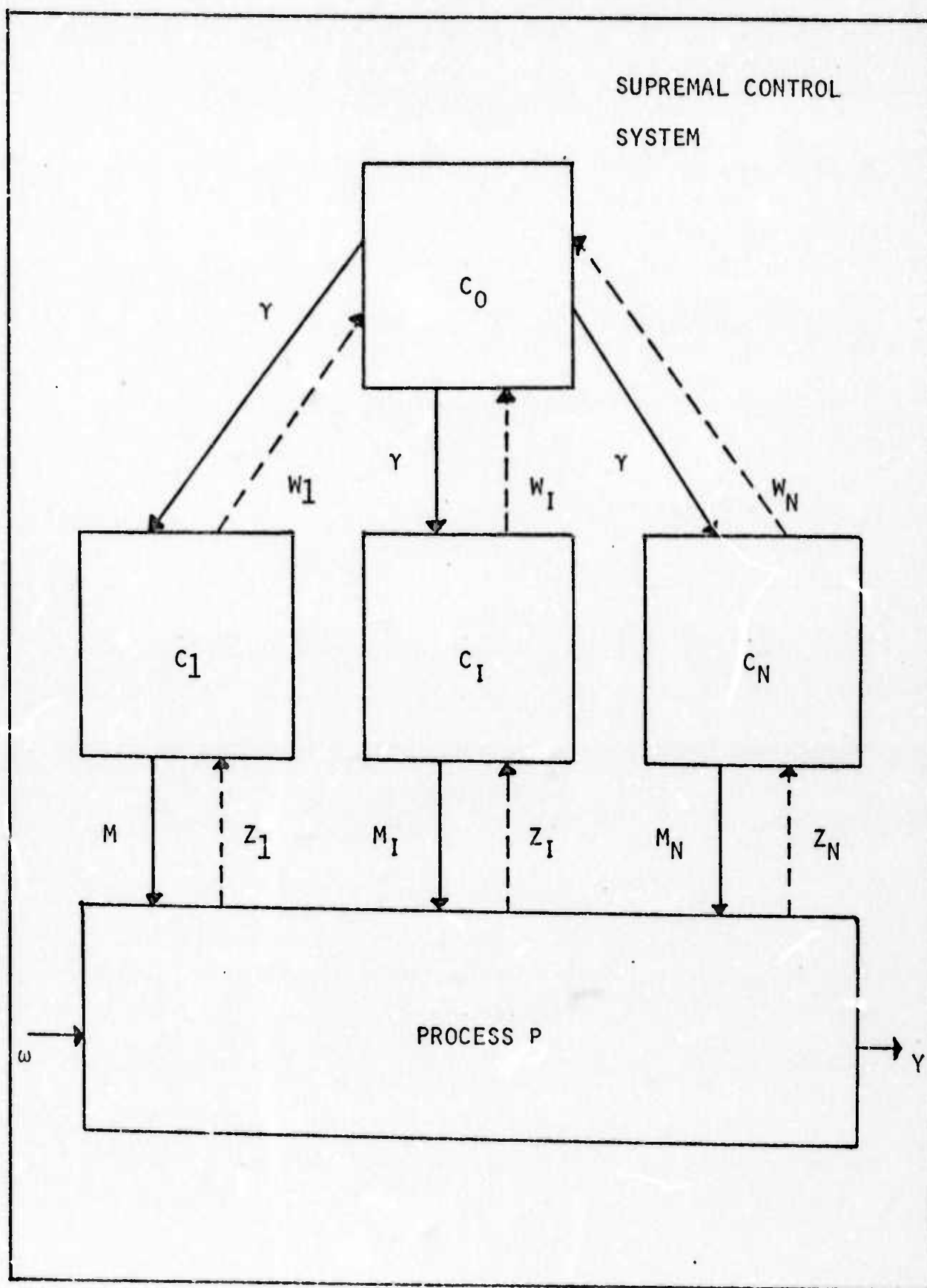


FIGURE II - A TWO-LEVEL SYSTEM WITH N INFIMAL CONTROL SYSTEMS AND A SINGLE SUPREMAL CONTROL SYSTEM*

-31-

* TAKEN FROM MESAROVIC, ET AL., 1971, P. 86.

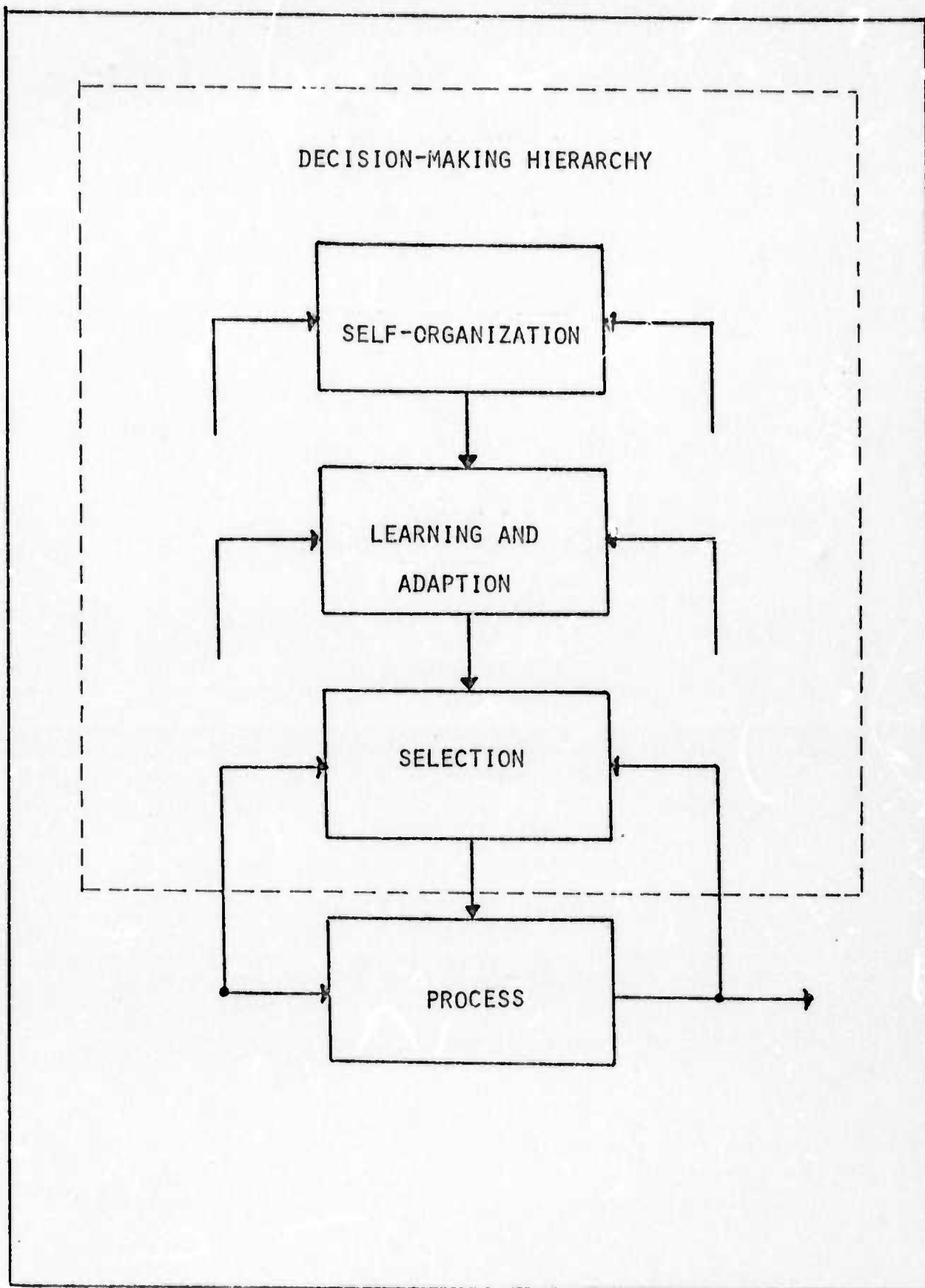


FIGURE III - FUNCTIONAL MULTILAYER DECISION HIERARCHY*

-32-

*TAKEN FROM MESAROVIC, ET AL., 1971, P. 47