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ADAPTATION AND FOREIGN POLICY THEORY

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INTRODUCTION

The idea that foreign policy behaviors are in some sense the result of "adaptive" foreign policy "mechanisms" is a popular one. We read in the newspapers, for example, that United States foreign policy toward Israel must adapt to the "realities" of the energy crisis. Students of foreign policy behavior argue that nations like cells can be viewed "as entities that must adapt to their environments to survive and prosper (Rosenau, 1970:2)."

The notion underlying these and other such statements (see for example Easton, 1965, 1966; Deutsch,(1966); or McGowan, 1971) appears to be largely metaphorical. Human collectivities like infrahuman species either survive or they do not. If they are to survive they must somehow adapt to the external (or task) environment in which they find themselves.

In a very loose sense then, a nation is adaptive if it manages to "get along" in its environment. However, as has been argued in more detail elsewhere (Thorson, 1973), this is not a precise enough concept to guide theoretical research on national foreign policy behavior. For example, it does not distinguish between behaviors which are adaptive and behaviors which are generated by adaptive mechanisms. Adaptive mechanisms may behave maladaptively in "learning" appropriate responses. In using the concept of adaptation in discussing foreign policy, we must make precise of what "adaptiveness" is being predicated. Hopefully these distinctions (as well as the need for making them) will become more clear as this paper progresses.

First, however, it is important to briefly outline what sort of "theory" of foreign policy behavior it is reasonable to look for at this time. In doing this, we can distinguish between what Nelson and Winter (1973) have called "appreciative" theory and what has been called "formal" theory.

A theory in the formal sense consists of a set of sentences asserted to be true which is closed under deduction. That is, the set contains any sentence that is logically implied by any of the other sentences in the set. This usage requires a preassigned logical framework or "calculus" axioms which serve as the rules for moving from some sentences to others. These rules are ordinarily those of the first-order predicate calculus. Axiomatic theories are theories in the formal sense.

While formal theory might be an aim for many of us, few would argue that we presently have such theories of foreign policy behavior. Such theory as does exist is more of the appreciative sort. Appreciative theory is rather fuzzy in its deductive structure and its concepts often are intuitive rather than well defined. Nonetheless, as Nelson and Winter point out, it is the appreciative theory which guides most of the research effort in a discipline. It provides the concepts and a perspective from which to view and study phenomena without actually making precise analytic connections between statements.

Formal theory can then be built upon appreciative theory to make precise propositions and to eliminate some of the ambiguity inherent in the appreciative theory.

In this paper I will attempt the beginnings of an appreciative theory of national foreign policy behavior. The concept of adaptive or goal-oriented behavior will be central in the development of the theory. My major purpose, however, will be less to make a deductively related set of propositions about foreign policy behavior and more to identify a set of concepts and relations which may, through additional research, be capable of entering into a formal theory.

SYSTEM AND ADAPTATION

The problem of how nations generate appropriate foreign policy behaviors is in many senses analogous to the problem of how human beings generate grammatical sentences. In both cases, the theorist has a finite set of observations which he attempts to account for through general laws. In the case of the linguist, these finite observations consist of sentences and the general laws are called the grammar. As Chomsky, 1956:113, points out, "A properly formulated grammar should define unambiguously the set of grammatical sentences."

The theorist of foreign policy behavior has a similar task. He must attempt to account for a finite set of observed behaviors through some general theory of foreign policy behavior. Like the linguist, he can accomplish this task by identifying the rules (i.e., the "grammar") for generating these behaviors. That is to say, he must concentrate on the structural (my usage of structure is non-standard in political science and will be defined in a rigorous way further on) characteristics underlying the foreign policy behavior.

Note that we already face a difficulty. The linguist wants to account for sentences. The behavior unit is the sentence. What is the behavior to be accounted for by the foreign policy theorist? The "event?", sequences of "events?", some subset of "events?", or what? Without taking a position on this most central question, progress toward appreciative theory can still be made by making a rather innocuous (though perhaps erroneous) assumption that the foreign policy behavior of nations is goal directed.

Such an assumption is certainly consistent with Hanrieder's (1967: 971) rather vague definition of foreign policy as "... the more or less coordinated strategy with which institutionally designated decision-makers seek to manipulate the international environment." This consistency, of course, requires the additional restriction that these manipulations are made not willy-nilly but with some intended direction.

In turn, this restriction suggests immediately the question, "intended by whom?" The need for such a question (as well as for its answer) is pointed up by Allison's (1971:162) observation:

> The decisions and actions of government are intra-national political resultants: resultants in the sense that what happens is not chosen as a solution to a problem but rather results from compromise, conflict and confusion of officials with diverse interests and unequal influences; political in the sense that the activity from which decisions and actions emerge is best characterized as bargaining along regularized channels among individual members of the government.

This observation is important in that it warns us not to look at revealed national behavior (i.e., policy actions) and attempts to infer the national goals that the actions were designed to meet. Indeed it may well be that national policy goals (to the extent there are any) are better thought of as constraints on policy actions than as objectives those actions are designed to further. In Simon's (1964:1) words, "The goal of an action is seldom unitary, but generally consists of a whole set of constraints the action must satisfy." Ellsberg's (1972:102) description of United States policy objective in Vietnam as being "Do not lose the rest of Vietnam to Communist control before the next election" is illustrative of this. This objective served as a constraint on allowable policies and not as an operational goal around which one could design specific policy actions.

Thus, I am arguing that the foreign policy behavior generated by a nation is goal directed in the sense that the actors whose arguing, scheming, and compromising produced the policy each intended that the policy do (or perhaps "not do") certain things. These produced behaviors will seldom be "optimal". That is, the analyst can not look to a set of "national goals" and a set of "policy alternatives" and predict the alternative to be chosen will be the alternative which best achieves the goal.

Such an approach is wrongheaded for several reasons. First it assumes the existence of a consistent set of rational foreign policy goals which guide actor's decisions. Second, it assumes that all (feasible) policy alternatives can be listed. Third, and perhaps most erroneously, it assumes that there is an unambiguous performance function which can link policy actions to goals.

However, it is not necessary to assume that a nation's foreign policy behavior is "globally rational" in this economic optimizing sense. Rather we need simply assume that the behavior is goal directed

in the sense that looking at the goals of the individuals who interact to produce policy will help to account for the produced policy. In looking at these actor's goals, we must, of course, be careful not to look only at their foreign policy goals. Their bureaucratic goals, for example, will play a crucial role in determining their policy preferences.[1]

Moreover, to assume that foreign policy behavior is goal directed is by no means equivalent to saying that a nation will achieve its foreign policy objectives. Or, as was noted earlier, to say that a nation is an adaptive system is not to say that it will behave adaptively.

Leaving aside for a moment this problem of goals, it will be helpful to identify more precisely the general sort of structure underlying adaptive systems. I will be using a systems vocabulary because it contains a fairly well-defined set of terms which, I believe, can be profitably interpreted in a foreign policy framework and imbedded into a theory of foreign policy behavior. Therefore, I will first define some basic systems concepts and will then discuss goal-seeking systems in terms of this vocabulary. In so doing, it should become clear that to use a systems vocabulary imposes very little additional structure and any results which follow will generally not be an artifact of having adopted a systems approach.

In theorizing about any phenomenon (be it foreign policy behavior, ethics, or whatever) a first step is to isolate a set of "objects" about which you will be theorizing. Each of these objects may in turn take on a number of values. Each of these values can be termed an

"appearance" of the object. A simple example of such an object might be international conflict. Suppose that our theory partitioned international conflict into three values or "appearances"--low, medium, and high. Mathematically, we can think of the object "international conflict" as a set consisting of three elements. Each element of the set corresponds to one of the possible appearances of the object.

More generally, theories will be about worlds with "n" objects, X_1, X_2, ... X_n. A general system, S, is then defined as a relation on the cartesian product of these objects (i.e., sets).

$$S \subset X_1 \otimes X_2 \otimes X_3 \otimes \ldots X_n$$

The Cartesian produce of an n sets (denoted $X_1 \otimes X_2 \otimes \ldots X_n$) is the set of all ordered n-tuples $\langle x_1, x_2, \ldots x_n \rangle$ where $x_1 \in X_1$, $x_2 \in X_2$ $\ldots x_n \in X_n$. A relation on the Cartesian product of n sets is simply a subset of the set of all ordered n-tuples. These definitions will become clearer below when an example is presented.

Thus far, the definition of a system makes no mention of inputs and outputs. A system has simply been defined very abstractly as a subset of the set of all possible appearances of the set of objects being theorized about. The problem is to get from this definition to the familiar black box diagram with inputs X and outputs Y.

This problem is resolved by first defining an index set:

$$I = (1,2,\ldots n)$$

and then partioning I into:

$$I_x = (i_1, i_2, \ldots i_m)$$
$$I_y = (i_{m+1}, i_{m+2}, \ldots i_n)$$

Since this is a partition,

$$I_x \cup I_y = I \qquad \text{and}$$

$$I_x \cap I_y = \emptyset$$

Then define an input set U:

$$X = (x_i \forall_i \in I_x)$$

and an output set Y:

$$Y = (x_i \forall_i \in I_y)$$

A system is now defined as a relation on (i.e., a subset of) the Cartesian product of the inputs and outputs, or:

$$S \subset X \otimes Y$$

This may all seem excessively abstract. However, such a definition makes it very difficult to fall into the trap of reifying systems. A system is something the theorist imputes on the objects he believes make up the world. That a system can be imputed reflects the constraints on the allowable conjunctions of appearances the states in the theorist's world are allowed to evince.[2]

A simple example will help to make these points more transparent. It will also be helpful to have it to refer back to later in the paper. In order that it serve the required illustrative functions, the example will be highly stylized.

Imagine a system S with inputs X and outputs Y as in Figure 1

$$X \longrightarrow \boxed{S} \longrightarrow Y \qquad \text{Figure 1}$$

Suppose further that S is a nation's foreign policy generating mechanism and X is the mechanism's categorization of behaviors received from the world political environment. Y then can represent the "friendliness"

of the nation's foreign poiicy output. Equation (1) shows the reiationship between X and Y (the "t" subscript refers to time).

$$(i) \quad Y_{(t+1)} = Y_{(t)} + X_{(t)} \qquad 0 \leq t \leq 1$$

So far there are two objects, X and Y. Let:

$$(ii) \quad Y_{(0)} \in (0, +1)$$
$$X_{(t)} \in (-1,+1)$$

Thus given $Y_{(0)}$, we can specify $X_{(0)}$, and $X_{(1)}$ and compute using (i) $Y_{(1)}$, and $Y_{(2)}$. In order to make more sense of the exampie, interpretations can be assigned the various vaiues of X and Y as in Tabie

Interpretations of Values of X and Y

X			Y		
1	=	friendiy	-3	=	Very Unfriendiy
-1	=	unfriendiy	-2	=	Unfriendiy
			-1	=	Miidiy Unfriendiy
			0	=	Neutrai
			+1	=	Miidiy Friendiy
			+2	=	Friendiy
			+3	=	Very Friendiy

The inputs are specified by the sequence $(X_{(0)}, X_{(1)})$ and the outputs by the sequence $(Y_{(0)}, Y_{(1)}, Y_{(2)})$. The possibie input sequences are:

$$X = \text{(possibie input sequences)}$$
$$= \{(-1,-1), (-1,+1), (+1,-1), (+1,+1)\}$$

The possible foreign policy output sequences are:

$$Y = \text{(possible output sequences)}$$

$$= \{(0,-1,-2),\ (0,-1,0),\ (0,1,0),\ (0,1,2),$$
$$(1,0,-1),(1,0,1),(1,2,1),(1,2,3)\}$$

The output sequence (0,-1,-2), for example, can be interpreted as a neutral output followed by a mildly unfriendly output followed by a unfriendly output.

In terms of the vocabulary developed earlier, the system has eight appearances.

$$S \quad X \otimes Y$$

$$S = \{[(-1,-1),\ (0,-1,-2)],\ [(-1,-1),(1,0,-1)],$$
$$[(-1,+1),(0,-1,0)],[(-1,+1),(1,0,1)],$$
$$[(+1,-1),(0,1,0)],[(+1,-1),(12,1)]$$
$$[(+1,+1),(0,1,2)],[(+1,+1),(1,2,3,)]\}$$

Note however that even given these eight appearances, a knowledge of input strings is not enough to accurately predict the output strings that will be produced. For example, the input string (-1,-1) will produce either the output string (0,-1,-2) or the string (1,0,-1). In mathematical terms, S is a relation and not a function.

In order to make the outputs predictable, more information is required. This additional information is termed the "state" of the system:

$$S: \quad Z \otimes X \rightarrow Y$$

where Z is the state object. In the example, $Z = \{y_0\} = \{0,1\}$. As can be seen from the table of eight system appearances, a knowledge of the input strings and of the state (i.e., values of y_0) of the system

is enough to predict the output strings of the system.

The above discussion of "system," "state," "input" and "output," while abstract is, I believe, of importance to the student of foreign policy behavior. First of all, whether a particular nation's behavior is viewed as being stochastic or deterministic may be solely dependent upon how (if at all) the state of the system is defined. If the analyst ignores the internal structure of the behavior mechanism, he may well be lead to assert that equivalent inputs produce different behaviors. Yet, as the example showed, a proper selection of state objects might be enough to "make" the system deterministic. Simply correlating inputs and outputs (behaviors received and behaviors sent) will generally not yield laws of foreign policy behavior.

Second, the abstract notion of a system as a relation on the Cartesian product of objects (i.e., sets of appearances), forces the theorist to specify the objects about which he is theorizing. All too often, especially in theories expressed in a natural language such as English, the tendency is to assume that "everyone knows" what we are theorizing about. Since "everyone knows", there is no need to specify explicitly what objects make up that world. Yet, I think most would agree that we theorize not about the world but about our "representation" of the world. Since each of us may have a different representation of the world (or, indeed, there may be many worlds), it is always helpful to make public that representation by specifying it as unambiguously as possible.

This specification can begin by writing down the objects(and their possible appearances) which populate the representation. It is

completed when, in addition, the theoretically allowable conjunctions of appearances are specified. The fact that the set of logically possible conjunctions of appearances is greater than the set of theoretically allowable conjunctions is what gives structure to the world and allows scientific theorizing to be at all successful. Writing down the world being theorized about is equivalent (under the terminology of this paper) to specifying the system the theory is about.

An adaptive system is generally thought of as one which produces (generates, evinces) outputs in such a way as to seek to attain certain goals. Adaptive systems are goal seeking systems. Thus my earlier assumption that foreign policy behavior is goal directed entails that foreign policy generating mechanisms can be viewed as adaptive systems.

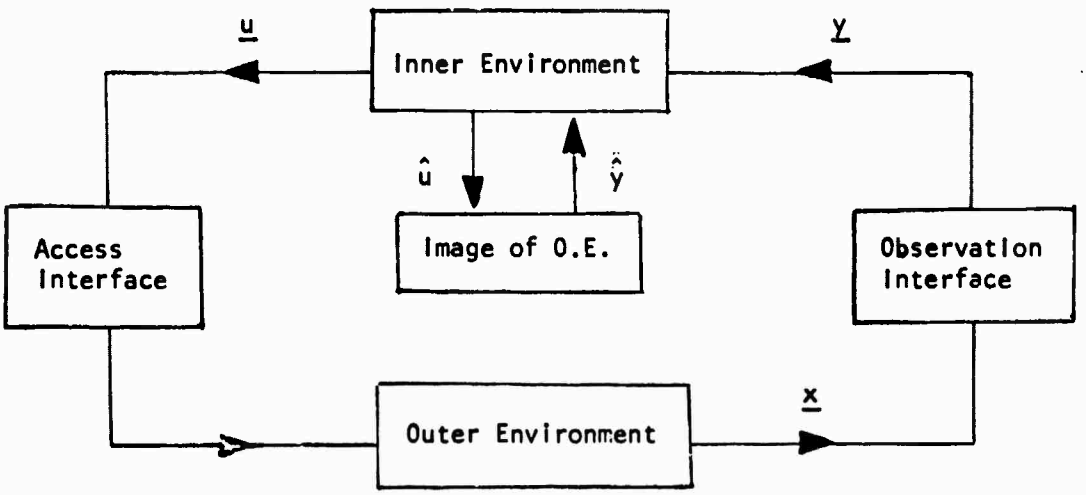
Adaptive systems belong to the class of systems labelled by Simon, 1969, as artificial systems.[3] While distinguishing between "artificial" and "natural" systems is not always easy (or even unambiguous), the central notion is that artificial systems are directed toward human goals whereas natural ones may not be. According to Simon, 1969:5,6:

> "1. Artificial things are synthesized (though not always or usually with full forethought) by man.
>
> 2. Artificial things may imitate appearances in natural things while lacking, in one or many respects, the reality of the latter.
>
> 3. Artificial things may be characterized in terms of functions, goals, adaptation.

4. Artificial things are often discussed, particularly when they are being designed, in terms of imperatives as well as descriptives."

An artificial system has a number of components. There is an inner environment (I.E.) which is attempting to achieve goals in an outer or task environment (O.E.). The I.E. receives information about the O.E. through an observation interface and sends policies or behaviors into the O.E. through an access interface. Finally, in order to evaluate alternative policies (without actually implementing them) the I.E. must have a representation or "image" of the outer environment. The structure common to artificial systems is shown in figure 2

Figure 2



This structure is very similar to the problem structure studied by control engineers. From a control perspective, the I.E. would be labelled the "controller" and the O.E. as the "process" to be controlled.

The easiest way to motivate this is through a very simple example. Let the inner environment (I.E.) be a country's officials responsible for economic policy and the outer environment (O.E.) be the country's economy. Let me stimulate further that the officials' goal is to remain in office and that they seek to do so by keeping the economic system in a certain specified set of acceptable states. The state of the economy is then represented by the vector $\underline{x}$ and might include such things as each citizen's income, all sales transactions, and other such elements.

The officials must have some way of observing $\underline{x}$ so that they can determine whether the economy is in an acceptable state. However, they can observe each and every sales transaction, etc. directly. In fact, even if they could get all this information, it would probably exceed their information processing capability. Therefore they must have something that filters all of the minute economic information into something manageable. This is the task of the observation interface.

The observation interface is the I.E.'s sensing device in the O.E.. In the example it might include various agencies to collect and aggregate economic data. Since, in this example, $\underline{x}$ would contain way too much information, the observation interface might incorporate some sort of indicator system. Thus instead of having $\underline{x}$ as an input, the I.E. receives $\underline{y}$. The vector $\underline{y}$ might include such indicators as GNP and unemployment rates. In some cases $\underline{y}$ and $\underline{x}$ will be equivalent. Most often, however, this will not be the case and the notation reflects this possible distinction.

Upon receiving $\underline{y}$, the I.E. must evaluate it to determine what sort of policy is indicated. The results of this evaluation will depend in part upon I.E.'s image of the O.E.. The image might, for example,consist of a Walrasian equilibrium model of the economy. Generally, this image will, at least in part, contain the elements of $\underline{y}$. In this way $\underline{y}$ can be used to set the "state" of the image and various policy alternatives ($\hat{\underline{u}}$) can be put into the image to assess their differential impacts ($\hat{y}$).

The elements of the $\underline{u}$ vector, to have any impact, must have some way of getting into the O.E.; that is, the I.E. must have some access interface which is capable of implementing $\underline{u}$ in the O.E. Fiscal and monetary policy might serve as accesses for the officials in this example.

This very crude economic example hopefully makes more clear the basic components of an artificial system. In addition, it should serve to illustrate the high degree of inter-relation between the components.

This example was <u>not</u> intended to suggest that the components of an artificial system will have simple "real" world interpretations. The distinctions between the components is analytic and it may be that the vocabulary generally used in theorizing about foreign policy is incapable of reflecting these distinctions. In using artificial systems concepts to construct empirically grounded theory, it may be necessary to develop some new terminology.

The artificial system's perspective suggested here requires the theorist to distinguish between the foreign policy "mechanism" and the outer environment in which the mechaninism must operate. This notion of "mechanism" can be related to the inner environment by stipulating that the inner environment together with the goals and the two interfaces will be referred to as "the mechanism." The outer environment (while definitionally remaining a primitive) then represents the external influences operating on the mechanism.

Depending upon the particular policy objectives being pursued, certain of the O.E. "influences" will be of special significance and will have a large (though not necessarily perceived) impact upon the mechanisms policy actions. These "influences" can be thought of as forming a specific subsystem of the O.E.. These subsystems are, of course, conditioned upon certain goals. Such subsystems can be termed "task environments" for the mechanism. As goals change, the mechanism will then be "facing" different task environments. While the O.E. is the global environment in which the mechanism must behave, the task environment is the particular problem solving situation faced by the mechanism. The mechanism may of course be pursuing multiple (and even inconsistent) goals and thus be facing multiple (and perhaps overlapping) task environments. The important distinction being made here is between the task environment and the outer environment. The outer environment consists of the total environment in which the mechanism operates. The task environment is the specific part of the O.E. which becomes important for a particular goal or policy action. "It is the task that defines the point of view about an environment, and that, in fact, allows

an environment to be delimited (Newell and Simon, 1972:55)."

As an example, one might view the U.S. foreign policy making mechanism to be operating in a very "large" outer environment. Included in this outer environment might be such elements as other foreign policy generating mechanisms, domestic political groups, multi-national businesses and so on. Yet for a particular task - say the development of a weapon system - only a small part of the whole O.E. is relevant. This smaller part is the task environment.

While the analytic distinction between the mechanism and its task environment may be clear, we must further distinguish between the task environment itself and the mechanism's internal image(s) or representation(s) of that environment. Here again one must pay careful attention to the internal structure of the mechanism for often times it is this structuring which will determine the mechanism's behavior.

The way(s) a problem is represented within the mechanism will play a major role in determining which policy behaviors will be seen. Within a foreign policy bureaucracy, this internal problem representation often takes the form of common images of reality on the part of bureaucrats.

Halperin and Kanter (1973) argue that these shared images serve as constraints on participants' ability to produce desired policy actions. As support for this claim, they provide the following example ". . . in the early 1950's, those in the Department of State who advocated forcing the Chinese Nationalists off Quemoy and Matsu could not support their case by advancing the argument that this would result in a substantial improvement of relations between the United States and Communist China. Since improved relations between the two countries was not a widely

shared goal, such an argument would have been counterproductive(1973:25)."

While this illustration does point out how shared goals may constrain arguments for particular policies, it fails to suggest how shared images of reality constrain policy actions. Indeed I have already claimed that "goals" may be thought of as constraints. Yet, of course, constraints are determined not only by "goals". Policy makers' images of their task environment will also constrain their behavior. That is, policies which might be infeasible under one image may become feasible under a second. For example, it is doubtful that either Nixon or his critics desire increasing the risk of nuclear war. His mining of Haiphong Harbor was criticized for increasing that risk. Whether it did or did not increase the risk is, of course, dependent upon the particular image being employed. The difference between Nixon and his critics may be viewed less as a disagreement about policy objectives and more as one over the appropriate image of reality. The point here is that to analyze the behavior of a foreign policy mechanism it is not enough to simply identify the task environment. The analyst must also consider how the particular task environment will be represented within the mechanism.

One possible way of increasing the ability of the foreign policy mechanism to adapt to its task environment is to change its internal image of its task environment. Oftentimes developing a more appropriate representation of the problem will make the problem much easier to deal with. Consider, the task of multiplying two large numbers. Most of us would find solving (i.e. behaving appropriately) such problems to be very difficult if the numbers were represented as Roman numerals. Simply changing the representation to a more familiar notational scheme makes solving the problem much simpler.

This same problem of internal representation is faced by designers of algorithms by which computers can play chess. How can the task environment of a typical chess game best be represented within a computer? This problem has attracted considerable attention since it has been felt by many that the principles necessary to playing good chess are similar to those required for dealing with other more general problems such as management and policy planning. A brief look at the approaches used in designing machine chess players should be helpful in clarifying the significance of the internal problem representation.

Shannon (1950) first identified the two approaches chess playing algorithms might take:

1. Scan all possible moves and construct a decision tree of equal length for each move (length here refers to the number of moves into the future the program scans). Then, using some weighting function the possible moves can be evaluated and the best one chosen.
2. Scan only certain moves. Eliminate others through the use of some special rule.

The first approach requires the computer to represent the chess board in all its complexity. Very valuable information is treated the same as less important information. The price of this synoptic approach is that, for a given memory size, the number of moves into the future that can be examined is severely limited. Much memory is wasted looking at trivial information. The second approach trys to avoid this problem. By pre-excluding weak moves a longer future can be considered. Unfortunately, the rule for eliminating bad moves is most difficult to discover.

The problem facing designers of chess playing machines was an interesting one. They had two approaches--one is easily implemented but rather wasteful and the other is very efficient but extremely difficult to implement. Mihall Botvinnik, a Russian grandmaster and electrical engineer, has spent considerable effort in trying to develop an algorithm for chess which is based upon the second principle. Central to Botvinnik's algorithm is the concept of "horizon." At each half-move point the computer generates a mathematical "map" of the chess board. The horizon limits the area of the map scanned by the computer much as natural boundaries limit our horizon. "The horizon is the boundary of the region containing those pieces, and only those pieces, that can take an active role within the given limits of time for movement . . . An attack falling within the horizon is included in the mathematical calculations--otherwise, it is not."

Rather than having the machine calculate all positions and eliminate some very early, Botvinnik has developed a means by which the machine's internal representation immediately eliminates (by not representing it) trivial information. This, of course, should greatly increase the depth to which moves within the horizon may be considered. Thus the way in which the problem is represented internally is important even in dealing with problems in which all information is, at least to some degree, relevant.

A less precise example of this point can be drawn from Ellsberg's (1972) description of U.S. experience in Viet Nam. Let us suppose the task environment here to include (though not exhaustively) the combat areas of Viet Nam together with the goal of "not losing Viet Nam this year." Ellsberg describes the usual Viet Minh and Viet Cong response to increased U.S. military intervention:

> After suffering initial setbacks they would lie low for an extended period, gather data, analyze experience, develop, test, and adapt new strategies, then plan and prepare carefully before launching them (1972:120).

The U.S., however, monitored "enemy" strength through its field commanders who in turn equated frequency of enemy contact with enemy strength. If the enemy is strong, the reasoning went, then it will fight. If it is quiet, then it must be weak. Based on these reports, the tendency was always for the President to view his policy changes as a "success." However, this representation of the problem was not appropriate. Decreased contact did not mean a weakened enemy and, indeed, the periods of greatest crisis came at the times of highest U.S. optimism. One way of "improving" U.S. policy might have been to change the problem representation from one in terms of field commander's reports of enemy strength to one in some other objects. With respect to the artificial system structure, the observation interface needed improvement.

CONCLUSIONS AND IMPLICATIONS

The stated purpose of this paper has been to identify a set of concepts with which to begin to build an "appreciative" theory of foreign policy behavior. More specifically, I have attempted to show how the rather vague notion of "adaptive foreign policy behavior" can be rendered more precise by viewing foreign policy behavior from an artificial systems perspective.

Such a perspective has a number of implications for both theoretical and empirical research on foreign policy behavior. First, it entails the use of a systems vocabulary. This requirement is, however, not very restrictive.

if one adopts the very abstract definition suggested in this paper, then to specify a system is to identify the objects and relations of the "world" being theorized about. Thus as long as one is prepared to be explicit about what it is he is studying, he can use a systems vocabulary.

The second implication of the artificial systems vocabulary is its distinction between the foreign policy generating mechanism (i.e., the inner environment together with goals, interfaces and images) and the outer environment (including, of course, the task environments). The mechanism is posited to behave in such a way as to seek to adapt (achieve goals, solve problems) to its task environments. The internal structure (i.e., the objects and relations) of the foreign policy mechanism becomes very important for a number of reasons.

First, goals can be viewed as constraints upon behavior rather than as precise specifications of required behavior, and the way the mechanism is structured will also severely constrain behavior. Indeed, output behavior was defined as being a function of inputs and internal states. What appears to be goal oriented behavior may sometimes be an artifact of the structuring of the mechanism itself. Conversely, certain objectives may be unattainable unless the mechanism is restructured. As an example, a mechanism whose goal set includes some sort of world disarmament may find that structural constraints on its inspection capabilities (i.e., its observation interface) make such an objective itself infeasible (i.e., this constraint is itself dominated by structural constraints).

Second, the mechanism's internal images of its task environment will often determine its foreign policy behavior. These images form the "perceived

reality" on which policy actions are pretested. A mechanism whose components have very similiar images of reality will exhibit greater consistency in its foreign policy over its task environments than will one which is characterized by widely divergent images. Note that images do not include goals except insofar as the image may so severly constrain behavior as to give the behavior the appearance of being directed toward some specified goal.

In terms of a research program, the approach developed here requires that attention be paid not only to the revealed behaviors of nations, but also to the mechanisms which are producing these behaviors and the range of behaviors it is theoretically possible for the mechanism to produce. In addition to descriptive theories which relate behaviors, theories which can account for how the foreign policy mechanism receives, transforms and emits behaviors are required. It is only with such theories that we can begin to assess the capability of various mechanisms to adapt to their task environments.

NOTES

1. See Halperin and Kanter, 1972.
2. For a more complete discussion of this point see Rogowski ( ), or Thorson (1973).
3. Much of the following discussion of artificial systems is adapted from Thorson, 1973.

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