INFORMATION TO USERS

This was produced from a copy of a document sent to us for microfilming. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help you understand markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure you of complete continuity.

2. When an image on the film is obliterated with a round black mark it is an indication that the film inspector noticed either blurred copy because of movement during exposure, or duplicate copy. Unless we meant to delete copyrighted materials that should not have been filmed, you will find a good image of the page in the adjacent frame. If copyrighted materials were deleted you will find a target note listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed the photographer has followed a definite method in "sectioning" the material. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For any illustrations that cannot be reproduced satisfactorily by xerography, photographic prints can be purchased at additional cost and tipped into your xerographic copy. Requests can be made to our Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases we have filmed the best available copy.
PROBLEM-SOLVING HEURISTICS IN INTERNATIONAL POLITICS

The Ohio State University

University Microfilms International

Copyright 1981
by
Tamashiro, Howard Yukio
All Rights Reserved
To my parents, Yeiichi and Betty Tamashiro
and to Jean Miyahira
ACKNOWLEDGEMENTS

It has been my great pleasure to write this dissertation under the supervision of Professor Charles Hermann, Chairman of my Ph.D. committee, and Professors Stuart Thorson, Donald Sylvan, and James Noble. A more congenial committee could not be assembled.

In Professor Charles Hermann, I had an abundant source of sound advice, patience, and good cheer. While he has read and commented on various drafts of this study and offered strategic suggestions at crucial places, he also allowed me the freedom to pursue my own ideas in my own way.

Professor Stuart Thorson has been a source of exciting discussions and ideas, not only with regard to this study, but throughout my graduate career. I have profited immeasurably from his advice. His intellectual presence is evident throughout this study and will be sorely missed upon my departure.

Professor Donald Sylvan has also been a continuing, reliable source of helpful comments, criticisms, support, and solid, good sense. My work has profited much from his extraordinarily careful scrutiny and encouragement. A
graduate student could not ask for more generous attention.

Finally, my thanks go to Professor James Noble for his guidance to philosophical matters. His comments, I am sure, saved me from many errors and obscurities, both large and small.

Part of my research was done while a University Fellow at Ohio State University. At various stages of my work I also profited from research and teaching assistantships at Ohio State's Department of Political Science. My gratitude to all those responsible for this support.

I also wish to thank my friend, David Levine, for his clerical help at key stages of this research.

Despite the contributions and support of all those above, none of them, of course, shares responsibility for any defects or errors in this study.

Howard Tamashiro
Columbus, Ohio
August, 1981
May 30, 1947 ................ Born - Kahului, Maui, Hawaii

1969 ......................... B.A., Mathematics, University of Hawaii, Honolulu, Hawaii

1973 - 1974 ................ University Fellow
The Ohio State University,
Columbus, Ohio

1975 - 1977 ................. Research Assistant, Saudi Arabian Simulation Project, The Ohio State University, Columbus, Ohio

1978 ......................... Research Assistant, Cuban Missile Crisis Simulation Project, The Ohio State University, Columbus, Ohio

1980 ......................... Research Assistant, Polimetrics Laboratory, The Ohio State University, Columbus, Ohio

1980 ......................... Teaching Assistant, Department of Political Science, The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: International Relations - National Security, US Foreign Policy, Comparative Foreign Policy, Arms Control.

Minor Field: Theory - Formal/Analytic, Philosophy of Science.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>VITA</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1-30</td>
</tr>
<tr>
<td>I. The Context of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>II. The Problem</td>
<td>4</td>
</tr>
<tr>
<td>III. Why Algorithms?</td>
<td>14</td>
</tr>
<tr>
<td>IV. Heuristics As An Alternative</td>
<td>17</td>
</tr>
<tr>
<td>V. Research Tasks</td>
<td>28</td>
</tr>
<tr>
<td>CHAPTER 1: On the Usefulness of a Frame Approach</td>
<td>31-58</td>
</tr>
<tr>
<td>I. Introduction</td>
<td>31</td>
</tr>
<tr>
<td>II. An Intuitive Introduction To Frames</td>
<td>31</td>
</tr>
<tr>
<td>III. The Many Guises of Frames: What They Are and Are Not</td>
<td>53</td>
</tr>
<tr>
<td>CHAPTER 2: The Anatomy of Frames, Frame Tasks and</td>
<td>59-129</td>
</tr>
<tr>
<td>Frame Orienting Strategies</td>
<td></td>
</tr>
<tr>
<td>I. Introduction</td>
<td>59</td>
</tr>
<tr>
<td>II. How Frames Are Managed and Used</td>
<td>59</td>
</tr>
<tr>
<td>III. Frame Strategies</td>
<td>64</td>
</tr>
<tr>
<td>CHAPTER 3: Some Problem Types and How They Might Arise</td>
<td>130-180</td>
</tr>
<tr>
<td>I. Introduction</td>
<td>130</td>
</tr>
<tr>
<td>II. Some Types of &quot;Problems&quot;</td>
<td>131</td>
</tr>
<tr>
<td>III. Problem Formulation</td>
<td>157</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>I. Introduction</td>
<td>181</td>
</tr>
<tr>
<td>II. Frame Finding Heuristics</td>
<td>189</td>
</tr>
<tr>
<td>A. Strategies Using Cues To Suggest Opening Problem-Solving Moves</td>
<td>190</td>
</tr>
<tr>
<td>B. Strategies For Assigning Saliency To A Concept</td>
<td>206</td>
</tr>
<tr>
<td>III. Frame Altering Heuristics</td>
<td>251</td>
</tr>
<tr>
<td>A. Strategies For Generating Examples</td>
<td>252</td>
</tr>
<tr>
<td>B. Strategies For Modifying Problem Formulation</td>
<td>265</td>
</tr>
<tr>
<td>C. Estimation Strategies</td>
<td>302</td>
</tr>
<tr>
<td>D. Strategies For Selection Between Alternatives</td>
<td>318</td>
</tr>
<tr>
<td>E. Strategies For Diagnosing Unpromising Searches</td>
<td>334</td>
</tr>
<tr>
<td>IV. Frame Fixing Heuristics</td>
<td>358</td>
</tr>
<tr>
<td>A. Strategies For Deflecting Contradictions</td>
<td>362</td>
</tr>
<tr>
<td>B. Strategies Of Frame Reinforcement</td>
<td>386</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>431-441</td>
</tr>
<tr>
<td>I. A Backward Glance</td>
<td>431</td>
</tr>
<tr>
<td>II. A Look Ahead</td>
<td>437</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>442-460</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frame Strategies For Orientation</td>
<td>65</td>
</tr>
<tr>
<td>2. Frame Heuristics For Problem-Solving</td>
<td>185-187</td>
</tr>
</tbody>
</table>
I. The Context of the Problem

The search for a precise, broad-based perspective for describing and prescribing decision-making behavior is longstanding. A number of alternatives exist. The orthodox approach is the analytic one. Basically, this approach places decision-making within a framework of calculated rationality. Under this view, people behave as if they systematically define goals, canvass actions, calculate the consequences of these actions with respect to goals, and choose those actions most likely to achieve their goals. Actions are often seen as conscious, consistent, intentional products of calculation to realize well-defined ends.

Although the analytic view remains the dominant style, it has not proved satisfactory in all contexts (e.g., in situations where goals are not well-defined, where preferences are unstable, where cognitive influences distort calculations, etc.). Other decision-making approaches, designed to meet overlooked, contextual contingencies, have been proposed.

In particular, considerable interest has grown in cybernetic engineering, and adaptive styles of decision-
These approaches, try, in different ways, to cope with the shortcomings of the analytic framework. In general, they do not seek to overthrow the analytic view, only supplement it. Since the world of decision-making is exceedingly rich, these new approaches seek to illuminate different, key properties and not the whole landscape. By limiting their scope in different ways, these approaches are better able to cope with the complexities and varieties of human choice behavior.

Policy engineering, for example, avoids claiming universal relevance, preferring instead, to carefully craft scope conditions defining its applicability. Cybernetic and adaptive approaches, on the other hand,

1In international politics, John Steinbruner's The Cybernetic Theory of Decision (Princeton, Princeton University Press, 1974) is probably the best known application of cybernetic thinking.


For an example of the adaptive approach in foreign policy, see Stuart Thorson, "National Political Adaptation In a World Environment," in Comparing Foreign Policies, ed. by J. Rosenau (Beverly Hills, SAGE Publ., 1974), pp. 71-114.
seek to capture the evolving character of choice behavior by stressing feedback processes and experiential learning. According to one prominent proponent of this view, the decision-making environment can often be decomposed and treated in separable, piecemeal fashion. Complicated choice behaviors are explained in simple feedback terms or by "recipe-like," rule-following descriptions. Sometimes cognitive limitations (e.g., human computational limitations, memory limitations, human aversion to uncertainty, etc.) are added to further simplify matters.

And these simplifying moves are effective. They ease considerably the descriptive demands that are so burdensome under the old, analytic approach. And they have given us new insights into choice behavior. But this success is only partial. We have, I believe, now reached

---


3 The sense in which a "recipe" or program of instructions might explain behavior is illustrated by the following example:

Suppose we want to know how little Johnny, a boy innocent of electronics, is able to build sophisticated audio equipment. We all know the answer: he follows the instructions in the manuals that come with the kits. He can do what each instruction specifies -- i.e., he already has the capacities required by each instruction -- and he can follow the list, in the sense in which this means simply adhering to the specified order. Anyone who does what the instructions specify in the order specified, whether knowingly or by sheer accident, winds up having completed a very sophisticated task.
a point where some past, simplifying, research assumptions are obstructing further progress.

II. The Problem

Almost all past efforts, including both the old analytic perspectives as well as the newer cybernetic, engineering, and adaptive approaches, share a key, but heretofore little considered, belief. They all assume, to some degree, that context is unproblematical. They assume that some "master" context can be fixed in exogenous fashion before running one's research on choice behavior. Admittedly, all research must start with some assumptions. But the "context problem" being raised here is a matter of degree. Past decision-making studies have made contextual assumptions of heroic proportions in return for analytical power, precision, and predictive ability. I believe these contextual assumptions, in the world of politics anyway, now overstep the bounds of prudence.

What the manual does is analyze a certain sophisticated performance into unsophisticated performances in a sophisticated order. This allows Johnny to build an amplifier, but it also allows us to explain how Johnny is able to do such a thing given his meagre capacities. Any set of instructions -- recipes, a teacher's rules for doing long division, the directions on your hot water heater for relighting the pilot light -- can, with a slight change from the usual point of view, be seen as an explanatory analysis of a complex capacity. The source of explanatory power in these cases is obvious: ability to execute a sophisticated performance
What are some of these questionable, contextual assumptions?

First, most studies of choice behavior assume well-defined, well-behaved preference orderings over alternatives. This usually means that:

Alternatives and preferences are stable — they are assumed fixed during the whole decision process from the time choices are made to the time consequences are realized.

Alternatives and preferences are consistent — mutually contradictory desires are not allowed unless they can be handled by some tradeoff or control-shifting procedure.

Alternatives are precise — alternatives are assumed to be conceptually distinct.

Alternatives and preference satisfaction are well-understood — the fit between outcomes and desires is assumed to be unambiguous. Decision-makers have no problem recognizing when their desires are satisfied; they know without question what it means to "act in accordance with one's preferences."

Alternatives and preferences are exogenous — they are assumed to be uninfluenced by the choices they help create.

is reduced without remainder to abilities which are, relatively speaking, simple and antecedently understood. (emphasis in original)


These assumptions about alternatives and preferences structure much current decision-making theorizing. And, if these assumptions are sound, then so much the better for our theories. But much evidence suggests this posited, fixed view of alternatives and preferences is a serious oversimplification. People change their tastes, sometimes in inconsistent fashion; people manage their tastes strategically; people define their tastes ambiguously; people even routinely ignore their tastes. In short, alternatives and preferences are embedded, manipulated, and changed within some larger context that theorists abstract away at their peril.

A second, common, contextual assumption concerns the notion of complexity. "Complex" problems pose the most interesting, decision-making challenges. Unfortunately, many decision-making approaches assume the notion of a complex problem can be defined prior to consideration of one's decision-making perspective. The assumption here is that such a stipulated, "complex problem environment" provides a common context within which different perspectives (e.g., analytic, cybernetic, cognitive, engineering, 5

5For an extensive treatment of self-induced strategies directed at controlling and even confounding personal preferences, see Jon Elster, Ulysses and the Sirens (Cambridge, Cambridge University Press, 1979). See also, March's "Bounded Rationality, Ambiguity, and the Engineering of Choice."
and variations thereof) might be tested and compared. 6

But the notion of a complex problem cannot be stipulated independently of the decision-making procedure one wishes to employ -- complexity is relative. 7 What might prove vexingly complex from an analytic view, for example, might be child's play from a cybernetic one.

Now, the stipulative view of complexity would be a perfectly acceptable theorizing ploy -- if and only if a common, unchanging core of problem traits were universally recognized as defining "complexity" from all decision-making perspectives. But this is emphatically not the case.

Different decision-making patterns impose their own peculiar, contextual baggage in order to transform a vague, problematic situation into a tractable, "solvable" problem.


7For an example of this assumption in action, see Steinbruner's development of the "complex decision problem" in The Cybernetic Theory of Decision, pp. 15-18.

7To see how the notion of complexity changes depending on the particular context or description used by an analyst, refer to Hannu Nurmi, Causality and Complexity (Turku, Finland, Turun Yliopisto, 1974), pp. 79-100.
These imposed contexts produce different views of complexity and different ways of handling the issue. The complexities and options of arms racing, for example, will be seen very differently depending on whether one is a diplomat, a general, a politician, or a mathematical modeller. By insisting on an _a priori_ view of complexity, this important process of problem definition is obscured. The vital question is not how different decision-making techniques stack up against each other within some stipulated, complex problem environment; rather, the question is how different views of complexity and different ways of coping with this issue mesh with one's larger needs and goals. For decision-making theorists this means understanding how a particular problem-solving approach structures a problem context, how it operates within that context, how problems are made tractable, and how problems are transformed. This requires, in turn, a careful analysis of different problem types (e.g., ill-defined problems, well-defined problems, etc.), and the recognition that whether a problem is seen as complex and how it is seen as complex depends on one's problem-solving approach.

A third, perhaps more seriously inhibiting, contextual assumption concerns strategic interaction. The study of strategic behavior is troublesome in part because people can operate from very different frames.
When a clear, mutually-shared view of things among competitors is absent, all sorts of strategic anomalies can arise.

To cope with this problem, analysts often build a fixed environmental structure -- called a "parametric environment" -- within which to define maximal strategies and solutions. From this view:

The parametrically rational actor treats his environment as a constant...In a community of parametrically rational actors each will believe that he is the only one whose behavior is variable, and that all the others are parameters for his decision problem.®

Using parametric environments, analysts hope to transform subjective rationality into "objective" rationality -- that is, rationality that is objectively verifiable and well-defined. By "parameterizing," one removes or assumes away informational, procedural, or perceptual vagaries that preclude definitive judgments and evaluations.

In competitive, gaming contexts, "parameterizing" is usually done conservatively. A player posits a generalized, well-defined, and fixed environment within which his opponents are assumed not to suffer from exceptional judgmental, informational, or procedural deficiencies. In short, one does not claim special strategic advantages for oneself. Then, within this "idealized," parametric environment, one calculates strategic solutions for one's decision problem.

®Elster, p. 18.
This parametric approach is the dominant one in analytic, engineering, and cybernetic investigations of decision-making. In game theoretic studies, which are devoted to strategic behavior, such fixed, parametric-like, initial conditions are routinely set (e.g., perfect information among actors, all players have full knowledge about each other's preferences, no one can advance ahead of others, no one communicates with anyone else) in order to realize neat, unique, mathematical solutions (i.e., equilibrium points).

Parametric environments are often contrasted with strategic environments -- that is, environments that are not assumed constant. We observe here that an environment is never parametric or strategic in any absolute sense; an environment can be described in either terms. Any setting can be parameterized by stipulating enough constants in its description. And any setting can be "made" strategic by introducing enough contingent elements and uncertainties.

See Elster, pp. 18-19, pp. 117-118.

My use of parametric and strategic environments with respect to game theory differs from Elster's. He sees game theory as operating within a "strategic" context where "each actor has to take account of the intentions of all other actors, including the fact that their intentions are based upon expectations concerning his own" (Elster, p. 18). For Elster, this is sufficient for classifying game theory under strategic rationality instead of parametric rationality. In particular, with respect to game theory, Elster assumes a player is in a strategic environment when:
In politics, the uncertainties that suggest strategic, environmental descriptions spring from the presence of other actors. All actors must account for the intentions of all other actors; all actors know that their intentions are in turn being accounted for in the same manner by all others producing a "hall of reflecting mirrors" dilemma. Unfortunately, this untidiness of strategic descriptions, in contract to neat, parametric ones, often means that well-defined, "maximal" policy decisions cannot be calculated.

So, we have two, basic sorts of contextual descriptions available -- parametric and strategic. Parametric descriptions usually offer the advantage of well-defined, decision solutions. This makes such contextual descriptions

1) the player sees himself participating in a game,

2) there exists perfect information about player preferences and knowledge,

3) no one has special, procedural advantages such as being "one step ahead of everyone else," and

4) no one communicates with anyone else to change the game's structure.

In contrast, I see strategic environments as having far less structure than allowed by Elster. For instance, I view the above, game-theoretic "strategic environment" as parametric because of the structural assumptions implied by points (2), (3), and (4). For my purposes here, a player would be in a strategic environment if:

1) the player sees himself participating in a game,
very attractive to certain theorists. But, the choice is less easy for political practitioners.

A policy-maker's parametric description may not agree with the description held by his opponents. This is no problem if your parametric view is either equivalent to your opponent's in all significant ways or, better yet, if your parametric view subsumes or contains your opponent's. But, if your opponent's description contains yours, that is, if your opponent's view is of a higher-order than your parametric description, then any "maximal solutions" you calculate will probably be self-defeating. 10

2) the player cannot assume perfect information about player preferences and knowledge (in particular, he cannot assume his opponents do not enjoy special information advantages,

3) the player cannot assume everyone is "procedurally equal,"

4) the player cannot assume everyone defines the game's structure in the same way, and

5) communication among players to change the game's structure is allowed.

10 Game theory, for example, requires some fixed, "idealized" description of one's setting and opponents, and then offers strategic moves that are the "best" possible within this fixed situation. Game theory says nothing about the appropriateness of one's initial, "idealized," contextual description. Such contextual questions would move us out of the realm of parametric environments and into strategic ones.

In general, at least two sorts of strategic oversights are possible when following a strict, parametric approach. First, if one's initial description is fixed at too high a level -- that is, if it assumes a lot about the opponent's capabilities -- against an opponent who in reality operates
Policy-makers must be forever wary of this danger. Politics is the art of turning the assumptions of one's opponent against him. Political competitors strive mightily to exploit and out-maneuver each other in this fashion. Hence, the well-defined solutions promised by a particular, parametric description, while appealing to certain theorists,\[1\] may be a trap for the practitioner. These calculated solutions and their attendant, fixed assumptions may give one's opponent decisive counter-strategies. In contrast, strategic, contextual descriptions, no matter how problematical, are less likely to lead one astray in such deterministic fashion.

very suboptimally, then one may select a highly inefficient (though in theory a dominant strategy) means of winning.

Second, and more serious, if one's initial description is set at too low a level, hence underestimating the opponent's capabilities, one is vulnerable to being defeated by higher-order strategies.

In both instances (i.e., either pitching one's parametric description too high or too low) one faces questions about the appropriateness of the initial description. Such questions cannot be addressed within the limited, constricted view of strategy presupposed by the parametric approach.

\[1\]Some philosophers contend that law-like generalities are, in principle, unattainable in strategic environments. If true, this would increase the theoretical appeal of parametric descriptions still further. For example, Alasdair Macintyre, in a well known essay, argues:

The key part that beliefs play in defining political situations, and the fact that beliefs are always liable to be altered by reflection upon the situation, including reflection about the beliefs of other agents, has a crucial
This descriptive tension between the theorist's parametric setting and the practitioner's strategic setting is especially severe because political science lacks a theory of context for dealing with frame changes and slippages among actors. Instead, the issue is often suppressed by imposing, artificial, contextual "boundary conditions," often in an unselfconscious and heavy-handed fashion.

We now examine why the desire for an imposed context is so strong -- even when the issues of unstable preferences, relative complexity, and strategic environments argue against such "strongly-imposed," initial conditions.

III. Why Algorithms?

As noted above, most analytic, cybernetic, and engineering approaches demand much axiomatic structure. The basic, research strategy involves explaining decision-making consequence: that we cannot even identify a determinate set of factors which constitute the initial conditions for the production of some outcome in conformity with a law-like regularity. To claim that we could identify such regularities and such sets of factors would be to claim that we can understand what occurs in politics independently of a knowledge of the beliefs of the agents, for it would be to claim that the beliefs do not play a causal role in political outcomes. (A. Macintyre, "Is A Science of Comparative Politics Possible?", in The Philosophy of Social Explanation, ed. by Alan Ryan (Oxford, Oxford University Press, 1973), p. 184 (emphasis added)).
behavior by reinterpreting that behavior within some framework of calculation—a framework that usually assumes a parametric environment. In return for such far-reaching structural assumptions, the researcher gains much analytical exactitude.

This sort of systematic, problem-solving has great pragmatic appeal. It promises a neat way of narrowing down complicated matters, allowing one to isolate the practical problem at hand, and then solve it. Moreover, this pattern comports well with popular notions of scientific orderliness and rationality.

But, as suggested earlier, this approach is too narrow; it overlooks serious, contextual issues that might easily invalidate one's research results. In order to lay the foundation for an alternative approach towards these contextual matters, I shall first recast our discussion in terms of algorithms.

When people talk about analytic rigor in decision-making research, they often mean the attainment of results that are algorithmic or potentially algorithmic in form. Briefly, an algorithm is a problem-solving procedure with the following properties:

1) it is a finite list of distinct instructions that can be executed to completion,

2) it is subject to a certain, unambiguous, and systematic interpretation—in particular, criteria exist for recognizing the algorithm's inputs, responses, and solutions, and
3) its results count as a well-defined answer ("well-defined" in the sense that one has criteria for recognizing it) to the problem targeted by the algorithm.

Basically, it is the promise of ultimately finding algorithmic explanations that drives many analytic, cybernetic, and engineering efforts. The prospect of reducing complicated decision-making patterns to relatively simple algorithmic instructions in Turing machine-like fashion is irresistible. This explanatory strategy is made even more seductive by the natural way algorithms lend themselves to computer processing and simulation. Couching things in algorithmic terms, in short, allows one to use all sorts of powerful, rigorous, research techniques.

But algorithms require a great deal of prior structure. They presuppose a fixed, unambiguous interpretative outlook; they presume a parametric environment; they assume, in short, some sort of "master context," the risks of which we discussed earlier.

Of particular interest for the political scientist, algorithms are ill-suited for treating strategic interactions. Algorithms require some kind of fixed, parametric context. But, fixing one's environmental image in this way invites higher-order, strategic vulnerability. An opponent can usually craft some higher-order strategy to neutralize one encased within a fixed context.
This happens frequently in military history, when generals try to reduce military strategy to algorithm-like formulas on logistics, fortifications, or firepower. Invariably, these efforts are unhinged by some wily foe who alters the strategic context by surprise, superior politics, deception, technology, or superior maneuverability. The siege tactics of a Vauban, the mechanical efficiency of a Frederick, the logistical intricacies of a von Schlieffen, or the massive fortresses of Maginot may suffice momentarily in a stable setting; but eventually a Napoleon, von Manstein, or Patton appears who upends all set-piece, algorithmic theories of war.

In short, algorithms are not context-free expressions of soaring, universal truths beloved by scientists. Algorithms are tied to a lot of contextual baggage, much of it hidden. And this baggage often precludes the nimbleness and flexibility necessary for pursuing innovative and strategic advantages.

IV. Heuristics As An Alternative

Clearly, for strategic situations especially, algorithms must be supplemented to overcome the problems of contextual rigidity. Heuristics offer an answer.

In the artificial intelligence literature, heuristics do not have a clear, universally accepted definition. They are usually characterized vaguely as search-suggesting
or solution-directing ploys. They are, however, often contrasted with algorithms. While this is a useful device for clarifying certain heuristic properties, it may mislead one into thinking that heuristics are, in some sense, polar opposites of algorithms. This is not so. In what follows, heuristics will be compared and contrasted with algorithms; but, as will be shown, heuristics are not photograph-like, negative images of algorithms. Algorithms and heuristics are not mutually exclusive. They are more like alternative descriptions that can be applied to the same solution procedure. Both may be equally legitimate and are dependent on one's vantage point. Just as hypermodern chess may seem novel to a duffer but passé to a grandmaster, so a solution procedure might be someone's exploratory heuristic and another's routine algorithm.

The basic difference between algorithms and heuristics, seen as problem-solving procedures, is that algorithms require well-defined inputs and produce well-defined solutions within one's posited context, while heuristics do not. Algorithms "guarantee" solutions because they operate within fixed, well-defined contexts. In contrast, heuristics offer no certainties because they operate within ill-defined, changing contexts.

This basic "certainty/uncertainty" difference between algorithms and heuristics is not absolute; it depends on
The following example illustrates this relative difference between algorithms and heuristics.

Consider the following time heuristic for setting policy priorities: "Move fast on reversible decisions, slower on irreversible ones." Clearly, within the broad, messy confines of politics, this heuristic does not "solve" the everpresent problem of setting priorities (e.g., what is a "reversible" decision?).

Yet, in a narrower sense, this heuristic can be shown to guarantee solutions. We might transform our time heuristic into the following, stylized algorithmic form:

TIME ALGORITHM:
1) Set i = 0.
2) If i = last issue, then go to step 5 (end of job), otherwise increment index i to i + 1.
3) If issue (i) = reversible, then select issue (i) for top priority action status.
4) Go to step 2 (to increment index i to i + 1).
5) End of job.

This list of instructions can easily be written as a short FORTRAN or COBOL search routine. Such a programmed search (assuming acceptable inputs and no syntax errors) will produce output -- output that, from the perspective of the computer's compiler, is a "solution." Whether this output constitutes a solution from the broader perspective

---

The following example illustrates this relative difference between algorithms and heuristics. Consider the following time heuristic for setting policy priorities: "Move fast on reversible decisions, slower on irreversible ones." Clearly, within the broad, messy confines of politics, this heuristic does not "solve" the everpresent problem of setting priorities (e.g., what is a "reversible" decision?).

Yet, in a narrower sense, this heuristic can be shown to guarantee solutions. We might transform our time heuristic into the following, stylized algorithmic form:

TIME ALGORITHM:
1) Set i = 0.
2) If i = last issue, then go to step 5 (end of job), otherwise increment index i to i + 1.
3) If issue (i) = reversible, then select issue (i) for top priority action status.
4) Go to step 2 (to increment index i to i + 1).
5) End of job.

This list of instructions can easily be written as a short FORTRAN or COBOL search routine. Such a programmed search (assuming acceptable inputs and no syntax errors) will produce output -- output that, from the perspective of the computer's compiler, is a "solution." Whether this output constitutes a solution from the broader perspective

---

This important observation was pointed out to me by Stuart Thorson.
of the programmer or his client is another matter. In short, the above "time prioritizing" search procedure can be seen as either an algorithm or a heuristic depending on one's context. It is an algorithm *vis-a-vis* the compiler; it is a heuristic *vis-a-vis* the policy analyst reading the printout. Further, we note that whether a problem-solving procedure is expressed in formal or informal terms is not crucial for distinguishing between algorithms and heuristics. The important point is whether or not the procedure insures recognizable solutions within one's chosen context. Algorithms provide such assurance; heuristics do not.

But, if algorithms can guarantee solutions, why bother with less "reliable" heuristics? The question is a reasonable one (and certainly, the skepticism implied by the question has sustained the algorithmic trend in the analytic, cybernetic, and engineering approaches in decision-making). The answer takes us back to the "context problem" developed earlier.

The "context problem" referred to those fixed, often highly questionable, contextual assumptions that sustain many decision-making investigations. In particular, we noted algorithms were especially open to these contextual difficulties. Algorithms offer well-defined solutions, but at a cost; one must accept the rigid, impermeable, prior contextual structure that make such solutions
possible. Algorithms work well in familiar, unproblematic, and stable contexts — contexts that include all those properties relevant for our broadest purposes.

Unfortunately, in most subject areas such "master contexts" are rare; in politics, they are nonexistent. Most political contexts are ill-defined, fluctuating, unfamiliar, problematical — the natural habitat of heuristics. This is the reason heuristics are important. Although they guarantee no solutions, heuristics are robust enough to operate in contexts that cannot support realistic, algorithmic approaches. While algorithms choke on ambiguities, heuristics tolerate them. Where algorithms are "blind" to underlying, contextual assumptions, heuristics can be used to highlight and manipulate such assumptions.

We now consider the advantages of heuristics in greater detail:

1) Heuristics lend themselves to talk about context construction, selection, and manipulation in ways that more brittle algorithmic and quasi-algorithmic approaches do not. Unlike algorithms, heuristics do not require the assumption of parametric environments. This heuristic suppleness in dealing with contextual matters, in turn, allows us to treat strategic behavior (e.g., in question and answer
formulations, the use of implications, the use of time) that passes beyond the narrow confines of algorithmically-based, analytic or engineering treatments.

2) In general, heuristics do not need much prior structure because they do not require well-defined inputs and do not generate sure solutions. While algorithms only work on well-defined problems in "imposed contexts," heuristics can treat ill-defined problems in new "discovered" contexts. Hence, the domain of applicability for heuristics is broader.

3) Heuristics bring us closer to understanding human cognitive processing in practical, everyday affairs than do algorithms. This is true for at least two reasons. First, most, current, decision-making algorithms employ formal languages (e.g., math) that do not have great intuitive appeal. People do not readily think in sophisticated, logical formalisms. Although formally stated algorithms can be recast into more intuitive forms, policy-makers and theorists rarely attempt this.
In contrast, descriptions in heuristic form are usually couched in natural language terms. Heuristics, therefore, are expressively closer to the subtleties and ambiguities of applied policy-making; heuristics use the language of practitioners in their everyday work. In this sense, heuristics mirror the way people actually reason; we are not getting a formal, "reconstructed" reasoning style as is so often the case with algorithmic descriptions.

Secondly, heuristics are closer than algorithms to human reasoning patterns because heuristic-based, problem-solving descriptions illuminate all the agent's problem-solving missteps (e.g., false starts, mistakes, etc.) as well as any final solutions. In contrast, an algorithm generates only solutions within its predefined context. Since all algorithmic outputs count as solutions, it is not possible to discern missteps. Hence, algorithms may not shed much light on the higher-order, human problem-solving intents that motivated the algorithm's construction and operation in the first place. In short,
heuristic descriptions are often closer to "experiential learning" patterns than many algorithms. This makes heuristics seem more plausible descriptions of human reasoning than algorithms.

To see this, consider problem-solving process P where P is an algorithm in context 1, and a heuristic in context 2.

From context 1 (where P is described as an algorithm), problem-solving descriptions will not reveal much about the human problem-solving process. The reason: context 1 descriptions will not be broad enough to capture such things as false starts, mistakes, modifications, rejected solution proposals, and so on. Relative to context 1, such "missteps" do not exist because, by definition, P is an algorithm, which means all of P's outputs count as solutions.

But relative to context 2 (where P is seen as a heuristic), the roving path marked out by human problem-solving missteps and adjustments can be observed. P, playing the role of heuristic in context 2, does not have its
outputs automatically accepted as solutions. From the vantage point of context 2, mistakes can be distinguished from answers.

Hence, while algorithms might generate "heuristic outcomes" (as when P, seen as an algorithm in context 1, generates "heuristic outcomes" as seen from context 2) or simulate "heuristic outcomes" (as when some process P*, seen as an algorithm in context 1, simulates P, seen as a heuristic in context 2), we cannot be sure algorithms, viewed from their definitional contexts, are useful descriptions of human problem-solving procedures.

In contrast, heuristics are more likely to be "mechanism-elucidating" or "path faithful" with respect to human thought. Heuristics often seem descriptively more natural because their outputs are in accord with the intuitions of people and their knowledge of psychological mechanisms underlying decision-making performance (e.g., memory lapses, muffings, misperception, etc.). Unlike algorithms, but like people, heuristics do not guarantee answers. In this sense, heuristics are more, intuitively
acceptable descriptions of human problem-solving procedures.

4) Heuristics further the process of discovery and idea-generating better than algorithms. Because algorithms are encased within fixed contexts, they cannot readily break new ground or suggest new approaches. In contrast, the purpose of heuristics is precisely to offer such guidelines in unexplored territory.

For example, one class of heuristics encourages shifts from one interpretive context to another in ways that are either constrained or prohibited by algorithmic or quasi-algorithmic modes. This flexibility is especially useful when algorithms are expressed in formal terms. People do not easily move to new symbolic interpretations without the informal assistance of heuristics. Algorithms, for instance, cannot produce new algorithms directly without a rich heuristic repertoire playing a mediating role.

13The theme here about the "expansive" character of heuristics and their ability to suggest new conjectures are reminiscent of Mary Hesse's views on analogies in science. I see Hesse's "analogies" as one sort of heuristic among many others. See Mary Hesse, Models and Analogies In Science (Notre Dame, Indiana, University of Notre Dame Press, 1966).
The above list on the advantages of heuristics is not a call to abandon algorithms. First, as noted earlier, the distinction between the two is not absolute, but relative to a particular frame of reference. One person's algorithm might be another's heuristic. The major point here is that the contextual flexibility offered by heuristics helps us escape becoming algorithmically locked onto the ground, unable to scan the horizon for strategic advantages. In this sense, heuristics ease the "context problem" by offering a corrective to the contextual narrowness and rigidity of algorithms.

Accordingly, the best problem-solving procedures are often a judicious marriage of the algorithmic and heuristic. Consider, for example, the problem of combat aircraft design. Such a context would seem to be the prototypical, "engineering/algorithmic" domain. And indeed, algorithms are used here in abundance. Given the performance specifications set by the military, engineers look up well-established algorithms that give solutions for stylized, aerodynamic situations. A general aircraft configuration is then constructed by uniting these algorithmic solutions -- a configuration that remains safely within the confines of the "known theoretical design environment." But, successful combat development requires that one eventually move outside the world of stylized, mathematical models. One must venture into the unknown
in order to produce a better plane than the opponent. One must take "technological risks" (aircraft proposals literally have sections entitled "technological risks"). At this point heuristics dominate the design process. They are needed as experiments, past experiences, hunches, and trial-and-error testing slowly change the initial, algorithmically-based design into the final product. Not all the algorithmic solutions are altered (e.g., aircraft use round nozzles rather than other geometric shapes because the mathematical properties of circular or spher-ical bodies are easily investigated algorithmically), but enough changes occur to establish firmly the need for both algorithms and heuristics. It is reasonable to assume that political decision-making would also benefit from such combined algorithmic/heuristic approaches.

V. Research Tasks

Recognizing the important properties exhibited by heuristics and the contribution they can make towards easing the "context problem" afflicting algorithms, I shall examine more closely the role of heuristics in problem-solving. This enterprise will be subdivided into three tasks:

1) I shall discuss the fundamental role of context in shaping social meanings and
perceptions. The "anatomy" and functions of contextual backgrounds will be identified, together with a suitable vocabulary for talking of such things. These conceptual devices, in turn, will be used later to illuminate the context-dependent nature of political perception, policy, and meaning.

2) I shall offer a brief description of different problem types that might arise within political contexts. The process of problem-formulation will also be discussed.

3) I shall suggest how heuristics act on contextual elements to cope with problem-solving demands. A classification of heuristics based on their "context-manipulating" functions will be offered.

On a more concrete level, I shall exhibit a fair number of political heuristics. These examples will show that the variety of heuristics used by practitioners is rich enough to account for the complex behavior and strategic thinking found in politics.

The satisfactory completion of these tasks would, I believe, make a number of worthwhile contributions. First,
it would apply current, theoretical work in cognitive psychology and psycholinguistics to concrete, foreign policy activities. Such applications have many, illuminating insights to offer.

Second, a careful description of heuristics in politics will accent their context-dependent quality -- and indirectly suggest the various ways in which "historical lessons" may mislead because of insensitivity to this context-dependency.

Finally, the research themes pressed here could alert policy-makers to both problem-solving heuristics and cognitive pitfalls not widely known, in a manner akin to Irving Janis's work on the potential pathologies of small group decision-making.

In general, I believe that the role of heuristics in problem-solving represents a vast, new field of research possibilities. I hope, in the following chapters, to make a convincing case for this belief.
Chapter 1: On the Usefulness of a Frame Approach

I. Introduction

In this chapter the notion of a frame is introduced to describe the way international political situations are perceived by people. Further, I shall explain why frames are important for apprehending social meanings. Finally, some conceptual difficulties of frame analysis will be aired. This chapter serves as an introduction to the more detailed discussion of frames properties offered in chapter 2.

II. An Intuitive Introduction To Frames

Recognition is growing in diverse disciplines concerning the crucial role context plays in social affairs. For example, in cognitive psychology doubts are arising concerning the ecological validity of laboratory experiments insulated from ordinary, human environments. In other areas of psychology such as memory studies and child socialization, added emphasis on context is also appearing. In animal behavior studies, the relatively sterile maze learning, barpressing approaches of a generation ago have given way to detailed observations of animals in their natural habitats. In studies of everyday social life, sensitivity to context is growing. In
psycholinguistics, simple, stimulus-response models of sentence comprehension have been abandoned because researchers now recognize that such comprehension depends upon complex (and as yet, little understood) social contingencies. Even in the artificial intelligence field of pattern recognition, the suspicion is spreading that adequate computer descriptions of the real world will never be possible if based on input patterns alone and that preprogrammed "environmental frames" are required to direct computer input processing and interpretation.


For a discussion on the crucial role of context in sentence comprehension, see Eric Warner, "Do We Understand Sentences From the Outside-In Or the Inside-Out?" in Language As A Human Problem, ed. by E. Haugen and M. Bloomfield (New York, W.W. Norton and Co., 1974), pp. 165-185.

Given this confluence of interest on context, it should come as no surprise that political scientists are increasingly concerned about the embedded, contextual characteristics of political life. The need for a "theory of context" is, for example, becoming painfully apparent in such diverse fields as social choice behavior, discourse analysis, decision-making, program evaluating, deterrence theory, political socialization, and international systems theory. It is this need which motivates the frame approach below.


To illustrate the indispensible role of contextual matters in human understanding, consider the following experiment conducted by J. Bransford and M. Johnson. They gave subjects texts with ambiguous contexts. The following example, for instance, proved nearly incomprehensible and impossible to remember:

If the balloons popped the sound wouldn't be able to carry since everything would be too far away from the correct floor. A closed window would also prevent the sound from carrying, since most buildings tend to be well insulated. Since the whole operation depends on a steady flow of electricity, a break in the middle of the wire would also cause problems. Of course, the fellow could shout, but the human voice is not strong enough to carry that far. An additional problem is that a string could break on the instrument. Then there could be no accompaniment of the message. It is clear that the best situation would involve less distance. Then there would be fewer potential problems. With face to face contact, the least number of things could go wrong.

This unintelligible text, however, became much more understandable when subjects were given a picture.

Finally, for a discussion on the importance of situational context in deterrence theory, see Alexander George and Richard Smoke, Deterrence In American Foreign Policy: Theory and Practice (New York, Columbia University Press, 1974), pp. 509-517.


4 Ibid., pp. 392-393.
establishing the following context, call it context 1:

**Context 1:**

A young suitor is serenading his girlfriend with a guitar. She is sitting at the window of her sixth-floor apartment. The man is transmitting his song from below via a microphone, and a loudspeaker held aloft outside his sweetheart's window by six balloons.

The proffered context changed a meaningless text into something meaningful. Even more interesting, we can modify the Bransford-Johnson experiment to show how meanings can be sharply changed by switching contexts. Simply replace context 1 with context 2 below, and the original text takes on a completely different meaning.

**Context 2:**

Political prisoners are imprisoned on the top floor of a building. A comrade on the outside wishes to give them messages and moral support, while publicizing their cause to the general public. He does this by launching a number of balloons equipped with loudspeakers broadcasting protest songs and messages of support. The balloons also carry a homemade, leafelet-dropping device, triggered by timers and twine "rip-cords."

While the particulars of the above example may be improbable, the general principles are not. In politics, texts with purposefully ambiguous contexts are not uncommon. Allegories, fables, and stories with multiple meanings; for instance, are old devices for disguising political messages to evade censorship. To cite just one recent example, during the latter stages of the Red Guard movement in mainland China, seemingly esoteric debates about Confucious and ancient Chinese novels were actually symbolic vehicles for denouncing political opponents.
Devising messages with ambiguous contexts is also a tactic for broadening political appeal and promoting acceptance. Presidents deliver nondenominational, public prayers as a means of appealing to diverse, religious groups; politicians use broad abstractions to duck controversy and avoid alienating voters; prognosticators package their predictions in general terms to fit all seasons and circumstances; and diplomats purposefully draft resolutions open to multiple interpretations in order to obtain agreements. These are all tactics using contextual ambiguity for political ends.

That some notion of perceived environment, framework, image, clarifying depiction, script, or schema (to use but a few, possible terminological candidates -- the term "frame" will be adopted here) is essential for understanding human, goal-directed behavior is now a widely held view. Far less clear, however, is the nature of this perceived "picture" upon which human expectations and

5

This view, however, has not always been the dominant one. In the post-World War I, behaviorist period of psychology, the stress on observable, external behavior made the study of images less than respectable. Images were, by definition, subjective, and hence, smacked of the discarded 19th century, introspective approach to psychology. Hence, images and cognitive processes, in general, were ignored by most of the discipline. Only recently, with computer modelling and theories of information processing, together with the rediscovery of Piaget's work, has cognition become a lively focus of interest. See Neisser, pp. 1-9. See also Silvano Arieti, Creativity: The Magic Synthesis (New York, Basic Books, 1976), pp. 45-46.
action are based. Findings from cognitive psychology (a field which is itself barely a decade old) are still too spotty and narrow to provide a coherent picture of human cognition within political settings. Hence, the following discussion on frames will, of necessity, rely heavily on speculation and hypothesis. The formulations will be crude, even by the standards of current, political science theorizing. Characterizations and descriptions, rather than definitions will be stressed here.

Nonetheless, even without a firm definitional underpinning for the frame idea, I believe useful and interesting things can be said about it. Indeed, this particular strategy of leaving certain, "basic" conceptual definitions in abeyance while pressing forward with more tractable matters, is used frequently in other fields to good effect. For example, most cognitive theorists use the concept "cognition" without explicitly defining it.

Moreover, the proper role of perceived images in explaining human behavior is still under debate. Radical behaviorists like J. J. Gibson hope to explain behavior solely in terms of the subject's environment -- anything less would be "dangerously mentalistic" (Neisser, p. 53). Less radical, but still inclined towards downplaying the import of cognitive images is Herbert Simon's adaptation hypothesis:

A man, viewed as a behaving system, is quite simple. The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself.

Decision making theorists use the concepts "goal" and "complexity" without adequate definitions for their terms. We all use natural and formal languages (e.g., English, mathematics) which are not "exactly specified;" but, which we find useful nonetheless. Postponing these definitional chores is certainly not the ideal condition. But, useful progress can be made, and usually is made, under conditions less than the ideal.

Having argued precise definitions regarding cognition appear to be beyond us, what might be usefully said? In particular, how might we characterize the manner in which government officials go about interpreting their international environments? As noted above, any such account probably should employ a contextual approach, an approach which is sensitive to the wide variety of information an agent may draw from his environment. To accomplish this, the hypothetical, explanatory term "frame," preposed by Erving Goffman will be used. Explains Goffman:

I assume that definitions of a situation are built in accordance with principles of organization which govern events -- at least social ones -- and our subjective involvement in them; frame is the word I use to refer to such of these basic elements as I am able to identify. That is my definition of a frame. My phrase "frame analysis" is a slogan to
Frames, then, are schemata of interpretation, which are somehow specific to whatever events are being perceived. Frames can be used to locate; they can incorporate new information as it becomes available; they can serve as a standard for discounting information; they can be changed by information (sometimes very swiftly and drastically); they can be used to anticipate new information; they can provide hypotheses in place of vital, missing information; and they can serve as guides for exploratory activities making more information available. Indeed, all adaptive behavior is only comprehensible as an interaction between an agent and his environment, mediated by frames. Yet, for all their importance and "intuitiveness," frames are devilishly difficult to pin down conceptually. There are many reasons for this.

First, some frames are pre-linguistic in nature. These provide basic, perceptual orientations and ostensive

---

6 Erving Goffman, pp. 10-11. Goffman, in turn, borrowed the notion of frame from psychiatrist, Gregory Bateson. Much of the terminology used in this paper (e.g., frame, fabrication, containment, etc.) comes from Goffman. The term "frame" has also been used independently by Marvin Minsky in an attempt to account for context in computer pattern recognition experiments. As noted in the text above, Minsky currently feels computerized pattern recognition capabilities for real world setups require a preprogrammed frame or a hierarchy of frames, which allows the computer to anticipate environmental characteristics and to interpret ambiguous patterns.
meanings upon which all concepts, language, and higher-order thoughts depend. Such prelinguistic frames, by their very nature, defy sharp, unambiguous, linguistic characterization. But, even if we set aside such special, "primitive" schemas we still run into conceptual difficulties.

One major reason for this is the large organizational variation possible between individuals and even within the same individual over different situations. Notes Goffman:

Some are neatly presentable as a system of entities, postulates, and rules; others -- indeed, most others -- appear to have no apparent articulated shape, providing only a lore of understanding, an approach, a perspective.7

Consider, for example, the frame differences between a grand master, a duffer, and an infant when confronted by a chess board and pieces positioned after an actual gaming situation. The infant will see "objects" simply by virtue of the information conveyed by light and the laws of optics. The duffer will see pieces, positions, and tactical possibilities by virtue of the information conveyed both by light and the rules of chess. The grand master will see still more -- not only pieces, positions, and tactical possibilities; but, also crucial pieces,

7 Ibid., p. 21.
crucial squares, possible opponent strategies, and answering counter strategies. The grand master's frame of the gaming situation, is in some sense, better structured than the novice's or infant's, enabling him to see more and gather a larger amount of information. But, the grandmaster's analytical powers might be degraded significantly if the framing context were shifted from chess to cheese testing, where chess-framing skills would be of little help. These frame differences between individuals which determine the amount of information gleaned from a situation have, as we shall see later, important implications for inducement strategies in international relations.

Another, related reason for wide organizational differences among the frames people employ and hence, the difficulties in specifying exactly the nature of the frames, involves time. Frames extend in time; they have "life-spans." For example, when people watch a play, they adopt a theatrical frame with all sorts of accompanying dramatic conventions. This theatrical frame's beginning is signaled by the opening curtain and its end is signaled

For an interesting discussion on recall differences between master chess players and novices, see Simon, pp. 42-46. In general, chess grandmasters and masters can, given a 5 second preview, reconstruct chess game positions involving 20-24 pieces without error. Novices can hardly locate any pieces correctly. Intermediate players perform somewhat in between masters and novices.
by the final curtain. In Goffman's terms, the frame is "bracketed" in time. Wars can, in a similar fashion, be thought of as a type of frame bracketed by declarations of war and peace settlements. In general, the time horizons of individuals differ — often drastically so. Hence, frame lifespans will also differ between individuals, further increasing the variability of organizational framing differences, thus making the problems of conceptualization more difficult. For instance, returning to our theatrical example, dramatic convention utilizes curtains to bracket a play. But, what of the patron who falls asleep before the final curtain? Or, for a current political example, consider the energy crisis. To the average homeowner it may mean simply getting by the next winter with adequate heating; to a head of state it means getting by the next decade.

A third major problem complicating the precise delineation of frames involves simultaneity. Just as most people can walk and chew gum at the same time, they can also apply several frames at the same time. Examples include: negotiations over lunch or on a golf course, nonverbal signals in the form of military wargames or satellite launchings, intelligence gathering by tourists or traveling businessmen. This problem of simultaneity is a major obstacle facing cognitive theorists in their
attempts to understand perception and will certainly not be solved here. The point I wish to make is that the conceptual fuzziness surrounding the frame idea reflects the immense, unsolved problems of explaining perception and cognition, and not simply conceptual untidiness.

Robert Shaw has proposed a simple, mental exercise to demonstrate the extreme flexibility of the human brain and to illustrate the attendant theoretical difficulties this flexibility poses for simulation research:

Look around you. Now, close your eyes and describe aloud what you saw. Open your eyes and check to see how accurate your recall was. Although your recall of detail was by no means total, you probably ceased your description of your immediate environment out of boredom, rather than from lack of recall.

Again close your eyes and imagine you are a map-maker who must pinpoint exactly where in the world, in the country, in the state,..., in the room you are located. What is your present body posture? What is the weather like? The temperature of your room?

Now play autobiographer. Who are you? Where and when were you born? How did you get from there and then to the here and now? What events made you most happy, most sad? Bored you? Are you bored now?

Notice how naturally and quickly you are cognitively geared to answer such diverse and complex questions. We psychologists, who have agonized over theories of rote memory just to explain serial list recall, are understandably annoyed by anyone who reminds us of the immensity of our theoretical problems.

Shaw concludes by questioning whether simulation models will ever be constructed capable of duplicating this order of cognitive complexity. The relevance of Shaw's point for us is the human brain can shift rapidly from one frame to another and is capable of applying many different frames to the same, social situation. This

In contrast, Christopher Alexander, an urban designer, has suggested the flexibility of human cognition is quite limited in at least one important respect — in its ability to conceptualize systems of overlapping sets (as opposed to embedded sets or "trees"). In attempting to explain the sterility of contemporary, urban planning, Alexander observes:

Modern psychology treats thought as a process of fitting new situations into existing slots and pidgeon holes in the mind. Just as you cannot put a physical thing into more than one physical pidgeon hole at once, so, by analogy, the processes of thought prevent you from putting a mental construct into more than one mental category at once. Study of the origin of these processes suggests that they stem essentially from the organism's need to reduce the complexity of its environment by establishing barriers between the different events which it encounters. It is for this reason — because the mind's first function is to reduce the ambiguity and overlap in a confusing situation, and because, to this end, it is endowed with a basic intolerance for ambiguity -- that structures like the city, which do require overlapping sets within them, are nevertheless persistently conceived as trees.

If Alexander is correct, then the conceptualization of human social activities in terms of frames will, like contemporary urban design, have a strong bias towards embedded sets (trees) and away from overlapping sets. This would introduce limitations on the use of frame analysis in social affairs; however, I feel these limitations would not be decisive for our purposes. Many important, political activities are, it seems to me, organized as trees or are usefully viewed as such. See Christopher Alexander, "A City Is Not A Tree," Architectural Forum, in Two Parts (April-May, 1965), pp. 58-61.
The inherent elusiveness of frames can be lessened somewhat by specifying components one might expect in frames set within an international relations context. The following list is meant to be suggestive.

An actor within an international relations context is exposed to a vast array of stimuli, not all of which can be attended to. On these occasions, frames can promote understanding by providing a structure of selected stimuli with which the actor can interpret past events and coordinate expectations of future events. At other times, an actor may be required to formulate decisions with very little or ambiguous information. On these occasions, frames can provide "default conditions" whereby information gaps are filled by hypotheses, even if no relevant evidence bearing on these hypotheses is available. To play such a role, most frames probably contain at a minimum:

1) Agents -- these include any actors (and their histories, character, intentions) deemed functionally relevant to the perceiver. In international politics, the type of actors included can have a profound influence on the nature of the frame. For example, simply consider the significant differences between the following frames: a frame that included only national powers (or correspondingly their governmental representatives) as in the balance of power context, a frame that included only nation-states as in a collective security context, and a frame that included nation-states, MNC's, IGO's, NGO's, cities, private individuals, and the like. In fact, the current interest in expanding the notion of foreign policy to include more than nation-state policy is a bid to supplant one conventional frame for another.
Relevant actor traits that might be incorporated into the frame can include (but need not be confined to) absolute and relative strengths, vulnerabilities, internal conditions, values, goals, strategic and tactical styles, status, legitimacy, location, motivation, and credibility.

2) Relations between agents -- this includes the number and character of relevant links or interactions between the agents in the frame. It can be as elementary as the sharing of common borders or as dramatic as war. Often of particular interest are the cooperative and competitive nature of these links and the operating norms they reveal.

3) Events and episodes -- closely related to, but broader than, agent-to-agent relations are events and episodes. Most frames contain events and episodes (i.e., collections of linked events). They are the basic "building blocks" that people use to fashion their personal, unique understanding of the world; events and episodes are subjective creations unified by some interpretation within a frame.

4) Issue or problem -- this item refers to any questions, query, or dispute around which the frame may center and which gave rise to the frame's appearance in the first place. Now, not all frames have issues as their raison d'être (e.g., watching a movie): however, many, important, framing situations arising in international relations do (e.g., bargaining or influencing situations). Moreover, the discussion to follow later on influence via the frame approach, assumes all frames under discussion are centered on some issue. Important issue traits that can strongly influence the nature of a frame include issue scope, rigidity, motivational significance for the agents, periodicity, specificity, imperativeness, degree of cooperation required for resolution, clarity and salience of alternative resolution options, and vulnerability of resolutions to obstruction.

5) Frame brackets -- as noted earlier, these are socially recognized markers that separate a frame from surrounding events, thus, giving it
definition. Brackets are not merely analytical devices employed by researchers of social phenomena; they are boundaries often established by convention, and used by participants in actual social situations. Brackets occur before and after the framed activity in time and, hence, define the duration or life span of a frame. Examples include the opening and closing of a negotiation session, the beginning and end of a military alert, the start and finish of a race, or, more prosaically, the beginning and end of a work day. In general, frames differ in the social clarity exhibited by their brackets. Indeed, as we shall see later, this bracketing ambiguity can sometimes be used by one party to deceive another.

One final point, frames can be embedded within other frames (this idea will be developed later at greater length). Hence, brackets can contain other brackets. For example, assume diplomats meet at an informal lunch, then enter into a formal meeting, and afterwards break for dinner. The whole "event stream" can be viewed as one negotiating frame, which contains a formal meeting as a "subframe". The beginning of lunch and the end of dinner are, then, one set of brackets that enclose another set of brackets representing the opening and closing of the formal meeting.

Given this admittedly impressionistic description of frames, it nonetheless allows the treatment of a number of concerns important in international politics. The following, by no means exhaustive list suggests the central role frames can play in understanding real world affairs.

1) Prediction -- as noted earlier, frames provide the basis for forming expectations, and hence, predictions. Frames often embody social conventions within their design -- the more convention, the more predictive power offered by the frame (and, further, the more likely analytical rigor and specificity will prove fruitful in examining the frame's qualities). The movements in a royal
coronation or a minuet, for example, are predicted with greater detail and confidence than those found in a back alley brawl. We assume in every society the tendency exists to conform to social ideals and beliefs. People expect certain behavior in certain social settings and, in turn, meet the expectations of others in these same setting. The degree to which these interlocking expectations of reciprocal behavior govern a particular frame determines the amount of predictive confidence the frame offers. And this level of predictive confidence is substantial. People do predict one another's behavior with consistency and success — they manage to drive successfully through heavy traffic, arrive at the jobs on time, get paid, and make plane reservations for vacations. People do share an extensive, standardized set of social frames promoting a level of predictability required for group activities.

Unfortunately, this standardized collection of social frames (sometimes taken as a complete, operational definition of society) leaves much important behavior unaccounted for. It cannot, for example, account for situations in which less than complete obedience to social norms is displayed. It cannot, account for individual, idiosyncratic behavior; it cannot account for unconscious motives; and it cannot account for deception and fabrication. In short, frames largely structured on social convention are useful primarily for handling routine, cooperative social behavior. However, much behavior in international politics is nonroutine, noncooperative, and nonhomogeneous. For these concerns frames of far less cogency and predictive power are used. Yet, even here the situation is not completely hopeless. If frames in politics cannot reveal fortunes with the clarity of crystal balls, they can often suggest the unlikely, the possible, and even, in some cases, the likely. Given standard Western views of Soviet history, it is, for example, unlikely the Soviet Union will forego its emphasis on secrecy or armaments in the near future. And, given world inflation rates, it is likely OPEC oil prices will continue to rise. Indeed, since frames are used to fill gaps in our knowledge, to aid us in making "default assignments" in the absence of information, to help us form hypotheses, and to provide "anchoring
points" or standards of reference in making judgements, it is not very difficult to spin predictions from a given frame. What is difficult is assembling the appropriate frame for the situation being confronted.

2) **Deception** — frames provide a convenient way of discussing deception where a deceiver, designs a frame to mislead his victim. The victim assumes one framing context is operative while the deceiver operates from another, more sophisticated, more extensive frame that "contains" the victim and his frame. Since the deceiver's frame has, as one of its components, an accurate representation of the victim's frame, the gap in information between the deceiver and his victim is the decisive factor (e.g., negotiations where one side manages to infiltrate the other, hence, learning their bargaining strategy, strengths, liabilities, etc.). The point here is frame approaches are well suited for discussing deceptions and fabrications.

3) **Accidents and puzzles** — frames are useful for explaining how people make distinctions between intentional actions, on the one hand, and accidents, mistakes, or puzzles on the other. People find the notions of goals and intentions useful for describing and understanding the behavior of others. But, just as one cannot speak of motion in physics without specifying some frame of reference, so one cannot usefully speak of goals without some either explicity or implicitly understood frame. Indeed, a person cannot understand such notions as volition, intention, and responsibility, without learning to transform the world into a place governed by social frames — frames highlighting the differences between controlled and uncontrolled consequences. For those phenomena that fit neatly into frames depicting social control, one applies teleological terminology. For those phenomena that fall outside the realm of intent or design, one speaks of accidents, mistakes, or puzzles. Notes Goffman:

> Given our belief that the world can be totally perceived in terms of either natural events or guided doings and that every event can be comfortably lodged in one or the other category, it becomes apparent that a means must be at hand to deal with slippage and looseness. The cultural notions of muffing
and fortuitousness serve in this way, enabling the citizenry to come to terms with events that would otherwise be an embarrassment to its system of analysis. 10

Of course, the possibility of misclassifying consequences is always present. Intended and unintended actions can be confused. A student may purposely make "mistakes" to flunk an exam; a government may purposely "blunder" to mislead an enemy; a card shark may purposely "lose" the opening poker hand to set up his victims. The problem here is not with frame analysis as such, it is rather the imputing of an inappropriate frame to a given action — a possible error for which no absolute safeguard exists.

4) Discounting and forgetting — frames do not only admit and organize information. Just as importantly, they serve to screen out information. Without this screening process frames could not satisfy their main functions — to make sense of the world, to aid in discerning patterns, and to guide expectations. Clearly, this screening process runs the risk of eliminating crucial information. Anyone who has ever taken a test or read accounts of intelligence errors (e.g., Pearl Harbor, Tet, the Yom Kippur war, etc.) appreciates this danger.

10 Goffman, p. 35.

In a slightly more pragmatic vein, E.H. Carr argues that we distinguish between rational and accidental causes because it is fruitful to do so:

The former (rational causes), since they are potentially applicable to other countries, other periods, and other conditions, lead to fruitful generalizations and lessons can be learned from them; they serve the end of broadening and deepening our understanding. Accidental causes cannot be generalized, and, since they are in the fullest sense of the word unique, they teach no lessons and lead to no conclusions.

Yet, it is difficult to exaggerate the importance of discounting or forgetting. Without this ability, one faces the prospect of being flooded by endless trivia, rendering impossible the task of deriving general principles from particular instances. This point was summed up in the following complaint noted in a recent Congressional report:

The Deputy Secretary of Defense recently expressed frustration at the apparent inability of a multi-billion dollar US intelligence establishment to produce timely and useful information. He reportedly complained that "In a mechanical sense the system produces the information, but its so damn big and cumbersome and uncoordinated, that you can't get the information properly assessed and to the right people." 11

In short, data collection without interpretation and selection results in paralysis.

5) Values -- frames are useful for discussing the interaction between values and behavior. A frame can be interpreted as having its own particular, value profile. These values often exercise a strong influence on the way data in the frame is organized and the expectations which it generated: For example, in a recent laboratory experiment, subjects were exposed to a game and to asked to specify the economically optimal strategy. The game shown to all subjects was the same except one set of subjects believed all game players were people while a second subject group believed one of the players was a computer. The results revealed that subjects were far more sensitive to

11 "The Report On the CIA That President Ford Doesn't Want You To Read: Text highlights from the suppressed House Intelligence Committee report," The Village Voice (Feb. 20, 1976), p. 34.
the ethical principle of equity in the all-person context than in the computer-context. They were "framing" the games differently because of differing moral imperatives.

Vivid historical examples can also be found suggesting the inter-play between values and framing. For instance, in tracing the military history of the machine gun, historian John Ellis found the weapon was adopted most readily when used against non-Western, "uncivilized" nations (especially in Africa). The machine gun's significance for "civilized" warfare was much less quickly appreciated. Ellis explains this discrepancy primarily in terms of ethical distinctions governing European military perceptions:

Because they regarded the africans as weird eccentrics, hardly even human beings, they could look on colonial warfare as an amusing diversion that had little in common with the "real" wars that had been fought in Europe and might have to be fought in the future. Thus, because the machine gun had become so much a part of these imperialist sideshows, it came to be regarded, by definition, as a weapon that had no place upon the conventional battlefields... Of all the chickens that came home to roost and cackle over the dead on the battlefields of the First World War, none was more raucous than the racialism that had somehow assumed that the white man would be invulnerable to those same weapons that had slaughtered natives in their thousands.

In short, one might argue the Europeans used one frame for colonial wars and a second frame for European wars. The two frames, it appears, differed


significantly in value profiles. Machine guns were all right against savages, but were undignified and "ungentlemanly" for European military contests. Clearly, values in politics have a profound impact on perceptions and behavior. This dimension can, in part at least, be captured by distinguishing between different frame possibilities and their transformations over time.

III. The Many Guises of Frames: What They Are and Are Not

Recent work in artificial intelligence has produced at least four different perspectives on contextual frameworks. These four views are not mutually exclusive; they simply represent different research interests.

First, knowledge can be seen as organized in some sort of data structure such as an array. The main purpose of such data structures is access; they facilitate information retrieval. Nothing more is demanded. In the literature 14 these data structures have been dubbed frames.

Second, knowledge can be seen as falling in some temporal progression. This sequencing requirement, absent under the first, "data structure" view, is implied by the


term schema.

Third, knowledge can be seen as directed towards some goal. Under this view, contextual matters are subsumed under the notion of a plan.

Finally, knowledge can be seen as structured by social roles and conventions. Such social conventions provide instructions for behavior in everyday life. This "social-role" view of knowledge is implied by the term script.

These different views appear to fall along a continuum of increasing structural specificity: schemas are frames sorted in some, temporal order; plans are goal-directed schemas; scripts are plans ossified by social tradition and custom. Moreover, these different views do not exhaust all contextual possibilities; for example, frameworks for producing ethical judgments and priorities, frameworks serving basic, spacial-temporal orienting needs, and frameworks for organizing physical movement, do not readily fit under the four perspectives described.

---


17 Ibid., pp. 36-68, 97-100.
above.

These observations convinced me, for reasons of economy and elegance, to avoid dividing my study of contexts into separate boxes labeled "frames," "schemas," "scripts," and so forth. Instead, I have chosen to use the term "frame" to refer collectively to all possible contextual matters. I justify this move as follows.

The many possible uses served by frames -- whether as schemas, scripts, plans, and so on -- can be seen, I believe, as an interaction between frames and heuristics. So, for instance, a schema, under this view, is simply a frame altered by a certain repertoire of heuristics; a plan is a schema acted on by more heuristics; and a script is a plan transformed by still more heuristics. In short, schemas, scripts, plans, and so on are simply special cases of the general notion of a frame. This view makes it unnecessary to posit a different, contextual device everytime a new form of knowledge usage is encountered. As a result, theoretical economy and plausibility are enhanced.

One final remark about frames. In the chapters to follow, we shall be talking about the "anatomy" of frames,
frame organization, frame functions, and so on. Such talk may mislead one into reifying the frame idea; that is, taking frames to be tangible entities lurking in people's minds.

Frames are not to be understood in this way; they are not physical objects. The notion of a frame is simply a "short-hand" way of talking about very complicated, and heretofore little understood, interpretive processes.

But, why then talk about cognition in such a potentially misleading fashion? Why speak of frames at all? At least two levels of discourse are available for treating human thought. We might talk of processes that are actually used in cognition (e.g., neuron firings, hormone changes, protein production, etc.). Or we might talk metaphorically of processes that are used to interpret psychological happenings. It is in this latter sense that we speak of frames. Frames are a convenient way of getting at subtle, higher-order thought processes that cannot be probed via molecular biology or neurophysiology.

More specifically, if cognitive applications in politics are to be of any relevance, they must characterize cognition in a way that accounts for interesting political phenomena. Molecular biological talk cannot now, and probably never will be able to do this. And since no
established vocabulary exists for treating such matters, I have drafted frame terminology for this purpose.

Seen in this light, frame analysis is basically an exploratory study of some hypothetical, conceptual dimensions of human thought. We are like early 20th century biologists who spoke of genes as theoretical units of heredity before the discovery of DNA, or like present-day physicists who use quarks as mathematical conveniences without empirical evidence for quark existence. The sort of empirical data that might link perception and brain structure to higher-order, human thought does not exist (and it is not clear that such data would be very useful even if it did exist -- in politics, it is vital to characterize what people think and mean, not merely how they think; and molecular biology would only illuminate the latter, and even that only partially).

Accordingly, little theory exists to bridge the gap between physical description and subjective experience. Hence, in using frames to characterize the content and processes of cognition, plausibility will be a primary consideration. Lacking theory and comprehensive data, we must synthesize some general principles from a variety of disjoint sources and try to construct an intuitively believable account of human problem-solving processes. This whole procedure will be theoretically untidy.
Discursive reflection rather than deductive rigor will be the governing approach here.

But, in defense of this \textit{ad hoc} quality, I claim that we shall rarely underestimate the complexity of the cognitive phenomena we are trying to understand, and that any contending approach that seeks a similar level of comprehensiveness will have to deal with the same issues treated here, and, further, will likely end up with very similar results.
Chapter 2: The Anatomy of Frames, Frame Tasks and Frame Orienting Strategies

I. Introduction

In the last chapter I used the term "frame," proposed by sociologist Erving Goffman, to develop a contextual approach towards political perception. Knowledge is always knowledge from a certain position; knowledge claims always depend on context -- hence, the need for frames (or some other analogous contextual device).

I then characterized frames as schemata of interpretation used by people to select, discount, incorporate, and anticipate information in the world around them. Frames make possible the organizing, storing, and retrieving of experiences that problem-solving and adapting demand. A number of examples showing the importance of frames in political perception were also presented.

Here, I shall develop the notion of a frame further, enumerating the perceptual tasks that frames must handle and the framing strategies used to satisfy these tasks.

II. How Frames Are Managed and Used

Frames are always subject to change. Each day brings new challenges, new circumstances, new information, and new hopes; hence, the adaptive requirements imposed on frames.
Some of these changes are unconscious, as, for example, our gradual adjustment to aging effects on our senses. Other changes are less subtle.

Politics, perhaps more than most activities, makes great demands on an individual's ability to organize and reorganize information. As one observer colorfully noted, politicians deal with "human nature in the raw, and great events in the making: willy-nilly these force themselves on his attention, and he must respond to them in the arena he has chosen, where the spotlight of publicity shines on everything he does." Change is the rule in politics. Dean Rusk, for example, once observed that US foreign policy had to be conducted in a world where perhaps fifty changes of government occurred every year. This constant pressure to adapt while preserving perceptual coherence, raises the problem of explaining frame adjustments. How do frames operate in a shifting, unreliable world?

At least four adjustment tasks must be addressed if frame analysis is to be useful for discussing political phenomena. These four tasks can be conveniently summarized with the words "finding, altering, fixing, and using."

First, in order to make sense of external complexities,

---

a suitable frame for guiding interpretation must be found. This "finding" task leads naturally to a discussion of frame retrieval strategies. Second, frames, once accessed, must be modified as information is either learned or foregotten. This "altering" task entails frame modifying and comparing strategies. Third, frames must possess a minimum amount of consistency and coherence if they are to guide and orient someone. This "fixing" task leads to the study of frame preserving strategies.

Finally, frames are used in different ways. The first three frame tasks -- finding, altering, and fixing -- might be considered together as a frame preparing process in contrast to the fourth task, frame usage. This "usage" task forces us to consider orienting and problem-solving issues.

Before examining these different cognitive strategies, I offer a few general remarks.

2

Attitude changes stimulated by transnational experiences have been successfully described using a 3-stage model. The three stages, which roughly correspond to the finding, altering, and fixing frame tasks introduced here, are "unfreezing," "changing," and "refreezing."

That attitudinal changes can be suitably characterized in this fashion provides indirect evidence for the efficacy of the frame categories used in this study.

I discovered this attitudinal research after having organized my frame scheme.

First, it is important to note the interactive quality between frame preparing and frame usage. Finding, altering, and fixing a frame determines the quality of frame usage. But, perhaps less evident, frame usage can, in turn, rebound back to influence frame finding, altering, and fixing processes. This often happens in problem-solving. For example, given a problem, its accompanying frame will hopefully encompass all those elements that comprise a suitable solution for the problem (assuming, of course, the problem is solvable). As problem-solving takes place the frame may be significantly changed or even replaced in the process (e.g., the frame may be expanded to include more elements or narrowed to drop irrelevant ones, the problem may be totally redefined where one frame replaces another). In this way, finding, altering, and fixing processes influence frame usage. But, as a frame is used in problem-solving it may lead to new finding, altering, or fixing processes. This is the other part of the interactive bond between frame preparing and usage. Put another way: as we learn (i.e., alter frames), we often learn how to learn (i.e., alter our repertoire of frame preparing strategies as well).

These concerns lead to a second point. Just as, in principle, no limits exist on what we learn (i.e., the
number of framing possibilities); similarly, no limits exist on how we learn (i.e., the number of frame preparing and usage processes). No list of finding, altering, fixing, and usage strategies is ever exhaustive.

3 This observation on the open-ended quality both on what we learn and how we learn mirrors fairly recent developments in the philosophy of science. The old, logical positivist program in the philosophy of science sought, in part, to develop canons of rationality for evaluating knowledge claims and deciding what to recognize as "real" knowledge. It was assumed these canons of rationality represented a fixed standard not subject to change. One's data base changed as new knowledge was admitted; one's standards of evaluation, however, did not. All this is analogous to the assumption of modifiable frames accompanied by fixed, frame preparation and usage processes.

Current philosophical thinking now holds both the data base and patterns of reasoning in the sciences are subject to change. As a science develops and its knowledge base grows, new standards for evaluating knowledge claims arise. A primitive science will likely have very different evaluation criteria from a sophisticated one. Both sets of criteria are legitimate. No timeless set of canons exists to define acceptable, scientific activity. This current view in the philosophy of science is consistent with the more general position, expressed here, on the open-ended nature of learning and perception. No timeless set covering all perceptual and learning techniques exists, for, like scientific reasoning, both are subject to evolutionary changes.

III. Frame Strategies

In the last section we noted four frame tasks (frame finding, altering, fixing and usage) necessary for interpretation. We shall now consider some interpreting strategies people use.

Most of the strategies covered here come from fairly recent research in cognitive and social psychology, psycholinguistics, artificial intelligence, and the philosophy of science. Hence, no claims of primacy or frequency can be made. How often these different strategies are used, and whether all the major classes of strategies have been identified are still open questions. Also, many questions still remain about the conditions that call these strategies into play or limit their effects. Nonetheless, enough information exists to say some interesting things about perception and problem-solving in international relations.

To order our talk of frame strategies we note two modes of frame usage -- orienting and problem-solving. People need frames to orient themselves within some spacial-temporal context. Orienting involves the selecting, dismissing, organizing, and integrating of information. Orienting is closely tied to describing.
### TABLE 1: Frame Strategies For Orientation

<table>
<thead>
<tr>
<th>FRAME TASKS:</th>
<th>Finding</th>
<th>Altering</th>
<th>Fixing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Strategies Connected</td>
<td>1) monitoring</td>
<td>1) Intra-frame Strategies</td>
<td>1) limited access</td>
</tr>
<tr>
<td>With Each Task:</td>
<td>salient cues</td>
<td></td>
<td>2) cognitive consistency</td>
</tr>
<tr>
<td></td>
<td>2) frame-testing</td>
<td>a. concept identifying</td>
<td>3) idealization</td>
</tr>
<tr>
<td></td>
<td>expectations</td>
<td>b. rule-learning</td>
<td>4) ad hoc constructions</td>
</tr>
<tr>
<td></td>
<td>3) frame switching</td>
<td>c. given-new strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. reconstructive processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e. frame maintenance expectations</td>
<td></td>
</tr>
<tr>
<td>2) Inter-frame Strategies</td>
<td>a. frame comparison</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. keying</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In contrast, problem-solving moves beyond describing. In problem-solving frames are used to form and test hypotheses and search for evidence. This hypothesis testing demands more involved, cognitive handling than describing. Moreover, hypothesis testing demands feedback and, hence, is more likely to lead to frame changes than simple, descriptive activities. All this implies frame strategies for problem-solving will be, in general, more complex and numerous than frame strategies for orienting. Problem-solving demands more cognitively than orienting. Problem-solving requires orienting, but orienting need not imply problem-solving. Hence, problem-solving includes all those frame strategies needed for orienting plus additional, more specialized ones.

Given this orienting/problem-solving distinction, we shall order our survey of frame strategies by dividing

---

4 Given that problem-solving requires orientation, one might conclude that some sort of procedural priority exists for problem-solving and orienting. Isn't it reasonable to assume that orienting occurs first, and that problem-solving processes follow?

Paradoxically, work in perception and information processing suggests that such sequential assumptions may be too simplistic. According to Miller and Johnson-Laird:

In order to perceive that something is, say, a table, it would seem necessary to use information about its location, size, and shape, but how is it possible to judge its attributes until we know what "it" is? Which comes first, the attributes or the whole?
them along these lines. The first group serves orienting ends. There, strategies under frame finding, altering, and fixing subheadings will be covered. The second group of strategies falls under problem-solving. There too, the strategies will be further subdivided on the basis of frame

Experience with modern systems for processing information has taught us that such circles need not be vicious...it is quite common in computer programs - and presumably in thought processes - for two different procedures to use each other as subprocedures. When the system is forming a percept, object-forming procedures can call on shape-recognizing procedures as subprocedures; when it pays attention to shape, shape-recognizing procedures can call on object-forming procedures as subprocedures. The assumption that one set of procedures must in every case precede the other imposes a rigid and unnecessary constraint on the complexity of our hypothesis about object perception.


As with object perception, so perhaps with problem-solving. In particular, orienting and problem-solving processes might take place concurrently or in mixed fashion. Or perhaps in special cases, orienting strategies may fail, prodding people to use problem-solving procedures on particular features of the scene. But such failures would be the exception, not the rule. Accordingly, while the orienting/problem solving sequence is not crucial in the discussion to follow, we shall implicitly assume orienting precedes problem-solving for the following reasons: 1) the judgments surrounding problem-solving are usually more important in politics than orientation, 2) such judgments normally occur only after orienting is achieved, and 3) it will be analytically convenient to suppress orienting complications when we treat problem-solving strategies.
finding, altering, and fixing (see table 1, p. 65) for the listing of orienting frame strategies). Again, we note the problem-solving includes all the framing strategies used in orienting, plus many, additional ones.

To orient ourselves in the world, we must retrieve frames found in long-term memory. How do we go about finding the appropriate set? At least three basic processes seem involved—cue saliency, frame expectations, and frame switching.

First, we attend to external cues for hints. For example, if, upon walking into the middle of a lecture, I hear the words "orbit", "galaxy", and "universe," I would immediately associate this with astronomy. The three words "orbit", "galaxy," and "universe" here serve as verbal cues enabling me to call to mind a collection of frames dealing with astronomy. In general, this strategy of monitoring cues is not as straightforward as suggested by this example. Those cues that I find salient may not be richly evocative or even noticed by someone else. Since one is constantly bombarded by stimuli (e.g., tastes, odors, sounds, visual images, etc.), they cannot all call up frames. For each individual, some stimuli are more noticeable than others. What accounts for cue saliency? Part of the answer, according to cognitive psychologists, lies in the "encoding specificity principle." According to the principle, a
retrieval cue can release information on an event if and only if the cue is stored as part of the event's memory trace. For example, the cue word "hood," if encoded in the context of automotive repair, will be associated with a frame very different from one linking "hood" to a monk's garb. A mechanic probably would not find "hood" a useful cue for retrieving a frame dealing with monastic apparel. This encoding specificity principle implies only stimuli that are "richly and deeply encoded within a frame can

5 Encoding and retrieval processes are currently the "hot" topics in memory research as they apply to recognition and recall tests. Findings indicate the encoding and retrieval processes in recognition are very different. In recognition tests, subjects generally emphasize discrimination between items hoping to pursue a pattern matching process. In retrieval tests, subjects emphasize integration; they interrelate items so they can be more easily retrieved. Further, retrieval is strongly context dependent. A retrieval cue aids recall if and only if it is present both at the time of storage and at the time of recall.

Walter Kinsch has proposed a pattern-completion theory of retrieval to account for this context-dependent nature of retrieval. He argues a retrieval cue must match a portion of the memory code one is trying to retrieve. Recall is successful when the code pattern "hinted at" by the retrieval cue is "completed" by fitting it with the "to be retrieved" memory code pattern.

serve as salient cues for that frame. Words like "and, the, and of" therefore are not likely to be salient cues for any frame, whereas words like "sex" and "death" are.

Other factors that count in cue saliency of cues are: 1) temporal matters like frequency of cue appearance and elapsed time between encoding and retrieval, 2) gestalt properties such as figure-ground contrasts, 3) discrepant cues that depart from convention or expectation, 4) cues that are tied to important social concerns such as goals and plans, 5) cues that are clustered in space or time, and 6) cues that are concrete.

Two more general points. First, when a frame is retrieved, its elements can, in turn, act as cues calling up new frames. This is evident in daydreaming. Imagine a

Cue saliency factors also play a crucial role in child development. They help trigger major, maturational changes. A baby, from birth, is ready to monitor physical stimulation. Contrasts in light, motion, sound, smell, touch, and taste provide focal areas which a baby uses to discover the dimensions of the physical world. In ten weeks, a baby begins to notice discrepant events; that is, events which differ from his prior knowledge. Toward the end of the first year, an infant's attention to discrepant events increases and is accompanied by motor inhibition. The pattern of infant development is unmistakable. It depends upon cue saliency to aid in the interpretation and response to external events. For a more detailed discussion of cues in infant development within a cross-cultural context, see Jerome Kagan, "The Baby's Elastic Mind," Human Nature, Vol. 1, No. 1 (Jan., 1978), pp. 66-73.)
student listening to a dull, classical history lecture. The professor mentions Cleopatra, which prompts the student to remember the movie version with Elizabeth Taylor. This, in turn, leads him to recall the girl he accompanied to the movie, which, in turn, leads to more reminiscing about other things. The student's attention has passed through a number of frames, each providing cues prompting a succeeding one. Such frame transits need not, however, always be frivolous. They can play vital roles in creative thinking and brainstorming.

The second point on cue saliency touches on a longstanding issue in the philosophy of science — namely, does the content of science influence the logical and methodological criteria guiding scientific progress? A major philosophical tradition, beginning with Plato, nourished by Kant, and, still later, by the logical positivists, argued scientific content had no such influence — that "facts could not raise their own questions." A dissenting tradition beginning with Aristotle and now being pressed vigorously by Dudley Shapere argues that scientific reasoning is strongly influenced by scientific content. Our observations on cue saliency support this latter view.

---

7 See Shapere, pp. 518-599.
Spatiotemporal discontinuities, unexpected events, and deviant patterns are some, salient cues that can raise doubts or stir curiosity about gaps separating present experience and prior knowledge. In this sense, "facts acting as cues can raise their own questions."

A second, frame retrieval strategy, different from cue saliency, involves the use of expectations. Recall our earlier example on arriving late to a lecture. Upon hearing the lecturer using terms like "orbit," "galaxy," and "universe," I would immediately begin framing the lecture in terms of astronomy. Further, I would develop expectations about the lecturer's intents and train of thought. For example, since the word "orbit" was used, one might reasonably expect to hear references to planets, centers of rotation, precession, periods, galactic rotation, satellites, or any other topics related to orbits in astronomy. Similar expectations would accompany "galaxy" and "universe."

Such hypothesis-generating activities are important for three reasons. First, such expectations test the validity of my "astronomy" frame. If none of my expectations are met, I would be forced to reexamine my frame. Second, if my "astronomy" frame proves satisfactory, then expectations will help further clarify and sharpen my orientation. For example, if the lecture is on astronomy,
then which branch —  astrometry, cosmology, cosmogeny, exobiology, celestial mechanics? Third, expectations help one assimilate new material. A frame leads to expectations that promote further understanding. Expectations shape our views on new, incoming data: on the obvious, on the puzzling, on the important, on the unimportant, and, by omission, on that which is beneath notice. Expectations make new views possible; hence, expectations are indispensable. Yet, because interpretations always depend on a particular set of frames —  frames that may be inappropriate —  expectations can lead us astray. How?

First, expectations can lead us to dismiss or overlook information that is vitally important. People only see what their expectations prepare them to see. Sometimes that which one is prepared to see is not what is most important.

Second, initial expectations that are satisfied might lock one into a frame that is inappropriate -- what psychologists call "premature cognitive closure." By making

8

premature judgments, people make new data harder to assimilate than if they had withheld judgment pending more information. Moreover, the early satisfying of expectations may promote more confidence in one's frames than is warranted.

Third, expectations that are borne out by events often block out other alternate frames that may be consistent with those events. This is a very big problem in politics. Very frequently, policy-makers assume only one frame exists -- their frame -- for interpreting events and that everyone naturally shares that frame. But because of communication problems, differences in goals, differences in information, time lags, and bureaucratic practices it is, in fact, highly unlikely that participants in any political process will be operating from the same frame; hence, the immense problem of misperception in politics.

Since expectations, when severely disappointed, can lead to the discrediting of the frame being applied, one other important frame retrieval strategy must be covered -- frame switching. In this case, one replaces a set of frames

---

9 For numerous political examples dealing with misperception in international relations, see Robert Jervis, Perception and Misperception In International Politics (Princeton, Princeton University Press, 1976). For a discussion directed specifically to expectations and the role they play in perception, see pp. 163-216.
that fail with a new set. Again, recall the example on our
tardy appearance at a lecture. Hearing the terms "orbit,"
"galaxy," and "universe," triggered thoughts on astronomy.
Expectations arose about the lecturer's future utterances
as a means of validating and sharpening our framing beliefs.
Now, assume these beliefs are shaken. Assume the lecturer
introduces no new material that seems even remotely related
to astronomy. Instead, assume the lecturer dwells on things
like Malcev's "compactness" theorem, Gödel's "incompleteness"
theorem, and monads.

My first impulse would be to salvage the "astronomy"
frame by trying to adapt it to the strange things I'm now
hearing. Perhaps these ideas relate to new advances in the
discipline. I try to recall things I've read recently but
to no avail (we shall discuss these sorts of adaptive
strategems later). No connections. Now, the lecturer
begins talking about formal languages, models, and Abraham
Robinson. Immediately, the name Robinson clicks, and I now
know what the lecture is about. "Universes" refer to
different types of set-theoretically defined models,
"galaxies" refer to special classes of real numbers,
"orbits" refer to cyclic groups, and the lecture is about
nonstandard analysis, a new branch of mathematics developed
by Robinson dealing with infinitesimals. Cognitively, I
have just "switched" from one set of frames on astronomy to
another set on formal mathematics. (This, of course, would not mean I could understand the lecture; it simply means my sense of confusion has been somewhat reduced).

The above example demonstrates perception is not always a "continuous" process of extending past lines of understanding. At crucial junctures in our experiences, we may confront new cues, which radically contradict established beliefs. When this happens, rather dramatic reorganizations in framing can occur -- what is termed here "frame-switching." As shown in our lecture example,, one characteristic pattern that can lead to frame-switching is: 1) an event or set of events are noted, which some frame must account for, 2) the frame cannot satisfactorily account for these events or does so only via arbitrary, ad hoc, turns, 3) these puzzling events are deemed important for maintaining a sense of psychological orienting 4) another frame exists that can satisfactorily account for the events, and 5) time exists to allow for frame switching without unacceptable penalties. Under these circumstances frame switching is likely. If alternative frames for treating troublesome events are not available, one will probably cling to some unsatisfactory frame, perhaps preserving it from contradictory events via a process of denial. The alternative would be an uncomfortable sense of disorientation.
One final point. Frame switching can take place only if alternative frames are available. In particular, these alternates must, according to the encoding specificity principle, have cues stored as part of the frame's memory trace. If one never encounters these cues externally, then the corresponding, alternative frames will never be activated. Hence, when a frame is stored in memory it seems important to have it encoded with a diversity of cues to increase its retrieval chances. This, in turn, strengthens the frame-switching option.

Indeed, the ability to switch frames when events do not encourage such switching appears to be one hallmark of creativity. A remarkable example showing how "unorthodox" frame switching characterizes genius comes from the early years of quantum mechanics in the mid-1920's. Physicists were then astonished to discover the matrix mechanics of Heisenberg and the wave mechanics of Schrödinger were equivalent. As one physicist marveled, "they started from entirely different physical assumptions, used entirely different mathematical methods, and seemed to have nothing to do with each other." Yet, one person, David Hilbert, then considered to be the most able of mathematicians, had anticipated this bond between matrices and differential
equations in an impressive exercise of frame switching. As recounted by a contemporary:

... when (Born and Heisenberg and the Gottingen theoretical physicists) first discovered matrix mechanics they were having, of course, the same kind of trouble that everybody else had in trying to solve problems and to manipulate and to really do things with matrices. So they had gone to Hilbert for help and Hilbert said the only times he had ever had anything to do with matrices was when they came up as a sort of by-product of the eigenvalues of the boundary-value problem of a differential equation. So if you look for the differential equation which has these matrices you can probably do more with that. They had thought it was a goofy idea and that Hilbert didn't know what he was talking about. 10

The later, theoretical discovery linking matrix mechanics to wave mechanics confirmed Hilbert's insight. Hilbert had managed to switch from a frame about matrices to one on differential equations. His understanding of differential equations apparently contained encoded cues differing from his colleagues. Hence, Hilbert could switch to an unusual perspective under seemingly, unpromising circumstances, while others, lacking the necessary encoded cues, could not.

Up to this point we have been discussing frame finding strategies. Three basic, frame-locating processes were

identified -- monitoring salient cues, the use of expectations in frame retrieval, and frame switching. We now turn to strategies in frame altering. (See the second column of Table 1, p. 65).

Once a set of frames is recalled from long-term memory, they usually change as new information becomes available. Such changes can take place in a number of ways. Some of these ways will be treated here. But before describing these frame altering methods, the structure of a frame must be developed further.

When a frame is retrieved from long-term memory and is placed in short-term memory (i.e., when a frame enters consciousness), only portions of that frame's information become conscious. For example, if, upon entering an empty classroom and examining the symbols left on the blackboard, I recognize them to be about group theory, this does not guarantee all the knowledge I possess on the topic becomes readily available to me. Even after lacking onto the correct frame, I may have to exert much effort recalling specific bits of group theoretic information (e.g., Is the "\Delta" symbol about normal subgroups? What is the definition of a normal subgroup anyway?). All this suggests it would be convenient to distinguish in a frame between "foreground" and "background" information.
Foreground would contain all frame information that a person is conscious of at any given moment (i.e., that part of a frame found in short-term memory). Background would refer to all information still stored in long-term memory that has not yet been called into consciousness. The information connected with a frame's foreground and background would, from this view, vary depending on the efficacy and effort of an individual's recall efforts.

On one day, for example, I may have no trouble instantly placing normal subgroups into the foreground category of my group theoretic frame; on another day however, I may "blackout" on normal subgroups and it would remain inaccessible in background. In general, however, background information can be retrieved to enrich foreground information.

More precisely then, foreground knowledge might be characterized as: 1) knowledge claims that are conscious, i.e., stored in short-term memory, 2) knowledge claims that typically, have been accepted on the basis of what one has judged to be adequate evidence (the standards of acceptance differ among individuals, but are often kept within certain bounds by the pressures of conformity or intersubjective agreement), and 3) knowledge claims that are perceived to be bond together in some fashion.

In contrast, background knowledge might be described as: 1) knowledge claims that are nonconscious; i.e.,
stored in long-term memory, 2) knowledge that is retrieved only when necessary (following the principle of economy of effort). The need to retrieve is determined by the nature of foreground knowledge and the demands made on it by the problems being confronted, and 3) knowledge that is deemed compatible with foreground knowledge (e.g., in level of detail, subject matter, standards of acceptability, etc.).

In political matters background information typically covers historical elements connected with foreground concerns (the time dimension for issues), detail on capabilities (the resource dimension for issues), and detail on participant traits (the actor dimension). The link between foreground and background often stems from past experience. Usually, such background data has proven useful in past applications of the frame.

One final note on background knowledge. As it grows, its directive influence grows. It channels one's perspective to a greater extent; it imposes more selective guidelines on comprehension and action. It is this "rigid" quality of background knowledge that gives social institutions, for example, their sense of comprehensiveness and "objective" reality. Over time all institutions appear as unalterable, self-evident "givens" in a way often not intended by their creators (e.g., early Christianity vs. the established Church after Constantine). The "synthetic
quality" of institutions, so apparent to their founders, becomes, for later generations, the "objective reality."
In this sense, man is capable of producing things which he then sees as something other than manmade.

Having now distinguished between foreground and background knowledge we can treat frame maintenance techniques. They come in at least two classes -- intra-frame strategies

The connection between the growth of background knowledge and the externalizing and reifying of human institutions is nicely illustrated by Peter Berger and Thomas Luckmann. Imagine two people, A and B, from different social worlds who come together to start a new, social order. They soon develop habits of conduct -- "nascent social institutions." But, over time and especially for later generations, perception of these institutions change. The observations of Berger and Luckmann are worth quoting at length for the insights they offer on the directive power of frame backgrounds. They note:

As long as the nascent institutions are constructed and maintained only in the interaction of A and B, their objectivity remains tenuous, easily changeable, almost playful, even while they attain a measure of objectivity by the mere fact of their formation. To put this a little differently, the routinized background of A's and B's activity remains fairly accessible to deliberate intervention by A and B. Although the routines, once established, carry within them a tendency to persist, the possibility of changing them or even abolishing them remains at hand in consciousness. A and B alone are responsible for having constructed this world. A and B remain capable of changing or abolishing it... All this changes in the process of transmission to the new generation.
and inter-frame strategies. Intra-frame strategies refer to changes that take place within a given frame. Inter-frame strategies refer to changes that involve more than one frame. Basically, both classes of strategies are used to assimilate new information or reorganize old information.

One sort of intra-frame strategy, called simple classifying or concept identification, has generated much

---

The objectivity of the institutional world "thickens" and "hardens", not only for the children, but (by a mirror effect) for the parents as well. The "There we go again" now becomes "This is how these things are done." A world so regarded attains a firmness in consciousness; it becomes real in an ever more massive way and it can no longer be changed so readily. For the children, especially in the early phase of their socialization into it, it becomes the world. For the parents, it loses its playful quality and becomes "serious." For the children, the parentally transmitted world is not fully transparent. Since they had no part in shaping it, it confronts them as a given reality that, like nature, is opaque in places at least. Peter Berger and Thomas Luckmann, The Social Construction of Reality (New York, Anchor Books, 1967), pp. 58-59, emphasis in the original.

12

In distinguishing between inter-frame and intra-frame strategies, I do not suggest that these categories apply in some absolute sense. Whether a heuristic plays an inter- or intra-frame role depends on one's particular perspective. So, for example, from one level of description a given heuristic may be seen as involving two frames and, hence be categorized as an "inter-frame" strategy. But, the same heuristic, seen from a higher level description, may be viewed as making adjustments within a single, very large frame. From this "higher-order" view, the heuristic would be an "intra-frame" strategy. Hence, as was the case with "parametric/strategic" distinctions, the
research interest in the last twenty years. Indeed, very few other topics have been as intensely researched in cognitive psychology. Basically, concept identification deals with the categorizing of simple stimuli into artificial, usually binary classes.

In the standard, concept identification experiment, the subject is exposed to a carefully designed set of stimuli that have been previously divided into two or more classes by the experimenter. The subject's task is to discover the experimenter's classifying rule. Often the stimuli are line drawings, which vary along different terms "inter-frame" and "intra-frame" are always used relative to some underlying description. What counts as "inter-frame" from one description might be "intra-frame" from another.

For purposes of expositional convenience, we assume here that a fixed, but unspecified level of description has been set, which gives us a common context for drawing meaningful inter- and intra-frame distinctions and comparisons.

Concept identification is classified here as an intra-frame strategy because most of the knowledge about it comes from highly structured experiments in which subject tasks are well-defined. This strongly directive context sets the frame for the subjects. Indeed, given this highly directive setting, one might argue concept identification is more a problem-solving technique than an orienting one. But, since concept identification is a special type of discriminating learning I have decided to classify it as an orienting strategy.
dimensions such as color, size, and shape. Each dimension, in turn, has two or more values. For example, color may be red or white; size may be large or small; shape may be circle or square. An experimenter will, typically, choose a dimension, say color, and divide the drawings on the basis of the different colors. The subject must guess the dimension used for the classification. In more complicated experiments, multiple dimensions may be involved in the experimenter's classifying rule (the popular family game, Mastermind, is a modified, concept identification experiment using color and position as classifying dimensions).

We now summarize the psychological research on concept identification. Psychologists see this strategy as a search process. The most popular view holds that the search takes place among competing hypotheses -- "hypothesis testing". Hypothesis testing need not imply a conscious, systematic

14 Interestingly, much research activity in international relations can be characterized as concept identification. Nations, for example, are classified as developed/less-developed, large/small, Communist/non-Communist, nuclear/non-nuclear, etc., in the hopes of finding a classificatory rule which will prove productive in a particular, research context.
process since subjects cannot always describe their strategies even when responding successfully to stimuli. In general, subjects employ a "win-stay, lose-shift" approach in concept identification experiments. They stay with a hypothesis until proven wrong, then shift to another hypothesis until the right dimensions are located.

Further, subjects do not choose randomly among all hypotheses. As in frame finding, they search for salient cues as clues to promising hypotheses. Hence, to encourage concept identification, or indeed, any discrimination task, relevant cues should be emphasized to encourage the correct coding response, hence, simplifying the initial search problem. Additionally, moving from simple to complex cues is the best way for promoting discrimination learning.

15 The classical study on concept identification showing subjects need not always deal with conscious hypotheses and well-formulated search procedures to operate successfully can be found in C.L. Hull, "Quantitative Aspects of the Evolution of Concepts," Psychological Monographs, Vol. 28, Whole No. 123 (1920). For much descriptive material on the hypothesis testing approach to concept identification, see J. Bruner, J. Goodnow, and G. Austin, A Study of Thinking (New York, Wiley and Sons, 1956).

Another key finding: it is very difficult for subjects to alter perceptions of cue usefulness. If a cue that was irrelevant in past, concept identifying tasks suddenly becomes relevant, subjects very rarely discover the change in cue relevance. They are far better at discovering the relevance of newly introduced cues. With this point in mind, it is understandable that governments often find the switching of ambassadors or foreign ministers an effective way of signaling policy changes.

Finally, with complicated, concept identifying tasks, the use of memory in hypothesis testing is gravely degraded. When faced with complex stimuli, time pressure, or multiple, concurrent problems, subjects regress to "no-memory" techniques.

Concept identifying basically involves deciding which stimuli to attend to. Find the relevant stimulus dimension and your problems are solved. This selecting of relevant stimuli is implied by "encoding" in psychology.

---

17 For work on learning rates with various cue combinations (using flower designs as stimuli with variations in leaves, color, and stem/leaf angles), see T. Trabasso, "Stimulus Emphasis and All-Or-None Learning in Concept Identification," Journal of Experimental Psychology, Vol. 65 (1963), pp. 398-406. For research on the effects of redundant cue and new cues on learning in concept identification experiments, see T. Trabasso and G. Bower, Attention in Learning: Theory and Research (New York, Wiley and Sons, 1968). For an overview of the research literature on concept identification, see R. Millward and
Unfortunately, cognition usually requires more than encoding skills. The ways in which encoded information might be used is often very problematical. Such concerns move us to another intra-frame strategy — rule learning.

Rule learning experiments in psychology are a straightforward extension of concept identification designs with one exception. Rule learning tasks involve both stimulus encoding demands and the learning of some, non-trivial rule. Code breaking and interpreting, for example, might be considered a complex exercise in rule learning.

In general, rule learning research in psychology has focused on artificial tasks such as sorting geometric designs (differentiated by size, color, form, and number) or extending a given, serial pattern of letters or numbers. Hence, the actual rule descriptions discussed


in the literature hold little political interest. Certain, general, psychological lessons, however, have emerged which are noteworthy.

First, rules that make the greatest demands on short-term or working memory are the hardest to learn. The more factors to be recalled while applying a rule, the more difficult it is to learn. Multilateral negotiating rules are more difficult, for instance, than bilateral ones (this is one, cognitive advantage of Israel's current, bilateral negotiating strategy over Carter's old Geneva Conference approach). Second, the learning of a rule is not tied to only one, unique cognitive processing mode. Greene and Simon have shown a given rule for completing a number series can be executed in many ways, involving trade-offs between memory demands and computing demands. One might choose a


mental method that minimizes memory load at the expense of more computation or vice versa.

Before ending our survey of rule learning we briefly note here its relevance to Lawrence Kohlberg's stage theory of moral development.

Kohlberg argues seven, universal stages characterize man's moral development. First comes the premoral stages encompassing: 1) a punishment/obedience outlook, and 2) a "back-scratching," reciprocity outlook. Next, follows the role conformity stages: 3) "good-boy" morality, and 4) law and order morality. Finally, the stages of self-accepted moral principles appear: 5) social contract morality, 6) universal principles of conscience, and 7) post-conventional religious, "nonegoistic," cosmic outlook. These stages can be interpreted as seven, separate frames differentiated by increasingly complex, moral rules.

Kohlberg's stages represent a progressively, more abstract and sophisticated distinguishing of values. For example, the premoral stages make no distinctions between

20

All this implies is that rule learning is not cognitively synonomous with rule use. For our purposes, it is enough to distinguish the two without dealing with the cognitive details. Rule learning is here treated as a frame maintenance process; rule use is an artifact of frame selection.
egocentric, social, or ethical concerns. As one moves up the stage sequence these distinctions are made progressively finer via increased abstraction. All this in turn demands increasingly complex encoding processes. Further, the higher stages require more sensitive, situational refinements than the lower ones; more factors are weighed as one progresses higher and ambiguity amounts. Rule learning research would, therefore, predict the higher, moral stages are the hardest to learn and apply because of increasing encoding and memory demands. Kohlberg's research, in fact, suggests this is the case. Intellectual development seems necessary (but not sufficient) for high moral advancement.

One would also predict the appearance of "moral slippage" under stressful conditions involving time pressure; multiple issues, and complex stimuli. High-order morality places great demands on memory, and research indicates people revert to "no-memory" techniques when


pressed.

So far, we have covered two, intra-frame strategies -- concept identifying and rule learning. Both approaches are constructive (in contrast to reconstructive) in nature -- that is, they modify frames largely by using new, incoming data, as opposed to the recalling of old data. We now introduce a third, constructive process derived from psycholinguistics called the Given-New strategy.

Sentence comprehension has been a major focus of psycholinguistics for the last fifteen years. The results reveal no simple correlation between acoustic stimuli and the listener's comprehension. Hence, stimulus-response models will not suffice. Listeners, it seems, must use prior contextual information for understanding most sentences. Accordingly, a speaker will embed his sentences with local cues to guide listeners to the correct, interpretive context.

One method of interpretive guidance is the use of presuppositions. A speaker will syntactically mark off each sentence in terms of "given" and "new" information. The "given" portions of a sentence act as cues allowing the listener to quickly select the proper context from memory. This, in turn, promotes the integrating of new information. For example, in the sentence "Henry Kissinger, former Secretary of State and one of the foremost US experts on
international affairs, spoke today on the dangers of Eurocommunism," the relative phrase (former Secretary of State and one of the foremost US experts on international affairs) is a syntactical device telling the listener this is old information and should be integrated with the new information concerning Kissinger's views on Eurocommunism. The whole process is called the Given-New strategy of sentence comprehension.

The Given-New strategy can, I believe, be extended from sentence comprehending to frame maintaining. In particular, modifying a frame in the face of incoming information, will be made easier by dividing that information in a given-new fashion. Teachers, for example, find it useful to begin a lecture by briefly summarizing the last one instead of jumping directly into new material. Besides the pedagogical advantage of repetition, a brief, opening summary provides continuity between the current and previous lectures; hence, easing the student's learning

22


For a discussion of sentence comprehension and the research evidence showing context is necessary for understanding, see E. Wanner, "Do We Understand Sentences From the Outside-In Or From the Inside-Out?" in Language As A Human Problem, ed. by E. Hauger and M. Bloomfield (New York, W.W. Norton, 1974), pp. 165-185.
task. Historians, moralists, and political pundits also employ a given-new approach when they link present circumstances and past canons to preserve some desired outlook. Propagandists, too, exercise the given-new technique with great effect. Communist regimes, for example, sell major shifts in party line by pretending such changes are natural outgrowths of past precepts. A sense of continuity, even if invented, usually has a soothing, public effect; hence, preserving the "infallibility" of Marxist Socialism, while allowing, necessary adjustments to the exigencies of politics.

Using the Given-New strategy, one can distort information in at least three ways. First, elements of the retrieved frame may be altered to admit the incoming information. Second, the "given" part of the incoming information may be distorted to fit a desired frame. Third, the "new" part of the incoming information might be distorted to fit a desired frame. Distortions can take such forms as

23 Interpretive abuses often occur when history is used to preserve or strengthen some favored frame. In Oct., 1971, the Shah of Iran, for example, celebrated the 2,500th anniversary of the Persian state. The observance had, of course, more to do with the Shah's pretensions than with past remembrance. For an interesting essay on this and other abuses of history, see B. Lewis, History: Remembered, Recovered, Invented (Princeton, Princeton University Press, 1976).
over-generalizing, false inferences, and mistaken discriminations.

Yet, despite these distorting possibilities, the Given-New strategy is an effective way of assimilating new information while preserving old frames.

All the intra-frame strategies treated so far (concept identifying, rule-learning, and the Given-New strategy) are constructive processes. They "build" mainly by using incoming information. These processes include such things as generalizing, summarizing, and inference-drawing to aid understanding. We argued such frame maintaining activities allow frames to adjust to incoming information and, hence, were necessary for comprehension.

But, not all frame maintaining processes are constructive sorts. Reconstructive processes, connected largely with recall, also play a frame maintenance role. We turn now to this fourth sort of intra-frame strategy, reconstructive processing.

Whenever we orient ourselves within the world, we rarely find the foreground of our evoked frame or frames sufficient for our needs. Orienting is a process where we move, sometimes gradually, from greater uncertainty to lesser uncertainty, from greater perplexity to lesser perplexity. This gradual sharpening of understanding, especially in new situations implies we comprehend initial
stimuli imperfectly and must hold them in working memory for more reflecting. We then retrieve information from frame background hoping to clarify the meaning of the stored stimuli and, hence, sharpen our sense of orientation.

Reconstructive processes are those "background recall" strategies that provide the data needed for deciphering incoming information. In this manner, reconstructive processes promote frame adjustment and improve our sense of orientation.

At times, reconstructive strategies can lead to information distortion. This happens when background information is recalled inaccurately as a means of maintaining a frame.

In general, people do not passively store and retrieve information. Rather, information, both when stored and retrieved, is restructured to fit one's world knowledge and expectations. Remembering, therefore, is a sort of problem-solving that is inseparable from a person's general reasoning processes. In particular, remembering might be used as a device for "solving" frame maintenance problems. "Remembering" distorted background information is one type of frame maintaining "solution."

Information can be distorted in many ways to "artificially" maintain frame integrity. Some examples:

1) incomplete recall based on presuppositions — e.g., the item "Senator Joe McCarthy says the
State Department is soft on Communism": might be recalled simply as "the State Department is soft on Communism."

2) overgeneralization -- e.g., "two research findings support my theory" might be recalled as "many research findings support my theory."

3) false discrimination -- e.g., "Nixon is supported by wage-earners" might be altered to "Nixon is supported by wealthy wage-earners."

4) reassociation of elements -- e.g., "corruption leads to weakness" might become "weakness leads to corruption."

5) inventions -- inventing items to fill in memory gaps and preserve coherence; e.g., a young boy, when asked who Martin Luther King was, replied he believed King was some king in Europe.

In general, research suggests people store overall themes with scattered, illustrative details. Themes are less easily forgotten than details. When forced to retrieve these items from background, reconstructive processes are used to cover up gaps in detail. Often, these reconstructive moves produce "fillers" of acceptable accuracy -- e.g., when drawing correct inferences from background presuppositions. Harold Garfinkel, for example, in his studies on conversation, found a speaker leaves much unsaid
and depends on the listener to fill in the missing conversational links. Conversing, it seems, requires continuous reconstructing. Since people, in general, cope reasonably well when talking, reconstructive techniques seem to have great efficacy.

Further, reconstructive moves may be crucial for the creative, reassociating of ideas desired in problem-solving. Indeed, some evidence suggests that total recall, as a substitute for reconstructive faculties, actually inhibits the creative integrating and inferring of ideas. Creative thought stresses novel exploratory reassociation, not perfect reproduction. In this vein, foregetting, by calling reassociative mores into play, may paradoxically be a necessary component of creativity.

The last intra-frame strategy to be considered here covers expectations. Earlier, we studied expectations in the context of frame retrieval. We noted expectations played a prominent role in rating the fit of a particular

---


Many techniques in memory training rely on the use of themes and reconstructive processes for the recalling of details. For a nice review of many such techniques, see K. Higbee, Your Memory: How It Works and How To Improve It (Englewood Cliffs, N.J., Prentice-Hall, 1977)

frame initially retrieved from long-term memory. If the expectations connected with the retrieved frame were badly disappointed, the search for a better frame was likely to continue.

But, expectations can be used for more than testing frame fitness. They can also guide the search and assimilating of new information. Once an orientating frame suits a person, expectations shaped by that frame predispose him to notice certain things, neglect other things, draw certain inferences, ignore other inferences, recognize certain choices, and pass over others. Expectations are perceptual hunches about the world's character. When accurate, they quicken data collecting, selecting, and assimilating. Unfortunately, when inaccurate, they cognitively fix unsuitable frames insulating them from inconsistent information (usually by neglect and oversight) until some disaster jars one into a frame finding mode.

Examples of expectations paving the way to disaster in diplomatic and military affairs are legion. The reader

is invited to insert his favorite ones here. We should note, however, expectations are a valuable and necessary, albeit fallible, means of fitting new data into pre-existing frames. The demands for orderly, timely, consistent, and coherent information require its use.

So far we have treated intra-frame strategies. As noted earlier such strategies involve maintenance moves dealing with a single frame (hence, the term "intra-frame" strategies). We now turn to inter-frame, maintenance strategies.

Like their intra-frame counterparts, these strategies modify frames in the light of new information. Unlike their intra-frame counterparts however, they handle more than one frame. Two such strategies will be discussed here -- frame comparing and keying.

Frame comparing basically is the changing of one frame by comparing it with another, often very different frame. One common form of frame comparison is reasoning by analogy. To sharpen the orienting or integrating power of a given frame one seeks analogical guidance from other frames. In international politics, analogical frame comparing is usually historical. Elsewhere, the character of historical
analogy has been developed in some detail; hence, an example should suffice here.

Immediately following World War I, it became clear to a small circle of men warfare would be radically changed by the tank. The details, however, of this new, military future were unclear to most except the military theorist, J.F.C. Fuller. The method he used to update his outlook was frame comparison in the form of analogy. In particular, he compared future land warfare with naval warfare, arguing naval tactics could be superimposed on land warfare by the use of tanks. The accuracy of his analogies was remarkable. For example, consider this excerpt from a February, 1920 lecture:

I see a fleet operating against a fleet not at sea but on land: cruisers and battleships and destroyers. My astral form follows one side and I notice that it is in difficulty; it cannot see; there appears an aeroplane and gives it sight. It says by wireless telegraphy the enemy are yonder. The approach march begins. I see a man in one of the aeroplanes whose head is swollen with the future;

27 For a discussion on analogies in the context of historical evaluations, see D. Sylvan and H. Tamashiro, "Program Evaluation in Foreign Policy and International Politics," Dept. of Political Science, Ohio State University (1976), mimeo, pp. 53-56.
he is the Commander-in-Chief of the land fleet I am following. Suddenly I see the fleet is moving a few points north-east; the Commander-in-Chief has spoken to it by wireless telephone. I sniff the air; it seems impure. Is it gas? The Tanks submerge; that is to say, batten down their hatches. The battle begins.

Out go the mine-sweepers; we are in the enemy's land. A series of detonations show that the act was not executed a moment too soon.

The enemy's fleet concentrate their fire on the gaps made. The Commander-in-Chief is again talking. A small squadron moves to the north, tacks east, and huge clouds of smoke pour across the sky. New gaps are made and the fleet moves through.

Then I see the old scene re-enacted -- the contest between armour, gun-fire, and mobility.

The enemy is disorganized, demoralized; his flag aeroplane has been brought down; his brains are paralyzed; it is now the pursuit.

---


We should note here the dangers of frame comparison via analogy. If the analogy proves inappropriate serious distortions might arise. For example, in contrast to the usefulness of Fuller's tank-battleship analogy, consider the disastrous effects of a remarkably similar line of reasoning used by the French in waging, not a conventional war, but a guerrilla war.
A similar, but perhaps more carefully refined version of frame comparison often occurs in the sciences. Lindley Darden, for example, has argued genetics emerged as a clearly defined, scientific field largely by using a frame comparing form of reasoning. Her schema:

1) Problems posed by observations were generalized to produce
2) a general form of the problem, which was linked analogically to
3) general forms of similar, solved problems found in other areas.

In 1953, faced with strong Viet-Minh activity in South Vietnam a central highlands, the French formed a highly mobile regimental task force (Groupement Mobile 100 -- GM 100) to clear the area. In theory the task force, richly equipped with tanks and mechanized infantry, was to operate independently of other units. Like a naval fleet, it was to sally forth into enemy held territory, moving fast and striking hard with its massive firepower. In practice, the French found themselves roadbound while the Viet-Minh used the jungles to nullify French mechanized mobility and firepower. The Viet-Minh infantry emerged from the jungle to strike wherever and whenever they pleased and then disappeared back into the jungle. By July, 1954, GM 100 had been cut to pieces by a series of ambushes. See Bernard Fall, Street Without Joy, 4th ed. (Harrisburg, Pa., Stackpole, 1964), pp. 185-250.
These general problems and their solutions, in turn, were used to construct

4) a general solution that was then particularized to produce

5) a plausible solution for the original problem, which started this whole line of inquiry.

Darden's work is just one of many others in the philosophy of science that stresses frame comparing in scientific discovery.

But, perhaps the most interesting example of frame comparing in the sciences comes from quantum mechanics. Here, at the very cutting edge of research into the basic properties of matter, physicists use frame comparing not merely for problem-solving, but for orientation and intuitive understanding of their own mathematical theorizing!

Contemporary physics suggests elementary particles (e.g., electrons, positrons, photons, neutrinos, etc.)

---

For a brief summary of Darden's work on the emergence of genetics as a scientific discipline, see Frederick Suppe, "Afterward," in The Structure of Scientific Theories. 2nd ed., ed. by Frederick Suppe (Urbana University of Illinois Press, 1977), pp. 687-688.

For other works stressing the importance of analogies in Science, see N. Hanson, Patterns of Discovery (Cambridge, Cambridge University Press, 1958), and M. Hesse, Models and Analogies in Science (Notre Dame, Indiana, University of Notre Dame Press 1966).
cannot be perceived independently of their interactions. Particles are not separate entities. To mathematically describe particles together with their interactive properties, physicists construct theoretical models for particles called quantum fields (each type of particle has its own model or quantum field — photons have a photon field, electrons have a Dirac field and so on). Physicists are now trying to mathematically integrate this "quantum mechanics," encompassing the "very small", with cosmological theories dealing with the "very large." But, a major hang-up in this enterprise is the difficulty of interpreting the mathematical results. Writes Christopher Clarks:

Since the structure of space-time is itself a dynamical variable, and not merely a fixed arena for other events, it must itself be quantized: firstly, because its source is composed of quantized fields; and, secondly, because it seems likely that there are regions of the universe where the space-time curvature is characterized by a length-scale small enough to be in the quantum domain. But the quantization of space-time is not only technically difficult. In addition, the removal of both a fixed background space-time and a reliable particle-representation leaves very little structure on which to hang an interpretation of any formalism proposed.

This...point leads one to the central difficulty of quantum cosmology: if everything is quantized — space, time, particles, observers — then everything dissolves into a structureless haze from which it is impossible to extract any semblance of concrete reality.
Clarke goes on to quote Heisenberg's 1930 prediction of just this sort of interpretive poverty should the whole universe be conceived as a single system. Clarke then notes:

The more cosmology has developed, the more this observation of Heisenberg has been confirmed, that the simple extension of quantum theory to the cosmological domain yields a mere "mathematical scheme" that stands in need of something else before physics can emerge. For him this addition comes through alternative descriptions which...are "complementary to quantum theory in being compatible with it, but not decucible from it. 30 (emphasis added)

In short, what cosmologists require is some frame comparison to add interpretive flesh to their emerging mathematical skeleton. Without the orienting properties of another, dual frame, they are left with an uninterpreted "mathematical scheme." One is unlikely to find a more

---


31 This interpretive quandary in quantum mechanics may hold some lessons for theorists in international politics. Not many current theories in IR, for example, offer the mathematical structure, together with the breadth of scope, found in R.J. Rummel's status-field theory. Yet, Rummel's work has been greeted with little enthusiasm by the discipline. This unresponsiveness is, I believe, due in large measure to the unconvincing substantive interpretations underlying much of Rummel's formalisms (e.g., "social forces" linking attribute vectors to behavior vectors). Had Rummel's framework produced impressive
dramatic example illustrating the importance of frame comparing for cognitive orientating.

In general, frame comparing is one of the more valuable and more difficult perceptual strategies to execute. Clearly, it is important for creative thought when old, exhausted lines of interpretation must be overcome and new paths sought. Unfortunately, frame comparing demands a lot of predictive results, his interpretive shortcomings would probably have been sympathetically overlooked by IR specialists (as is true among psychologists vis-a-vis their regression analyses and "bootstrapping" techniques).

cognitively because often, seemingly unrelated frames must be retrieved from long-term memory and held in working-memory for reorganizing and analogizing efforts. But, too, the rewards are potentially very large because frame comparing appears to be the strategy which, more than any other, captures the spirit of what we often celebrate as creative insight.

We now consider another inter-frame, maintenance strategy called keying. The term "keying" was coined by Erving Goffman to refer to moves that tag frames as rehearsals or drills instead of as "real, serious" performances that matter. For example, football practice is a keying of football games; a flight simulator is a keying of actual flights; a dress rehearsal is a keying of actual, stage performances. In general, keying encompasses such activities as contests, ceremonials, practice sessions, demonstrations, and controlled experiments. Within the context of inter-frame maintenance, keying is important because it offers a way of altering old frames in the face of new information.

The military, for example, spends most of its time preparing to fight wars, not actually fighting them. Given the sporadic, unpredictable nature of wars, generals cannot

---

rely on them to keep their knowledge of warfare "current."
Hence, to keep abreast of new tactics, strategies, weaponry,
and so forth, they rely, in large measure, on keying in the
form of war-games and military exercises. In this manner
(in theory at least), military frames are updated without
the stimulus of war.

Of course, like all of the other orienting strategies,
keying is not fool-proof. It may prepare one for the wrong
contingencies, or lead one to learn the wrong lessons.
Military exercises on the proper use of cavalry, for
instance, will be of questionable value when one's neighbors
are converting to the tank. Further, keying can lead to
the blurring between the practice frame and the genuine
frame being keyed. In particular, legal and moral

33

The following, funny example of keying confusion was
reported by the Agence France Presse:

Army war games in central Finland nearly ended
in disaster when a hunting party opened fire on the
troops, it was reported here.
Parachute troops ambushed the hunters and shot
at them with blanks, believing them to be "enemy
forces." But the astonished hunters returned the
fire with live ammunition.
However, the misunderstanding was soon cleared
up, and no one was hurt.
restraints may be weakened as military exercises and the "real thing" become increasingly indistinguishable. Launch exercises on Polaris submarines, for instance, are really no different from the genuine article. Electronic battlefield sensors and the "automated airstrikes" they made possible in Vietnam possessed a similar, disturbing, "antiseptic" quality free of moral or humane concerns. When bomb delivery becomes fully automated ("removing the pilot from the control loop"), airwar-fare might easily fade from public awareness altogether, further weakening moral constraints.

So far, we have covered frame finding and frame altering strategies. The first class of strategies dealt with ways people go about selecting the proper frame to orient themselves and to interpret events. The second class of

---

34 For a good description of the airwar in Vietnam, together with the innovative, technological advances introduced, see R. Littauer and N. Uphoff (eds.), The Air War In Indochina (Boston, Beacon Press, 1972).
strategies dealt with ways people modify frames already "activated" so as to accommodate the receipt of new information. We now turn to a third class of orienting strategies -- fixing or stabilization strategies.

Faced with the task of orienting themselves, people are often caught between two, competing demands. On the one hand, they must be sensitive to new information and alter perceptions accordingly (Hence, the need for frame altering strategies); on the other hand, they must guard against information overload which can lead to paralysis. It is this second concern that we address here. How do people protect themselves from the shocks associated with new information and rapid change?

Research on the perception of motion and changes offers a general answer. In normal viewing, haphazard and sudden changes are exceptional. Events are seen as local changes within a stable frame of redundant information. Our sensory systems are designed to preserve this stable frame. Constancy is expected; surprise is minimized.

Under this setup, sensory reserves can be focused on "really" significant changes while sensory changes of less significance are coded as predictable states. In this fashion, the amount of unpredictable information is minimized, and with it, the danger of overloading our cognitive
processes. Once a frame is established, only information needed for updating need be processed closely; all redundant information is discarded.

This established frame, in turn, determines which sensory changes are perceived by us as "events". Hence, events are determined both by sensory inputs and the frame within which these sensory inputs will be assimilated. No way exists for predicting, solely on the basis of sensory inputs, which patterns will be regarded as events. It is in this sense that our perceptions are context-dependent.

To understand and operate in the world, we must have some stable, conceptual representation of that world. This representation helps organize and interpret new, incoming information. Because this representation is so crucial, our perceptual apparatus is biased towards frame preservation. Our perceptual system is designed to "frame fix."

To act on one's perceptions and beliefs demands stability in one's outlook; i.e., in one's frame. The greater the demands for action, the greater this desire for stability. B. H. Liddell Hart, for example, once noted soldiers tended to be nonreflective. Reflection led to doubts and hesitation -- qualities not often rewarded in wars. Mediocre plans quickly and boldly pursued have, not infrequently, triumphed over brilliant plans tardily and timidly executed. The point: perceptual orienting, if it
is to pave the way to action, must admit strategies of frame preserving (fixing strategies). Such strategies are necessary to ward off the evils of draft of paralysis.

Frame preserving strategies are necessary for another, related reason. Because information in a frame is an interrelated, consistent, and coherent unit, limited incremental changes in these interconnected elements often cannot be made. If changes are necessary, they often are huge changes, perhaps even frame switching ones. Clearly, such upheavals require much cognitive effort and, hence, cannot be undertaken lightly. The need must be acute.

Consider, for example, the focused quality of moral crusades. The necessity of holding firmly to a single perspective when engaged in moral reform is perhaps best illustrated by "True believers" bent on establishing a new, just, social order. Such aspirations demand a unanimous society with a single theory of excellence. Such a society would not necessarily be more virtuous -- it would simply be unanimously unaware of its evils. The unanimous society, however, can get very excited about the evils it does see.

In contrast, a pluralist, information-rich society will have abundant knowledge about evil, but would get less excited about it. To the extent it does get excited, it becomes less pluralistic and less tolerant.

To create the unanimity and resolve demanded by a crusade demands information control. The hypnotic impact of evil resides in its details, and details are what people forget first. To restore virtue requires holding particular evils in mind long enough to grapple with them. Distraction, complication, qualification, moderation, and relaxation must be avoided.

John Brown, Lenin, Khomeini, and Ahab in Moby Dick achieved this single-minded insularity. Such heroic concentration teaches that an effective attack on corruption requires a narrowing of perspective and a severe rationing of information. For this reason, crusades to retrieve virtue require censorship.
Until the need for such drastic changes becomes unmistakable, it is often more reasonable to be conservative and employ preservation strategies to shore up old, proven frames. Such behavior, moreover, are generally consistent with the "economy of cognitive effort" principle.

Fixing or stabilizing strategies operate basically by eliminating or deflecting burdensome information from a frame. In general, such strategies satisfy both cognitive and motivational needs. We shall consider four such fixing strategies -- limited access, cognitive consistency, idealization and stereotyping, and ad hoc constructions (see the third column of Table 1, p. 65).

Earlier, when talking about retrieval cues, we noted the encoding specificity principle that states only cues stored as part of an event's memory trace are useful for frame retrieval. This principle suggests, given a particular set of cues, some frames are less likely to be retrieved than others. In particular, those frames that are weakly associated with a few cues are less apt to be activated than frames that are strongly associated with many cues. Further, infrequently activated frames cannot be readily challenged by new information; hence, they are

36 This observation, might, in part, explain why ethical considerations sometimes receive little attention in foreign policy-making. During the Cuban missile crisis, Secretary of the Treasury Douglas Dillon was persuaded by ethical arguments to move from a "hawkish" airstrike position to a "dovish" blockade one. More interestingly, Dillon confessed
less likely to change because of external pressure (such frames are, however, subject to changes due to forgetting). What one does not think about cannot be consciously altered. This process of cue encoding so that a frame is rarely retrieved and thereby protected might be termed the "limited access" strategy. For example, during the relatively peaceful years preceding the First World War, the general staffs in Europe largely neglected economic and financial arrangements in their otherwise elaborate, mobilization plans. This economic "absentmindedness" flourished because past military experiences did not require long-term national, economic efforts. Moreover, few cues existed during peacetime to prod generals into reconsidering their old, economic perspective. Hence, the increasing coordination demanded by modern industry, the complex financial arrangements required, even the vulnerability of vital supplies from abroad (e.g., France depended on Germany for her phenol supplies) all escaped the notice of the generals. In this case, the success of the limited access

he had not even considered the moral implications of an airstrike until they had been brought to his attention. Up to that point all the cues addressed (i.e., the intelligence reports, Soviet strategems, US counterstrate-

gems) were strongly associated with political/military frames; hence, it is understandable how key US decision-
makers might become locked into such a perspective.

37

approach was complete. The amount of outdated notions preserved was prodigious.

It would, however, be misleading to conclude that the effects of the limited access strategy are always mischievous. The limited access approach can also preserve beneficial frames. For example, the US has often enjoyed the goodwill of foreigners stemming from past, mutually rewarding contacts. Perspectives formed by Filipinos because of pre-World War II, American education policies in the Philippines and current perspectives carried by Saudi graduates of American universities have produced, and probably will continue to produce mutual benefits for all parties concerned. Such favorable attitudes are given longer life whenever limited access processes are at work.

A second fixing strategy is the cognitive consistency approach. With cognitive consistency techniques one protects a favored frame from inconsistent information by discounting or discrediting the information. Only information that is consistent with one's frame is assimilated.

This strategy is derived from Festinger's cognitive dissonance theory; however, certain, key differences exist between Festinger's theory and my use of cognitive consistency.

38 Festinger introduced his cognitive dissonance theory in L. Festinger, A Theory of Cognitive Dissonance (Stanford, Stanford University Press, 1957). For a discussion of
First, Festinger argues people are made uncomfortable by dissonance and are, thus, psychologically motivated to reduce it. I make no such motivational claims. In this paper, cognitive consistency is simply one of a number of frame preserving strategies a person might employ. The deep, motivational reasons propelling a person towards such a strategy are not investigated here.

Second, Festinger argues people will protect themselves from stress by actively avoiding information likely to increase dissonance (i.e., "selective exposure"). Again, no such claims are made here (in fact, I have argued elsewhere political decision-makers can be highly motivated to seek dissonant information). The cognitive consistency strategy may indeed be employed with avoidance techniques (e.g., when no promising policy alternatives exist except the one chosen); however, cognitive consistency does not, in principle, require such techniques.

A third difference between Festinger's theory and the attitude toward cognitive dissonance adopted here concerns ________________________
cognitive dissonance within the context of international relations, see Jervis, pp. 382-406. Jervis also uses the term cognitive consistency in describing perceptual processes in international relations. But, his use of the term is much broader than the definition employed here. For Jervis, cognitive consistency is a family of processes used for assimilating new information into pre-existing images. Some of his processes include expectations, cognitive-effective balance, and source-message interaction. See Jervis, pp. 117-202.

39 Tamashiro, p. 44.
information gathering. Festinger's theory encompasses the seeking out of new information, the distorting of information, and the discounting of information to preserve consonance. Cognitive consistency, as understood here, implies only the latter. Cognitive consistency is a strategy of frame preserving by discounting or denying inconsistent information that comes to one's attention. Thus, while Festinger's theory has 'both additive and deflective components, the cognitive consistency strategy is only deflective in character. ("information deflecting" can take two basic forms. First, one can argue the contradicting information holds only for special conditions and, therefore, is not really relevant to the frame in question. Second, the validity of the contradicting information or its source might be challenged).

Like Festinger's cognitive dissonance theory, my use of cognitive consistency implies the following points. First, cognitive consistency is used to strengthen or stabilize a frame once a commitment has been made to it. Admittedly, this notion of a commitment is a troublesome one. At what point does a person decide a frame is satisfactory enough to warrent emphasizing frame fixing over frame finding? While this question admits no precise answer, one might argue the difference between "policy-formulation" and "policy-implementation" is often clear
enough in international relations to render the idea of frame commitment useful.

Second, like Festinger's cognitive dissonance theory, the notion of cognitive consistency requires some way of identifying information that is dissonant from information that is consonant. This problem becomes especially acute when moving from laboratory experiments to political events. I do not think a universal guideline can be formulated here. Dissonance or consonance is context-dependent. It is, in part determined by the particular, interpretive frame one is using. Further, even if two people work initially from the same frame, they may employ different altering or fixing strategies. This, in turn, may lead to different conclusions about the dissonance or consonance of a particular information set. For example, mathematics, which one might think contains the lest problematical of frames, has produced disputes involving dissonance/consonance questions (e.g., Are the results gotten via "proofs by negation" consonant with past mathematics? What of existence proofs or proofs by computer?). Such disputes encompass more than issues of mathematical convention and inference. They encompass personality traits and personal tastes. If the iron-like "logical imperatives" of mathematics cannot, by themselves, automatically decide the dissonance/consonance question, how much chance is there of formulating a precise answer in the far more contextually
problematic world of politics?

A third stabilizing strategy might be termed idealization. With this technique a frame is characterized in terms of ideals; hence, protecting it from contradicting evidence. Since the frames content is insulated by a "belt of ideals," incoming experience is always measured against "the perfect." The contest is an unequal one. Using ideals as a guideline, inconsistent information can then be safely acknowledged in one breath; but, quickly dismissed as exceptional in the next. Idealizing is basically, therefore, a disarming device. Moreover, by reducing frame content to ideals, idealizing softens the demands of cognitive processing; the reason ideals are "streamlined" without troublesome qualifications and dangling details.

A personal experience nicely illustrates the technique. I once heard a Marxist scholar deliver a lecture on the superiority of Communism over all other social orders. Social and liberal democracies suffered grievously by comparison; not because Communism was inherently better, as our speaker wished us to believe, but because he consistently compared Communist ideals with social-liberal democratic realities. When challenged by the less than perfect realities found in Communist states, the speaker perfunctorily acknowledged "certain imperfections." but dismissed them as temporary aberrations having little to do
with the "true" nature of Communism. A similar gambit proved popular among career, Army officers following the My Lai atrocity. Lieutenant Calley, it was explained, was not really a member of the professional officer corps. He did not embody the ideals of the Army. He was an exception, an aberration which, in no way, should be confused with the "real" Army. Accordingly, the dishonor of My Lai was Calley's, not the Army's.

A special form of idealizing worth noting here is stereotyping. Stereotypes are highly simplified and exaggerated traits associated with some group of people or objects. As with all other forms of idealizing, stereotypes preserve accustomed categories of thought from external interference (e.g., it would be very difficult to convince a KKK member the concept of race is an outmoded term of little scientific utility). Besides preserving categories, however, stereotypes also rationalize. They justify a particular code of social conduct towards the stereotyped group (e.g., all Blacks are lazy, therefore, black education can be neglected). In contrast, idealizing need not rationalize a particular code of social conduct (e.g., ideal types in scientific theorizing, Toulmin's ideals of natural order). In this sense, stereotyping is just one, special form of idealization; it is not the only one. Further, stereotyping, unlike idealization, always implies
some value judgment. Stereotyping carries with it some notion of emotional acceptance or rejection. In contrast, idealizing need not embody emotional elements. It can be used in emotionally, nonevaluative ways (e.g., a perfect gas in physics).

A fourth stabilizing strategy is the use of ad hoc constructions. The first three stabilizing strategies (limited access, cognitive consistency, and idealization) relied mainly on either "hiding" or "hardening" the frame to be preserved, or discounting the threatening information. Ad hoc constructions, in contrast, either change the frame to disarm contradicting, incoming information, change in the new incoming information to make it consistent with the frame, or seek new information to shore up a frame threatened by contradicting evidence.

Since frame changes are involved one can argue ad hoc constructions really belong in the frame maintaining category and not under frame stabilizing. However, because the sole intent of these frame changes is to disarm or neutralize information, I decided ad hoc constructions properly belonged in the frame stabilizing category (Recall earlier we observed Festinger's cognitive dissonance theory contained additive and deflective components, and that the cognitive consistency strategy only covered the deflective component — i.e., the discounting of new information. Ad hoc constructions encompass the missing, additive
component — i.e., the search for new information to resolve contradictions).

Ad hoc constructions involve limited frame changes designed simply to remove anomalies introduced by new information. It can spur a search for more information; it can lead to the discarding of old information; it can involve a combination of searching and discarding. Further, the consequences of ad hoc constructing can range widely from the routine to the revolutionary. It may involve little more than the rewording of old ideas. At other times, it may set the stage for spectacular frame alterings.

In a very influential effort, Imre Lakatos has distinguished between "progressive" and "degenerating" research programs in science. A progressive research program produces a sequence of theories derived from a core of permanent assumptions and an "outer belt" of auxiliary hypotheses. Each theory produced by such a program displays greater explanatory power than its immediate predecessor. In contrast, a degenerating research program cannot produce such a sequence of progressive theories. Moreover, such a degenerating program eventually cannot protect its core assumptions from new evidence without invoking ad hoc constructions. Accordingly, such programs are gradually abandoned in favor of more promising ones.

Lakatos' research programs can be thought of as frames. Unlike Lakatos, however, no guidelines are presented here to distinguish between "progressive" and "degenerating" frames. Lakatos was interested in characterizing the scientific perspective. My task is one of characterizing perceptual orientations, in general. Further, Lakatos views ad hoc strategems as "degenerating" from the scientific viewpoint. In accordance with the larger context of this paper, no such judgment is developed here.
First, they often are used to mask painful trade-offs. Faced with a large scale German arms build-up in the 1930's and the unpleasant possibility of an extended arms race, Britain produced an interesting pattern of cognitive consistency and ad hoc constructions. In particular, Walter Laquer identifies four stages in British thinking:

Stage 1) reports of German rearmament were inconsistent with earlier views and, hence, must be grossly exaggerated;

Stage 2) German rearmament reports were acknowledged accurate but Germany was so far behind she could never catch up;

Stage 3) Germany admittedly had achieved parity but this was of no military consequence since the Germans


Ad hoc strategems, viewed from a broader motivational and cognitive standpoint, may, in fact, have an importance not readily apparent within a philosophy of science context. Moreover, even within the narrower confines of the scientific enterprise, ad hoc strategems have not been totally without value. Quantum mechanics, for example, grew basically from ad hoc empirical role which were totally at variance with the classical concepts in which they were expressed. See David Bohm, "Heisenberg's Contribution To Physics," in The Uncertainty Principle and Foundations of Quantum Mechanics, ed. by W. Price and S. Chissick (New York, John Wiley, 1977), pp. 559-563. For Lakatos' views on research programs see I. Lakatos, "Falsification and the Methodology of Scientific Research Programmes," in Criticism and the Growth of Knowledge, ed. by I. Lakatos and A. Musgrave (Cambridge, Cambridge University Press, 1970), pp. 91-195.

faced potential enemies both in the East and West; Stage 4) Germany had achieved clear military superiority; hence, Britain had to appease her to avoid a disastrous war. Stage 1 is an example of cognitive consistency whereby incoming information is dismissed. Stages 2 and 3 are examples of ad hoc constructions where new information on German strength is acknowledged but neutralized. Only in stage 4 does frame fixing end, to be replaced by frame switching.

Second, ad hoc constructions are used to "explain" puzzling events especially when information searches are unsuccessful or impractical. For example, when the Soviet Union cut her armed forces strength in 1955, Secretary of State Dulles explained, in ad hoc fashion, this was due to Soviet economic difficulties. In this manner, Dulles preserved his image of a hostile Soviet Union in the face of contradictory evidence. An even more extreme example of ad hoc thinking involves General DeWitt, commander of the West Coast 6th Army Command during World War II. DeWitt was absolutely convinced Japanese-Americans (AJAs) posed a serious, domestic, security threat. When asked why no acts of sabotage had occurred, DeWitt explained this merely showed how disciplined and, therefore how dangerous the
AJAS really were. The "enemy," DeWitt believed, was waiting patiently for the right moment to strike a single, co-ordinated blow.

Ad hoc constructions are also used to maintain frames, which are so broad in scope as to be almost beyond direct contradiction, thus, requiring a minimum of stabilizing effort. This special class of "all-encompassing," orienting frames might be called "monopolistic." Examples of monopolistic frames include religious doctrine and ideology. This monopolistic character is perhaps best illustrated by Saudi Islamic belief where even ad hoc constructions appear superfluous:

A conversation with any Arabian makes it evident that to him, Islam is more an axiom than an idea.

42

According to Milton Eisenhower, Lt. General John Dewitt (Commander of the Western Defense Command), in a phone conversation with General Gullian (Provost Marshall), argued that:

"The fact that nothing has happened so far is more or less...omnious in that I feel that in view of the fact that we have had no sporadic attempts at sabotage that there is a control being exercised and when we have it it will be on a mass basis."

Arabian agnostics do not exist, because the questions of belief and faith that gnaw at the Western mind have never been raised. Even years of education and travel in the West are unlikely to affect the Arabians' outlook. "I have a Ph.D. in economics from the States," a senior officer who overseas all Saudi arms purchases told me. "I wouldn't call myself pious, but everything in the Koran is perfectly logical to me." For most Arabians, moreover, there is no "logic" separate from the Koran, and they will freely tell you that they know pork (forbidden in the Koran) tastes bad without ever having tasted it. While their belief is total, it is not necessarily abstract, and they see nothing incongruous in adducing the will of Allah to explain the most mundane fact or event. Nothing is profane to this very proximate God whose hand is everywhere. Men's accidents are God's purposes, and All is Divine Plan. The arrival of an extraordinary new machine or news of a moon landing may prompt the response, La illah il-Allah -- "There is no god but God." The likely reply to an impatient businessman who asks when his visa will be ready, is Inshallah -- "God willing"; or, when will the office
building be finished: **Maktoob** -- "It is written"; or,
will the Olympics ever be held in Riyadh: **Kullu**

43

**Shughlu** -- "It's all His work."  (emphasis in original)

Before concluding this section on stabilization strategies, it is useful to consider their overall reputation.

---

43


A similar example of a monopolistic frame can be found in the voodoo cults of Haiti. Voodoo's significance, according to Robert Crassweller, "lies in its encompassing quality, not as a religion only, but as a system of concepts, covering and explaining all human and supernatural activity, the bridge between the known and the unknown, between pattern and anarchy."

Unlike Christianity, which only offers doctrine and guidelines to personal behavior, Voodoo offers doctrine, social controls, a pattern of family relations, direct communication with natural forces, emotional release, dance, music, drama, theatre, legend and folklore, fertility, connections with ancestors, and medical treatments via herbs and ritual. As one Haitian student explained:

>You whites walk out in the morning and a butterfly crosses your path, and you think its pretty and forget it. But for some of us that butterfly would have significance that affects the entire day, even maybe an entire life. All events are connected -- it's a different world.

For more information on the comprehensive hold Voodoo has on the perceptions of Haitians and the resulting political implications, see Robert Crassweller, "Darkness In Haiti," *Foreign Affairs*, Vol. 49, No. 2 (Jan., 1971), pp. 315-329.
It is generally unfavorable. Often the stabilizing or fixing strategies are associated with the dangers of misperception. Cognitive consistency, idealization, and ad hoc constructions are usually linked with distortion, prejudice, rigidity, narrowness, unimaginativeness, and irrationality (in contrast, frame switching or altering often evoke the more glamorous possibilities of theoretical breakthrough, creative genius, etc.). Stabilizing strategies, like their brethren it should be noted, are indeed subject to misuse. But this is only half the story. Stabilizing strategies, again like their brethren, are necessary for successful adaptation. They preserve the valuable; they provide continuity of thought; they promote directness and simplicity of perception; they pave the way for action. Perhaps, stabilizing and conserving lack the glamour and glory inherent in creating and discovering. Nonetheless, all are required for survival.

J. V. Cunningham once noted:

This Humanist whom no beliefs constrained
Grew so broad-minded he was scatter-brained.

(Epigram 43)

Stabilizing strategies help us from becoming "scatter-brained".
I. Introduction

Before embarking on a study of problem-solving heuristics, it seems reasonable to identify some classes of problems, discuss their nature, and examine how they might be formulated.

In general, problems differ greatly in at least two ways: 1) in the amount of structure and preciseness they possess, and 2) in the nature of their solutions, if these exist at all.

Problems with much structure lend themselves, not surprisingly, to algorithmic treatment; however, we shall be more concerned here with the role of heuristics.

Heuristics, we shall discover, potentially play a much broader role than algorithms in problem-formulating and problem-solving. While algorithmic methods work only in highly structured, task environments, heuristics can be used in all problem settings. The usefulness of heuristics in such diverse settings will be sketched here. This discussion, in turn, will serve as a general background for the more detailed analysis of heuristic functions found in Chapter 4.
II. Some Types of "Problems"

When people complain about a "problem," they usually have in mind some vexing situation demanding change or some goal to be realized where the corrective course is unclear. The reasons for the obscurity of "solutions" are manifold. In accounting for this obscurity, we can identify at least four classes of "problems."

The first class I label paradoxes. Paradoxes are troubles arising from confused thinking, not from external references. In resolving a paradox, we recognize its imaginary character in that all uncertainties arise not from disputed facts but from mistaken meanings. Gilbert

1 The four-fold problem classification introduced here is for analytical convenience. I do not claim all problems can be neatly pigeon-holed without question. Intermediate hybrids, unfortunately, exist. But, I believe our present purposes do not require the tackling of these rather technical issues.

For an example of a problematic hybrid, having both "plight-like" and paradoxical elements, see Saul Kripke, "Outline of a Theory of Truth," Journal of Philosophy, Vol. 72, No. 19 (November 6, 1975), pp. 690-716. Kripke exhibits a version of the Liar paradox that depends on an "unfavorable" empirical situation rather than on a purely semantic or syntactic entanglement (e.g., self-referencing systems).

2 The definition of paradox stipulated here is somewhat specialized and is not universal. A common, alternative view associates the term with contradictions. In social contexts, a paradox sometimes refers to motivated actions producing unintended outcomes (e.g., the voter's paradox, the tragedy of the commons). At other times it applies only to motivated actions producing outcomes the opposite
Ryle describes them as:

...tangles brought about in our lines of thought when we treat one subject with a conceptual apparatus appropriate to another, or when we express one interest in idioms appropriate to another. Disparate systems or contexts of thinking have been knotted together. The dilemma is resolved when each line of thought or manner of speaking is put back into its proper place; the conflict is in the tangle and not in the lines themselves. 3

Paradoxes are man-made, conceptual obstacles arising from the misuse of language. In framing terms, paradoxes imply a joining of inconsistent frame elements or meanings. These inconsistent elements give rise to clashing implications or conclusions that coexist uneasily within a single frame. The sense of the paradox is felt most keenly when these clashing conclusions follow from seemingly consistent frame elements and correct deductions.

A rich source of paradoxes can be found in a class of language misuse called, in philosophy, the "category mistake." In ontology (the branch of metaphysics dealing of those intended (e.g., the Keynesian "paradox of thrift," where attempts to save more can, under certain conditions, reduce savings; the "arms race paradox," where military expansion to promote national security touches off an arms race, which actually reduces security). Contradictory qualities are not necessarily implied by the term paradox, as used in this paper.

See Arun Bose, Political Paradoxes and Puzzles (Oxford, Oxford University Press, 1977) for an alternative view.

3

For a lucid treatment of this subject see Gilbert Ryle, Dilemmas (Cambridge, Cambridge University Press, 1954).
with the study of being), categories are the most general classes possible for grouping things. Typical categories include space, time, qualities, and relations. Some words like "element" and "particular" can be applied to things in different categories. Other words, which have empirical content, like "green" or "soft," are limited to one category. Applying such words to the wrong category is known as a category mistake. The Russian cosmonaut who announced he did not see God in space was guilty of such an error. Physical objects, fields, events, etc., can be meaningfully assigned locations in space—but not God. To ask for God's location in space, like asking for the color of numbers, is not to raise a profound metaphysical issue but to confuse categories.

Algorithms are of little use in tackling paradoxes. Algorithms require well-defined inputs and problem specifications; but paradoxes, because they involve "tangles of meaning," cannot be neatly specified in such a fashion. Moreover, resolving a paradox demands that one's posited frame be changed in some, nontrivial manner. Algorithms are not fitted for such, major frame changes. They accept a frame as given while "cranking out" solutions defined in terms of that frame. Hence, algorithms basically leave

---

the frame intact. In so doing, they also leave intact paradoxes imbedded within that frame.

In contrast, heuristics, by their frame altering or frame switching actions, are able to produce the major, contextual changes needed to correct misuses of meaning. Heuristics can reach beyond the confines of a given frame to establish new associations or clarify meanings. Such moves, beyond the means of current algorithms, are required if paradoxes are to be resolved or redirected. Briefly put, algorithms "solve;" but, in a well-worn quip, "paradoxes are not solved; they are dissolved." And "dissolving" demands major frame changing -- something heuristics can do but algorithms cannot.

In international relations, clearing up confusions of language can have important, political consequences. Nevertheless, the majority of issues in international politics is not usefully classified as paradoxical. Political quandaries are made of more than misused words or misguided meanings. We must therefore consider other types of "problems."

A second class of problems might be labeled plights. These are difficulties that arise not because of language errors, but because of limitations inherent in a given frame or context. Plights cannot be solved; they can only be coped with or managed. Games, for example, are interesting in large measure because of the special plights imposed
by their rules and the opportunities afforded players demonstrate their skills within the confines of these plights. Consider, for example, the following rules that produce interesting "gaming plights": in football, only certain players are eligible to catch passes, the quarterback cannot pass beyond the line of scrimmage, offensive linemen cannot use their hands for blocking; in chess, the pieces can move and capture in only certain, prescribed patterns, white always moves first, the king's capture ends the game, and so forth. Plights, more importantly, characterize man's world, as well as his recreations. Consider, for example, the "core" plights of the following disciplines: 1) economics—man's desires are insatiable and the resources available to satisfy them are finite, 2) medicine -- all men age and die, 3) history -- man is time-bound, 4) mathematics -- there exist, in principle, limits on man's knowledge (Gödel's Theorem), and 5) politics -- men depend upon one another but their political desires conflict.

Many plights appear to be universal and independent of foreseeable contexts and circumstances -- e.g., no man is immortal, no man enjoys absolute power or perfect knowledge, no man can foresee the future, no man possesses absolute wisdom. When plights are of this sort, both algorithms and heuristics are of little use. In this context, heuristics might at best promote "plight-coping" by
redirecting attention from the plight to secondary, peripheral, "solvable" concerns.

Some plights, however, are clearly frame dependent. Progress in science, for example, can transform yesterday's plights into today's "solvable problems." For example, small pox in prescientific societies was a plight, today it is a medical problem nearly solved completely. In such cases, both algorithms and heuristics are valuable in their conventional, "knowledge-building" roles.

At times, the line separating plights from problems is unclear. It is difficult to know if one's knowledge base is potentially robust enough to transform a particular plight into a solvable problem. And even if one's knowledge is adequate, the power to put that knowledge to use may be missing. Medical researchers, for example, assume cancer is a 20th century problem; however, given the disappointing results so far, cancer may actually be a 20th century plight (in one observer's words, "a modern metaphor for death") and a 21st century problem. A similar uncertainty surrounds war. Is it a plight or a problem? Peace researchers assume it is a problem; but, the question really
remains open.

Even if one's knowledge base is potentially adequate and even if the power to realize this potential exists,

Whether war is a plight or a problem for the current generation of political scientists may be unclear; but, what is clear is the tremendous inadequacy of our knowledge base for treating wars. The "state of the art" in political science is nowhere close to providing the "preconditions for takeoff" into a war-free world. This conclusion, however, was by no means self-evident a couple of decades ago. Optimism was more fashionable, and perhaps more reasonable then.

The difficulty of estimating the potentials inherent in one's discipline is perhaps best illustrated by Kenneth Boulding's recent review of peace research contrasting his past hopes with the present's modest returns. Decrying the paucity of new ideas and the "niggling scientism" of American peace research, Boulding noted in his review:

I must confess that when I first became involved with the peace research enterprise 25 years ago I had hopes that it might produce something like the Keynesian revolution in economics, which was the result of some rather simple ideas that had never really been thought out clearly ..., coupled with a substantial improvement in the information system with the development of national income statistics which reinforced this new theoretical framework.

(Journal of Conflict Resolution, pp. 347-348)

Contemporary peace research, Boulding suggests, is not yet close to realizing its "Keynesian revolution."

Because solutions for plights do not exist is no excuse for passivity or despair. Even if complete solutions elude one's efforts, effective coping techniques need not. In particular, even if war is a plight rather than a problem, peace research should still excite great interest for the light it can shed on conflict management. What must be avoided in the sense of fatalism that once moved Great Depression economists to speak of depressions as "economic blizzards" - acts of God, like the weather, to which man had to patiently submit and endure without hope of moderation.

remedies may not be forthcoming. Knowing one's difficulties are neither paradoxes nor plights does not guarantee relief. Much more is required as the next two problem classes suggest.

Most quandaries in politics are treated neither as paradoxes nor plights. They are regarded as problems—that is, it is assumed some timely solution is attainable and worth striving for. At least two classes of such "solvable problems" can be distinguished—ill-defined problems and well-defined ones.

Well-defined problems are characterized by the following: 1) a standard, abstract problem representation with relevant background information (i.e., the frame), and 2) criteria for identifying a solution to the problem. A standard, abstract problem representation refers to some

As will become clear later (see pp. 152-156), the distinction between ill-defined and well-defined problems is not as sharp as I imply here. We are actually dealing with a continuum of problem formulations that differ by degrees in their preciseness and completeness.

But, for purposes of expositional clarity and convenience, I shall oversimplify matters somewhat and speak only of the modal differences denoted by the terms "ill-defined" and "well-defined." This terse treatment is adequate for our needs here.

It might be argued a third criterion for a "well-defined" problem is also necessary; namely, that the inference rules appropriate to the problem be known. Certainly, ill-defined problems often lack clear guidelines for identifying "acceptable" inference rules for generating solutions.
Admittedly, such inference rules are vital because in virtually all problems, some relevant information is presented in implicit, rather than explicit form. Such implicit information may encompass unstated givens, procedures, or even goals. Hence, knowing how and when to infer background information is often decisive. Further, inferences are often needed to retrieve background knowledge associated with a problem frame but which is not yet part of the problem solver's conscious data base. Therefore, might not the knowledge of appropriate inference rules be a useful feature distinguishing well-defined problems from ill-defined ones? After some reflection, I decided against this course for the following reasons.

First, knowledge of the proper inference rules for a given problem is tremendously demanding. Such strict standards are characteristic of only the most technically refined disciplines such as propositional calculus, the calculus of propositional functions, or the foundations of logic and mathematics. Hence, to adopt the "inference rules" criterion for identifying well-defined problems would automatically consign most problems to the "ill-defined" category. Certainly, all problems in international politics would be so classified. God, it appears, did not create the world after the logic of Russell and Whitehead.

Second, knowledge of inference rules is required to provide proofs, but may not be necessary for generating solutions. And the whole point here in distinguishing between ill-defined and well-defined problems is to focus on problem-solving, not formal proof-generation. That conscious inference rules are not necessary for generating solutions is demonstrated, for example, in the history of mathematics. Important mathematical advances have been made against very "well-defined" problems via intuition (e.g., Newton, Ramanujan, Klein, etc.), with formal proofs following much later. In Abraham Kaplan's terminology, the logic-in-use (i.e., the processes by which solutions are found) is often well beyond the scope of reconstructed logic (i.e., the explicit norms set by logicians to characterize rational inquiry). We often know things without knowing how we know them. In particular, intuitive insights reflect a logic-in-use that encompasses inference processes far beyond the reach of immediate awareness.

Third, and closely related to the two preceding points, our formal knowledge of inference rules for problem-solving is still in its infancy. Investigations into inference procedures outside the artificial domain of elementary logic is just beginning. For example, modal logic treats the structure of propositions about necessity, possibility, impossibility, contingency, actuality, and unreality.
Deontic logic treats propositions dealing with right and wrong, of what one ought or ought not to do. Fuzzy logic deals with propositions that can have an infinite number of degrees of truth, represented by numbers between zero and one (i.e., in fuzzy logic, we can know absolutely that an assertion is true only to some degree. In contrast, a branch of modal logic called probabilistic logic deals with the probability of an assertion being absolutely true. The two logics are different. Probabilities in probabilistic logic arise from imperfect information. Probabilities in fuzzy logic may reflect ambiguities in the nature of things rather than human ignorance alone. Multivalued logics treat propositions that can take on more than two truth values — i.e., propositions can be placed in categories other than True or False. These new branches of logic are moving us away from the narrow, inference procedures of propositional and predicate calculus towards the indeterminateness and flexibility required for handling everyday, practical problem-solving. But, much more progress is required, it seems to me, before the "inference rule" criterion can become a useful device for separating ill-defined problems from well-defined ones.

Interestingly, these activities seeking to broaden elementary logic were, in part, presaged by Ludwig Wittgenstein's monumental shift from the formal logic in his Tractatus Logico-Philosophicus to the ordinary language of his Philosophical Investigations. Wittgenstein in the Tractatus tried to describe the ultimate reality of the world, insofar as it can be expressed, in a logical language, specifically, the logic of Bertrand Russell and Alfred North Whitehead. However, he found this logic too rigid to cast reality. In his later Investigations, he switched to ordinary language as the subject and medium for philosophy. Ordinary language operates by rules that are indeterminate and flexible; it is an open language, in contrast to the closed language of formal logic. And this openness, Wittgenstein concluded, was necessary to deal with the "open" concrete world. Anything less would be too remote and artificial for handling the conditions of life.

These conclusions of the "mature" Wittgenstein, it seems to me, also apply to the treatment of problem types. To insist all well-defined problems obey the "inference rule" criterion is to relegate the term "well-defined
idealization of the problem in a different, "working" frame 8 within which the problem will be tackled. An example is the transforming of voting strategy problems into questions dealing with trees in graph theory. The tree networks represent an "idealized" problem representation of the original voting problem. Such a problem representation lets one use theorems in graph theory to extract solutions relevant to the original voting problem. Reasons for choosing a particular problem representation might include:

1) the initial frame for the problem may not be a practical one for problem-solving (e.g., the frame elements may be inaccessible, expensive, etc.),

2) a branch of science or mathematics may be relevant or convenient given an appropriate reinterpretation of the problem.

3) the initial frame for the problem may contain much irrelevant information that can be dropped.

problem" to the rarified realm of abstractions and ideals, far removed from most everyday affairs. I wish to preserve the notion of "being well-defined" for use in the political world. Accordingly, I shall willingly pay the price of inferential ambiguity in return for relevance when speaking of well-defined problems.


8 In this context, problem representation is a special case of frame comparison by analogy discussed later.
4) the initial problem frame may contain important gaps of information that are recognizable only after an appropriate reinterpretation of the problem, and

5) key relationships may only be recognizable under a suitable reinterpretation of the problem.

Criteria for identifying a problem solution is the second hallmark of a well-defined problem. The exact nature of these criteria will differ depending on the problem in question. If the problem, for example, demands an optimum solution, then some means of directly identifying this "best" solution will be necessary. If optimality is not required, then it need not be part of the "solution-recognition" criteria. The main point is some means of distinguishing successful solutions from unsuccessful attempts is required.

The frame structure offered by well-defined problems neatly meet the needs of algorithms. Standard problem representations mean well-defined, algorithmic inputs can be fixed; "solution-recognition" criteria mean algorithms can be found that reliably deliver solutions within the given, problem frame. To the extent that algorithms cover one's problem-solving needs here, heuristics are superfluous and probably less efficient.
The second class of "solvable problems" is the ill-defined category. Ill-defined problems lack one or more of the criteria characterizing well-defined problems. In particular, the proper problem representation or relevant background information may be in doubt, or the criteria for identifying a solution may be disputed. Contrasting the frame characteristics of well-defined and ill-defined problems is instructive.

Well-defined problems have an accompanying frame that encompasses all those elements comprising a satisfactory solution for the problem. Hence, the frame finding task for well-defined problems has been successfully completed even before problem solving begins. Moreover, with the proper frame given, the problem solver's information search will most likely be limited to the retrieval or related background information from memory. Hence, the frame altering tasks necessary for providing a solution can be handled in a rather smooth and systematic fashion by using reconstructive and frame maintaining expectation strategies (see chapter 2, pp 80 - 81). Also, since well-defined problems have suitable problem representations this means appropriate frame comparing analogies are assumed as "givens" before problem-solving starts. Finally, since explicit criteria for identifying a solution exist, the frame for a well-defined problem is clearly bracketed. We know both a
successful end exists for our frame activities and how to recognize it. This sort of frame coherence often eases frame fixing tasks so long as the original problem formulation remains unchanged. Therefore, for most well-defined problems, frame finding and frame fixing tasks are not relevant, while frame altering tasks are, in principle, straightforward. In contrast, the frame tasks for ill-defined problems are far more complex.

First, ill-defined problems may lack a suitable, agreed upon problem representation and/or relevant background of information. The proper frames required for treating ill-defined problems are, by definition, uncertain. Hence, frame finding and frame fixing tasks take on tremendous importance, in sharp contrast to well-defined problems. Much of the ambiguity and controversy in international politics springs from this sort of frame uncertainty. The current US debate over the meaning of Soviet heavy missile deployments is an example. Are the Soviets seeking superiority (the question implies a problem representation based on a unitary actor perspective)? Are their missile deployments merely the "patchwork" results of domestic, political logrolling (a bureaucratic politics perspective)? Or are their missiles the product of nonreflective operating routines (an organizational processes formulation)? How one chooses to frame the problem can go a long way towards determining the conclusions.
Moreover, frame selection tasks are often not straightforward choices between a set of clearly independent frame alternatives. Frame alternatives may be subtly related so that the advocates of different frames may not realize the perceptual discrepancy and, may unknowingly "talk past" each other. Embedded frames, for example, pose this danger.

Frames can be embedded within larger, more encompassing frames, like the successive layers of an onion. As one's perception expands, one's interpretation of a particular problem is apt to change. Herein lies one of the major reasons for the ill-defined character of many international relations problems. The fundamental difficulty with international politics is its multiframed "onion-like" quality where technical factors depend on the tactical, the tactical depends on the strategic, and the strategic depends on the political. The frame "layer" one selects for problem formulating and solving will determine the "reality" with which one works, and this "reality" often departs significantly from the "realities" associated with the other frame layers. Consider, for example, the antitank missile controversy following the October, 1973 "Yom Kippur" war, as described by Edward Luttwak.

---

From a technical perspective, the Egyptians, armed with highly accurate, cheap, and plentiful (tens of thousands) Sagger anti-tank missiles, enjoyed a marked advantage over the Israeli army, which could field no more than 1500 tanks on the Sinai front. Pitting Egyptian missiles against Israeli tanks, a straight-forward cost/benefit or means/ends analysis, in this narrow context, would conclude the Egyptians planned "correctly."

But, from a tactical perspective, the Sagger-armed Egyptian infantry went into battle largely unsupported by planes or tanks of their own. Hence, the Israelis could use artillery fire to decimate the unprotected Egyptian infantry. Having neutralized the Sagger in this fashion, the Israelis could then launch their tank assaults with impunity. Hence, any analysis pitting Egyptian infantry armed with Saggers against Israeli tanks supported by artillery would, in this tactical context, conclude the

In general, selecting the right frame, which encompasses all the appropriate background information for solving a given problem, is a serious obstacle in all task domains dealing with the real world. Even "simple" problems involving robot operations (e.g., retrieve a book from a table) in an ordinary room require considerable amounts of inefficient, factual "bookkeeping." In the field of artificial intelligence (AI), this difficulty is known as the frame problem. More specifically, the frame problem is the problem of selecting the appropriate informational context at each stage of a problem-solving activity. Currently, no completely satisfactory solution to the frame problem in AI exists. See Bertram Raphael, The Thinking Computer: Mind Inside Matter (San Francisco, W.H. Freeman, 1976), pp. 146-176.
Egyptians planned "incorrectly."

But, from an operational perspective, the Egyptian army lacked the skilled manpower to wage mobile war, coordinating tanks, artillery, and aircraft in support of infantry. Sagger, on the other hand, were plentiful and easy to use. Large numbers of relatively uneducated troops could be trained to use the anti-tank missile effectively. Hence, in this context, the Egyptian decision to rely on missile tactics was "correct."

But, from a strategic perspective, the unsupported Egyptian Sagger teams, no matter how plentiful, could not, in the long run, carry the war against Israeli mobile operations. Hence, in this context, the Egyptian to start such an "unwinnable" war was "incorrect."

But, from a political perspective, the Egyptians did not need to win the war militarily. Only an opening tactical victory and a temporary holding action were required to trigger US diplomatic intervention, to start a supportive, Arab oil embargo, and to raise Egyptian morale enough to make future, Israeli-Egyptian negotiations feasible. Hence, in this context, the Egyptian "Sagger" decision was "correct."

Looking at a problem from a variety of frames confers the advantage of a more comprehensive outlook. But, such multiframed appraisals as the one above are usually very difficult to carry out because of information constraints.
Further, the greater the number of embedded frames one must take into account, the greater the likelihood of compounding errors and, hence, the more problematical the whole argument and its final conclusion become. Like the childhood game of stacking blocks, beyond a certain number of stages, one's edifice becomes unstable.

In general, because the frame selection task for ill-defined problems is open, information searches are not reducible to simple, background retrieval operations. Further, the absence of a frame consensus means no agreement exists on a suitable problem representation. This, in turn, means no universally accepted frame comparison analogies exist. These obstacles make problem-solving difficult.

But, unfortunately, our difficulties may not end here. Ill-defined problems may also lack the second trait of well-defined problems; they may lack criteria for identifying a solution. Ill-defined problems of this sort are "open-ended." As long as one cannot recognize a solution, one can never be sure the problem has been solved. New problem formulations and solution proposals are always possible and, therefore, aggravate the frame fixing task. Indeed, whenever a problem elicits a plethora of solution proposals, it is often because the problem is ill-defined. In such cases, it is crucial to ask what elements a given solution proposal leaves out, as well as what it contains. In
extreme situations, "true believer" mentalities and social sanctions may be invoked to provide frame coherence and solution consensus. The price paid for such frame stability, in terms of creativity and discovery, is usually severe.

In international politics, the problem of recognizing a solution is often further complicated by the long time-intervals between policy implementation and policy consequences. Dean Acheson once quipped he enjoyed furniture making as a hobby because he didn't have to wait twenty years for the results. Unfortunately, even waiting the twenty years may not be enough. If, by a stroke of luck, someone found the best method for controlling population growth rates, for instance, the consequences would take decades to verify. Moreover, because of the myriad, intervening events between policy implementation and policy consequences, one can never be sure the observed results are consequences of one's policies or of unforeseen, uncontrolled, intervening events.

To complicate matters even further, the successful resolution of international problems often calls for the absence of something — that is, the absence of war, the absence of terrorism, the absence of famine, the absence of economic depression, and so forth. These absences may have little or nothing to do with policies designed to bring them about, in which case such policy "solutions" would be
spurious. In general, the valid identification of genuine problem solutions requires well-defined goals accompanied by specific time periods for realization. Unfortunately, in international political contexts, policy goals often do not satisfy this level of preciseness.

Policy goals in international politics are often fuzzy for a number of reasons:

1) Specific policy contingencies are very difficult to forecast, so policy ends are usually couched in abstract terms (e.g., promoting stability in an area, enhancing pro-US attitudes, encouraging democratic processes, discouraging Soviet "adventurism", etc.). The implications and operational details of a policy are worked out later by the relevant, government agencies when specific decisions are required. This situation is akin to the amendments of the Constitution, which are also framed as broad principles, the meanings and details for which are provided later by specific court cases. Also, like some Constitutional amendments, the specific implications of broadly enunciated policy ends can sometimes surprise and dismay their originators (e.g., George Kennan and the containment policy).

2) Policy goals may be purposely ambiguous to achieve consensus and mask divergent interests among those connected with a particular political program.

3) Imprecise goals may be useful for deflecting criticism, dodging accountability, diluting program responsibility, and providing political flexibility in unanticipated contexts.

All these difficulties arising from the absence of solution criteria -- that is, the possibility of an endless stream of solution proposals with no guidance for selection, the possibility of long time lags between policy implementation and acceptable consequences, the possibility of unrecognized or unforeseen intruding events, and the possibility of missing or misconstruing policy consequences because they are fuzzily or "negatively" defined -- all these difficulties mean frame fixing tasks are immensely difficult.

Ill-defined problems of this sort lack salient brackets in time. The possibilities for perceptual confusion are not unlike those of a mentally unbalanced person who, upon leaving an avant garde theatre that lacks the bracketing conventions offered by the rising and falling of curtains, finds the drama has followed him outside -- a swirl of actions and non-actions (like the "nonbarking" dog in the Sherlock Holmes mystery) for which the causal connections and durations are unknown. In the end, our hallucinating theatre-goer might try imposing frame brackets by shutting his eyes, going to sleep, getting drunk, or rushing to a psychiatrist. Social groups caught in an analogous position might impose frame brackets externally using arbitrary deadlines, quotas, selective perceptions, social barriers, sanctions, and so on. In
short, frame fixing without a means for recognizing solutions, can take on an arbitrary character, unconnected with the claims of the problem at hand.

Summarizing, ill-defined problems, in contrast to well-defined ones, may suffer from: 1) frames lacking the scope necessary for constructing a solution, or 2) frames lacking the stability required for effective discrimination between solution proposals. This contextual deficiency means algorithmic methods are of little use. Heuristics flourish here. This observation underscores the importance of heuristic studies in international politics. Most problems of international politics are ill-defined ones. And, in this domain, heuristics offer the only, viable, problem-solving option.

Through much of this section, I have stressed the difficulties posed by ill-defined problems in contrast to well-defined ones. But, this is not the whole picture. Ill-defined problems can offer valuable rewards as well as penalties. In a later section on problem-formulation, we shall explore some of these rewards.

Here, as a step towards modifying the Manichean perspective suggested above, we should note the variety of problem types within the well-defined and ill-defined categories. Some well-defined problems enjoy a greater degree of exactitude in formulation than other well-defined ones. Symbolic logic problems, for example, may include
the relevant inference rules for the solution search as part of the problem formulation; problems in chemistry, on the other hand, usually do not. Yet, both sets of problems are "well-defined" according to our criteria. Similar variations in precision can be found among ill-defined problems. Some ill-defined problems are more "ill-defined" than others. Consequently, these notions of well- and ill-definability cannot be pushed to extremes. We are dealing with a continuum of problem preciseness. But, for our purposes, the categories of well-and ill-defined problems will serve.

Further, we should note a problem's categorization can change. Ill-defined problems, for instance, may over time become better defined as our knowledge expands. One characteristic of scientific progress is the transformation of ill-defined problems into well-defined ones. More interesting, however, are those cases where previously well-defined problems are displaced and demoted to the ill-defined category. This can happen when changes in background knowledge alter a particular problem formulation or the criteria for an acceptable solution. A problem in one frame may be well-defined, but ill-defined when considered from another one.

One signal suggesting changes in a problem's formulation, and hence, its status of definition, arises whenever a debate over symptoms and causes erupts for a problem
once thought to be well-defined. Causes are usually those elements that a frame must encompass if a solution is to be recognized. Symptoms, in contrast, are of lesser importance and need not be included in the frame. Why this fine discrimination between symptoms and causes? Because, relieving a symptom may not remove the underlying cause, just as treating a headache and reducing it does not cure a brain tumor of which the headache might be a symptom. We wish to cure the disease rather than the symptoms. Hence, we should not confuse the disease itself with a complex of symptoms formulated at a somewhat more abstract level. A well-defined problem, therefore, would have its causes clearly demarcated from its symptoms. Whenever a debate over the identifying of symptoms and causes surfaces, it means contending frames are clashing. Should the framing context for a well-defined shift, this could, in turn, alter the problem's status of definition.

Consider the problem of inflation as understood by economists in the mid 1960's. The sources of inflationary pressures (e.g., demand-pull and cost-push inflation) were identified as well as the remedies (fiscal and monetary policies). Inflation appeared to be a well-defined problem.

But with the economic changes of the 1970's (global double-digit inflation, decline of US economic superiority, oil and food shortages, fall of the Bretton Woods monetary order, etc.) and the appearance of stagflation, a debate
has arisen over the nature of inflationary pressures and their relative importance. In particular, some ecologists argue the problem-solving frame of economists is too narrow, the preoccupation with short-term indicators leads to the treatment of symptoms, and the link between the world economy and world biological carrying capacities (croplands, fisheries, forests, and grasslands) must be better understood before inflation can be effectively managed. From this ecological frame, traditional monetary and fiscal policies, together with newly proposed income policies, are too narrowly focused. These ecologists are arguing: 1) the frame of current economic thinking on inflation does not encompass all those elements (biological) necessary to recognize and reach suitable solutions, 2) ecological stress is a major cause of current inflationary pressures, and 3) the inflationary problem, though perhaps well-defined from traditional economic perspectives, is ill-defined from an ecological perspective -- in particular, causes identified from the traditional view are merely symptoms when seen from an ecological view. If this ecological position wins acceptance it would provide an example of

For ecological arguments along these lines, see Lester Brown, "A Biology Lesson For Economists," The New York Times (July 9, 1978), Sec. 3, p. 16. See also, Lester Brown, The Twenty-Ninth Day: Accommodating Human Needs and Numbers to the Earth's Resources (New York, W.W. Norton, 1978).
a contextual shift reducing a previously well-defined problem to the status of an ill-defined one.

One final, separate point. Any problem representation (whether for a well-defined or ill-defined problem) is basically a description. This description should never be confused with the problematic situation that one is seeking to describe. A problem representation is not the same thing as a problematic situation. In particular, a problematic situation can be described in many different ways -- that is, it can have many different problem representations. Rejecting a particular representation does not require that one dismiss the problematic situation that gave rise to it in the first place. Confusing the two can lead to the premature dismissal of new perspectives.

For example, a small group of political scientists is currently exploring civilian defense or CD (e.g., non-violent resistance, passive resistance, etc.) as an alternative to nuclear deterrence. While this activity is extremely worthwhile, it is dominated by a radical orientation (e.g., CD is seen as a complete alternative to military defense, CD requires democratic-socialism to work CD cannot be achieved in cooperation with the government). This radical problem formulation, in the view of one observer, will serve to discredit CD research before it is given a fair chance. He predicts it will "hamper realistic research in this field and will prevent peace researchers,
military experts and politicians from exploring how far, in what circumstances, and under what conditions CD may be used to maintain peace. If this proves correct, it will serve as an example of how a particular leftist problem representation and its attendant assumptions can deflect attention from a very pressing problematic situation (i.e., finding non-nuclear defense alternatives to nuclear deterrence strategies).

A corollary lesson in all this is that finding acceptable and suitable problem representations is as important for the growth of knowledge as finding answers. This observation leads us to our next concern—problem formulation.

III. Problem-Formulation

Most interesting social, psychological, and political phenomena can be interpreted as problem-formulating and problem-solving processes. And of these two processes, problem-solving has attracted the lion's share of research attention. Clearly, this lop-sided treatment is amiss. Finding a problem is often more creative and important than solving a problem once that problem has been found and formulated. As Einstein and Infeld observed:

The formulation of a problem is often more essential that its solution, which may be merely a matter of mathematical or experimental skills. To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.13

And, one might add, in politics.

Yet, the current emphasis on problem-solving, especially in international politics is understandable. First, a foreign policy-maker might reasonably ask if problems really must be found. Are there not enough conflicts and violence among peoples and governments today to satisfy the most voracious problem solver? In response, one might readily admit problematic situations abound; but, that these situations do not automatically present themselves as problems capable of resolution or even of productive contemplation. Indeed, the transformation of problematic situations into tractable problems (whether ill-or well-defined) open to resolution is one of the major tasks of diplomacy.

A second reason for the current research emphasis on problem-solving over problem-formulation is that problem-solving is easier to study. Observing the solving of a problem is a popular research topic. Observing the finding of a problem is less common. Moreover, the information-processing perspective, currently popular in cognitive

psychology, is better atuned to the study of problem-solving techniques than to problem-formulating ones.

Yet, some research has been conducted on problem-formulating, with intriguing results. First, current research on cognitive processes in human reasoning indicates a major source of human error stems from incorrect encoding (i.e., selection of data) and representation of a problem rather than faulty logical reasoning. In other words, problem-formulation appears to be more difficult than problem-solving. Second, work in technological forecasting suggests the key obstacle here is not the designing of better forecasting devices, but the formulating of the "right" problems or questions to be solved. Again, problem-formulation emerges as a fundamental process. Third, in a more concrete, political context, Michael Blaker has shown, in his study of Japanese international negotiating style, how the Japanese expended tremendous amounts of

---


diplomatic energy in advance preparations to make problematic situations negotiable. Again problem-formulation emerges as a key element, this time in negotiating strategy. Finally, in a participant's account of the House Judiciary Committee's inquiry into Watergate, Renata Adler has shown how problem-formulation guided the constructing of the articles of impeachment, the search for evidence, and the selecting of strategies that ultimately forced Nixon's resignation. Problem-formulation, in Adler's account, appears to have been the fundamental process shaping the whole legal inquiry.

16 __Blaker__, pp. 156-169.

17 The following is Renata Adler's description of the legal abuses the Congressional inquiry formulated and pushed as grounds for impeachment. The influence of these charges on the final shape of the legal arguments marshalled against Nixon is remarkable:

In the early weeks of the inquiry, at about the time the brief on grounds was in the works, Doar (John Doar, special counsel for the inquiry---HYT) considered a number of loose assumptions about what kind of case it was going to be. There was, in general, a Tip of the Iceberg theory: that whatever the inquiry might ultimately reveal, it could only be the small, visible part of what was actually there; the case would have to be made from that small visible part. There was a Narrow Escape theory: that Nixon and his aides, having made what amounted to an extremely radical analysis of the system (namely, that all its processes were meaningless and all its officials essentially corrupt), had begun to supersede the legitimate forms of government in what amounted to a revolutionary coup; the case would have to protect the country from that coup.
There was a Robber Baron theory: that certain forms of corruption and violations of the system, like those committed by the robber barons, while they may have been tolerated for years, grow at some historic point beyond the tolerable; the case would have to bring such abuses of the presidency to an end. There was the Pattern of Conduct theory: that, while there may be abuses of power that a President might randomly, and perhaps by mistake, commit, a pattern of systematic violations would provide grounds on which he ought to be impeached. And a Higher Standard of Conduct Theory: that, since the President alone is required by the Constitution to "take care that the laws be faithfully executed," the Framers intended (as it is clear, from their letters and debates, they did intend) not to grant the President some "executive privilege" outside the law, but on the contrary, to hold him accountable, by some higher standard than any other citizen, to the law itself. There was the Superintendence theory; that the President, like any other civil or corporate officer, has a reasonable obligation to inquire and to inform himself of the acts of his subordinates, and be held accountable for them, particularly when those acts are crimes committed in his name, and solely for his benefit and on his behalf.

It is obvious that these informal assumptions combined hypotheses about the case with strategies for winning it. More directly in the line of strategy was what to look for and to try to prove. There was the Criminal Act under the Statues theory, the one set forth in the White House brief, which everyone, from distinguished Constitutional scholars to students of the problem in any depth at all, rejected. A Tax Fraud and Emoluments theory -- which, for various reasons, including questions posed by the financial affairs of previous Presidents and present Congressmen, was never seriously investigated by the staff. And there was a sort of nameless theory, which had to do with getting from the Constitutional oath, faithfully to execute the office of President, to the unconstitutional acts, by way of the lies. There is nothing, of course, in the law or in the Constitution which requires anybody not to lie, except under oath. But the President, once he is in office, need not submit to being put
But the single most illuminating work on problem-formulation I have encountered is Jacob Getzel and Mihaly Csikszentmihalyi's seven year longitudinal study of Chicago artists, beginning from performance in art school to early career experiences. They discovered technical skill was not the primary element separating the successful artists from the unsuccessful ones; the primary element was problem-formulating skill. In particular, they observed two sorts of problem-formulating perspectives. The less original less successful artists approached their tasks as presented problems -- that is, problems defined by known rules and known criteria. Problems formulated in this fashion were seen to have a single, correct solution. This attitude, in turn, choked off experimentation, exploration, and creativity. In extreme cases, premature problem

under oath; he incurs no risk of perjury. He cannot anyway be indicted while in office; nor can there be an effective warrant to search his premises. The question was whether the President, notwithstanding his special constitutional oath, had a limitless power to commit unlawful acts and to conceal them, by means of a limitless right, in effect, to lie. It was some combination of the Oath-to-the-Acts theory with those in the preceding paragraph which led to the ultimate argument for impeachment, and to the form of the Articles themselves.


18

closure led to "formula art," where artistic style was supplaned completely by stereotypes.

In contrast, the more creative artists approached their tasks as discovered problems -- that is, problems with new relationships and new solution criteria, where the crucial, symbolic elements were assumed to be unknown. Problems tackled in this fashion were never seen as completely defined or completely solved. The artist saw his aims and works as partial statements, never complete ones (Cezanne, for example, repainted the same still life or mountain many times without exhausting their problematic challenges). Indeed, the highly, creative artist was often unsure when a particular work was finished because the criteria for recognizing a solution were unclear. Creativity in art appears to require ill-defined problems.

Further, in formulating his problem, the creative artist used a variety of strategies even if most were eventually dropped. He continuously refined or if necessary re-defined his problem as he worked towards a solution. Problem-formulating and problem-solving were never observed as distinct, separate stages of activity. By avoiding premature problem closure the artist increased his chances of finding new problem representations and producing
imaginative, original solutions.

This research on artistic creativity offers four important lessons on problem-formulation. They highlight the importance of:

1) avoiding premature problem closure,

2) recognizing that problem-formulation and problem-solving can proceed in unison,

3) recognizing the distinction between presented and discovered problem situations, and

4) pursuing diverse problem-solving strategies.

For similar warnings against premature problem closure within a social scientific context, see Abraham Kaplan, The Conduct of Inquiry (Scranton, Pa., Chandler Publishing Co., 1964), pp. 70-71.

We should note here the Getzel and Csikszentmihalyi study stresses the importance of originality and creativity, which is appropriate in art. But, while creativity is also important in international politics, it may in some instances be of lesser importance than other factors. For example, if response time is of vital importance it may be better to transform a "discovered problem" situation into a "presented problem" to produce a timely, if unoriginal, solution. A highly creative solution offered after a deadline has passed may be less useful in comparison. "Grooved thinking," formulas, and routines have their places in policymaking.

Finally, we should observe problem formulating, to be useful, must be constrained by the resources available for problem-solving. Otherwise, problem formulating may become a sterile exercise in "plight" formulating. This is true both for politics and art. The American sculptor James Suls, for example, collects images from his dreams to be used in his work. When he visualizes his wood sculpture, however, he keeps in mind the limitations of logs, chainsaws, and drills, and does not visualize anything he cannot do with these tools and materials. For most purposes, creativity must dwell in the land of the possible. See Mike Samuels and Nancy Samuels, Seeing With the Mind's Eye (New York, Random House, 1975), p. 261.
The last point on problem-solving diversity will be treated later. Here, we examine further the distinction between presented and discovered problem situations in terms of frames.

Getzel and Csikszentimihalyi basically argue problem-solvers view the world differently; that some, when given the opportunity to mold a problem from scratch, cast it into the mold of a presented problem. This aspect of an individual's cognitive style places a premium on optimum solutions within the constraints of a single, well-defined problem. Consistency and precision within a single frame are prized. Problem-solving power, within these narrowly accepted limits, is enhanced; but, radically new problem formulations are unlikely.

In contrast, other problem-solvers cast things in a discovered problem context. With this approach problems tend to be ill-defined (criteria for recognizing solutions are unclear) with the possibility of many acceptable solutions. Further, a broader, multiple perspective is adopted. Instead of operating within a single frame, this aspect of an individual's cognitive style stresses frame switching to gain different viewpoints. Paradoxes, inconsistencies, and dilemmas that might arise in the course of moving between different framing formulations of a problem are prized for their possible insights.
Just as an optical range finder uses parallactic displacement to give an observer greater depth of field, so the multiple frame approach uses frame differences to give one new, "deeper" insights into problematic situations -- in extreme cases (e.g., the principle of complementarity in modern physics) understanding would be blocked without this multiple frame option. In general, new ways of seeing things and new problem-formulations are the key rewards of this approach.

The scope and complexity of social scientific issues often demand a multiple frame attack. Cases in which doubt exists about the appropriate frame for some unsolved problem are legion in the history of science. They are especially evident in social sciences. Consider, for example, the recent debate over unilateral altruism in human behavior. Anthropologists explain such altruism on a sociocultural level, invoking the existence of moral codes and conventions. Sociobiologists, in contrast, seek genetic explanations for man's predisposition towards altruistic behavior. While some anthropologists argue

20

Consider, for example, the following, "natural" concerns that arise from a multiple-frame approach in problem-formulating: 1) under what conditions should one frame be preferred over another?, 2) can different frames be usefully combined (e.g., Picasso's use of simultaneous, multiple perspectives in cubism)?, 3) do other, more useful frames exist for problem-formulating?, 4) how many different frames exist for formulating a problem?
that altruism is perfectly intelligible on a cultural level alone and that any genetic explanation represents a very cumbersome and unnecessary reductionism, socio-biologists argue for a dual explanation encompassing both proximate (i.e., cultural) and ultimate (i.e., genetic) components. Here, history is on the side of the sociobiologists. The multiple frame approach espoused by sociobiologists is, in general, the strategy marking past scientific advances.

As noted earlier, a key trait of ill-defined problems is the uncertainty surrounding the appropriate domain for its solution (e.g., during antiquity and the Middle Ages comets were considered sublunary objects and thus fell within the domain of meteorology). This sort of "domain ambiguity" is especially acute in international relations (e.g., is the problem of war best approached economically, psychologically, militarily, politically, etc.?). Hence, multiple perspectives are to be preferred. If one is unsure where the fish are, one's net should be cast expansively.

Moreover, multiple perspectives need not be treated as rival solutions. Sometimes the situation is best seen not as a competition but as an adjudication between viewpoints, where what is decided is not the separating of winners and losers in a race, but the identifying of rights and obligations between plaintiff and defendant
perspectives. Such tolerance in problem formulating and evaluating is especially necessary for social issues where diverse interpretations, both among participants and observers, are the rule.

Finally, in relating algorithms and heuristics to problem-formulating concerns, two important implications emerge. First, problem-formulation, treated in algorithmic fashion -- with standard methods and solutions -- is a likely formula for getting unimaginative "presented problems." Algorithms are ill-suited for multiple frame approaches that seem necessary for "discovered problems." The reason: algorithms require fixed, well-defined frames.

Second, in contrast to algorithms, heuristics seem perfectly suited for discovered problem-formulating. Heuristic framing flexibility decreases the danger of premature, problem closure and encourages the multiple frame view that promotes (creative, discovered problem-formulating.)

Having argued multiple perspectives and heuristics are important for discovering new problems and gaining new insights we now consider how problems are formulated or recognized. Because the line separating problem formulating and problem solving is often fuzzy our treatment will be both broad and brief. Specific
heuristics related to problem formulating will be found in the chapter on problem solving.

At least three general "friction points" promote the development of problems. These are:

1) **Clashes between a theory and its research traditions** — research traditions encompass general assumptions about the objects and relations within a given domain of endeavor, together with the methodologies acceptable for their investigation. Being general, such traditions are neither explanatory, nor predictive, nor directly testable. They do, however, help delimit the range and importance of problems. They divide a given domain's problems from the problems of other domains (e.g., the decision-making patterns a family uses to divide income among its members fall to sociology; the patterns an administration uses fall to political science). They separate legitimate problems from "pseudo-problems," which can be ignored (e.g., while the Founding Fathers believed the "pursuit of happiness" was a

21 For an excellent treatment of research traditions, and their role in scientific growth, see Larry Laudan, *Progress and Its Problems* (Berkeley, University of California Press, 1977) pp. 70-120.
verifiable proposition in moral physics and political science, it would probably not be counted as such today).

Of equal importance, research traditions can generate conceptual problems. Normally, explanations are proposed within a given research tradition. When tensions between an explanation and the research tradition of which it is a part arise, acute conceptual problems surface that cannot be ignored. Sometimes a proposed explanation may employ a methodology outside the norms of the research tradition. Conceptual controversy is often the result. The behavioralist vs. traditionalist debate among political scientists in the 1960's provides one example.

Such dissonance between a research tradition and a component explanation might also arise when a detailed expansion of a theory or explanation leads to the acceptance of assumptions inconsistent

---

22 In his "Inventing America (Garden City, N.Y., Doubleday, 1978) Garry Wills has closely investigated the meaning of the Declaration of Independence to the Founding Fathers, revealing the tremendous gap between political research traditions of their day and ours.
with those of the "parent" research tradition. For example, by the early 1960's it became clear to a number of political scientists that foreign policy studies involved processes not easily subsumed under the traditional, unitary actor view of international relations. This important conceptual problem arising from the dissonance between a time-honored research tradition (the unitary, nation-state perspective) and its component case studies (e.g., Presidential foreign policy-making, bureaucratic politics, Communist revolutionary movements, nongovernmental foreign penetrations, etc.) led eventually to important theorizing advances. In this

manner a research tradition can generate conceptual problems of the first magnitude.

2) Clashes between theories from different domains -- sometimes work from different scientific domains will produce inconsistent findings or rest upon inconsistent assumptions. Such conceptual difficulties have, in the history of science, produced spectacular advances. For example, before the discovery of radioactivity, late nineteenth century biology and geology clashed with physics over the age of the earth. Geological and biological evidence suggested the earth was very old. But the core assumptions of thermodynamics on energy conservation conflicted with the theory of evolution and the attendant geological time scale. The discovery of nuclear processes helped resolve this intrascientific conceptual problem.

Research traditions vary considerably in their scope. Some, like formal, social choice theorizing, game theoretic applications, or special theories of voting, are rather narrow. Others, like the research traditions associated with Weber, Marx, Freud, or liberalism are very broad. The latter, because they encompass so much, might be called "composite traditions." Such, broad traditions are significantly less likely to produce conceptual, "theory-vs.-research tradition" clashes, than narrow traditions.

I am indebted to Jim Noble for this observation.
A similar, intradisciplinary difficulty may be emerging in the social sciences. Much research on human cognition and memory suggests severe constraints exist on man's information processing abilities. Herbert Simon, for example, has argued:

The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world -- or even for a reasonable approximation to such objective rationality. 25

Some of the human intellectual limitations feeding Simon's skepticism include: 1) limits on the storage capacity of immediate memory, 2) limits on the accurate transfer of verbal information (around 50% accuracy), 3) limits on the accuracy of recalling information due to extraneous interferences (e.g., proactive and retroactive inhibition), and 4) limitations on the mental transforming, recording, integrating, and inferring of

Yet, new findings are emerging from areas outside cognitive psychology that suggest man’s memory and information processing capabilities merit greater respect. For example, a new discipline called archaeoastronomy, the study of prehistoric achievements in observational astronomy, reveals some preliterate societies had formidable observational, storage, retrieval, and computing capabilities allowing the discovery and monitoring of celestial patterns with periods exceeding fifty years (e.g., Stonehenge). The data management achievements of such “prescientific” peoples are impressive. Further, political cognitive mapping studies on the British Eastern Committee of the Imperial War Cabinet (1918-1919) provide more evidence favorable to human cognitive capacities. On the empirical results of his study, Robert Axelrod concludes:

When the cognitive maps are constructed for each of the participants in the Eastern Committee, there is a striking result. Despite our knowledge about the severe

limitations on people's cognitive ability, the maps are quite large and intricate. The set of causal beliefs connecting choices with outcomes seem to be so large as to be quite beyond the ability of people to use. And yet they did use these beliefs, and their conclusions were consistent with their cognitive maps.

The maps were certainly large. One standard of measurement is to compare the number of variables and arrows which were used in a given time span. The time devoted to discussions of Persia in the 45th and 48th meetings of the Eastern Committee generated just over 20,000 words. A thorough coding of these words uncovered more than 500 causal assertions, or an average of more than one every 40 words. At that rate it did not take a person very long to describe his beliefs on a specific proposal in terms of literally dozens of concept variables and the causal beliefs connecting them. Furthermore, repetition accounted for only a small proportion of these assertions because only a few of the assertions were repeated for emphasis. 27

These different views of human cognitive abilities are producing an interesting, intrascientific conceptual problem. Its resolution, like most intrascientific clashes in history, promises important advances in scientific progress. For us, this clash is interesting because it suggests

how a problem can arise unexpectedly from the research activities of independent fields.

3) **Clashes between a theory or research tradition, on the one hand, and a metaphysical-moral worldview on the other** -- every individual or generation employs implicit or incompletely explicit assumptions when thinking or interpreting. These mental habits may be a predisposition to certain conceptual categories, to particular types of imagery, to select aesthetic qualities, or to preferred moral perspectives. Presumptions of simplicity in seventeenth and eighteenth century Enlightenment thought, the yearning for natural diversity and irregularity in eighteenth and nineteenth century Romantic thought, or the stress on confrontation and conflict in nineteenth century dialectical thought are some prominent examples.

In general, worldviews can span such diverse areas as metaphysics, theology, ethics, or social theory. These intellectual tendencies are what

---

For an excellent, closely reasoned case study on the impact of such metaphysical/moral perspectives in intellectual history and of science, in particular, see Arthur Lovejoy's *The Great Chain of Being* cited earlier. Briefly, he traces the development and influence of the principles of plentitude, sufficient reason, and chains of existence from Plato onward, demonstrating its rich and often contradictory heritage in Western thought.
I mean by "metaphysical/moral views."

At times such views have clashed with scientific thought producing significant practical consequences. Some historical examples include: 1) the friction between between the theorizing of Copernicus, Kepler, and Galileo on the one hand, and the conventional theological doctrines of the time, on the other, 2) the clash between Newton's "action-at-a-distance" view in physics and the old ontological perspective stressing substance, continuity (i.e., no gaps in God's creation -- the great chain of being idea, and divine plenitude, 3) the controversies over evolutionary theories on the one hand, and theology or ideology (e.g., Lysenko vs. Darwinism in the Soviet Union) on the other, 4) Einstein's "Jewish" theory of relativity vs. the cultural purity of German science.

Current examples of such metaphysical issues include: 1) the innately probabilistic image of the universe derived from quantum mechanics vs. older philosophical beliefs about order, causality, determinism, and knowledge (Einstein's "God does not play dice with the universe" perspective), and 2) the "big bang" theory of the universe's beginning, suggesting a definite moment of creation vs. the traditional scientific view of knowable scientific principles and processes having no beginning and no end. This last example of metaphysical discomfort
is especially interesting because it pits scientists against their own results, and not scientists against non-scientists, as is usually the case in history.

A current example of a metaphysical/moral problem in international politics involves strategic nuclear deterrence and, in particular, the necessary willingness to destroy vast civilian population. The abstract theory of deterrence, whatever its operational merits, poses severe ethical problems because it runs counter to traditional "just war" beliefs about promoting survival, limiting needless suffering, minimizing war deaths (especially among civilians), and preserving our cultural heritage. Some observers, such as the theologians Paul Ramsey or James Douglass, have examined the conditions under which an enunciated deterrence policy (as opposed to an executed one) would be ethically justifiable. Others have sought viable substitutes for deterrence (e.g., civilian defense studies) or strategies for

29

For an interesting account of this seemingly curious dissonance between the current theoretical products of cosmology and its own metaphysical worldview, see Robert Jastrow, God and the Astronomers (New York, W.W. Norton, 1978).

30

altering international conditions to render deterrence unnecessary (e.g., peace research).

These many examples show clearly the problems that can arise between theories, on the one hand, and metaphysical/moral views on the other. Such controversies are not pseudoproblems. Value-free science does not exist. Moreover, in international politics, value-laden concepts and issues are especially potent. Hence, problems of this sort are as serious and as legitimate as any of the traditionally, better recognized, empirical ones.

To briefly summarize, we have treated three broad areas where problems might be recognized or formulated. These were: 1) clashes between a theory and its underlying research tradition, 2) clashes between theories from different domains, and 3) clashes between theories (or research traditions) and metaphysical/moral worldviews. This treatment, however, while illuminating somewhat the background or macro-factors in problem-formulation, tells us little of the proximate factors that people use to cast problematic situations into problems and ultimately into solutions. In particular, what tricks or heuristics are useful for problem-formulating and problem-solving? For example, past problem solutions provide valuable cues for formulating new problems and finding new solutions (e.g., any post-Graham Allison studies on the
contradictions and counter-productive processes in policy-making cannot ignore bureaucratic politics as a possible factor. This sort of incremental search using cues as stepping stones to move beyond the known might be considered a heuristic. Another, perhaps more familiar one from high school mathematics, is working from a desired solution backwards to the given premises; hence, marking out a solution path. These heuristics, the "micro-factors" in problem-solving, are the topics in the next chapter.
CHAPTER 4: On Problem-Solving Heuristics

I. Introduction

In chapter 2 we recognized four frame tasks (frame finding, altering, fixing, and usage) required for perception and interpretation. We then noted some strategies of interpreting people use to find, alter, and fix frames.

Further, we noted strategies for finding, altering, and fixing frames can be divided into two large classes depending on usage. In particular, two uses were singled out: orienting and problem-solving.

Our study of frame strategies began in chapter 2 with those used for orienting --- that is, those strategies used for simple, generalized, descriptive activities. We now complete our study by considering the second class of frame strategies --- those used for problem-solving. Because much of the relevant literature employs the term "heuristic," we shall call these frame strategies problem-solving heuristics.

Problem-solving heuristics, in general, are more specialized and more involved than orienting strategies. As noted earlier, orienting strategies deal basically with description; but, problem-solving heuristics encompass the analytically more demanding activities of hypothesis formulating, information searching, and task defining. Further, problem-solving presupposes orienting. Hence, problem-solving embraces all the orienting strategies treated earlier,
and much else besides. These added elements provide the focus for this chapter.

Heuristic studies, as guide to problem-solving, have a history going back to Euclid, but were largely forgotten until the 1940's when the mathematician George Polya revived interest in it. Polya, believing the informal "logic of exploration and discovery" to be vital to the creation of mathematics and long neglected by the drive for formal rigor, undertook an extensive study of problem-solving heuristics in mathematics. Related work on problem-solving strategies has since appeared in education, psychology, and artificial intelligence research. Most of these studies however, have

---

1 See, for example, George Polya, How To Solve It (Princeton University Press, 1945), and George Polya, Mathematical Discovery, Vols. 1 and 2 (New York, John Wiley and Sons, 1962, 1965).


Setting aside the question of fundamental limits on "computer reasoning," it appears programs can be used to assist practitioners. For example, one recently developed program called MYCIN, using 450 heuristics collected from medical journals and Stanford hospital case studies, is able to provide accurate diagnoses and treatment plans under experimental conditions.
dealt with problem-solving in narrowly defined contexts such as mathematics, chemistry, and physics, or in simple pattern recognition experiments. Research on informal heuristics in foreign policy contexts is less advanced. Alexander George's work on operational codes and studies on national negotiating styles are perhaps the best known examples in political science.

The following treatment of problem-solving heuristics differs from earlier efforts in its attention to contextual matters. One-step, contextually-insensitive techniques (e.g. game theory, cost/benefit analysis) often prove inadequate. In politics, wider perspectives have a way of invalidating narrow solutions.

To meet this challenge, the notion of a frame was developed in earlier chapters to provide a means for talking about contextual matters. Frame terminology also allows us to treat heuristics in a manner consistent with current research.

---

findings in cognitive psychology, artificial intelligence, and psycholinguistics. Additionally, these preliminaries were required because I wished to treat, in a general fashion, the common perceptual features found in handling all sorts of problems. In this chapter we shall examine, in some detail, three different categories of problem-solving heuristics: frame finding, frame altering, and frame fixing heuristics (see Table 2).

Before proceeding further, however, five general remarks are in order. First, all classes of problems can be treated by these heuristics; however, in international politics most problems are assumed to be either well- or ill-defined, as opposed to paradoxes and plights. The study to follow will reflect this implicit assumption.

Second, our focus will be on individual heuristics and not on combinations of heuristics. Clearly, problem-solving effectiveness depends, in part, on one's heuristic repertoire and small group environment. It seems reasonable to believe certain heuristic combinations, together with certain decision-making settings (e.g., Alexander George's multiple advocacy setup, the devil's advocate approach, the Delphi technique, role playing, brain-storming, etc.), will be more effective than others for certain tasks. However, our intent here is not to examine such problem-solving permutations. Space and time preclude such ambitions. We must remain content with
TABLE 2: Frame Heuristics for Problem-Solving

Frame Tasks:

<table>
<thead>
<tr>
<th>Finding</th>
<th>Altering</th>
<th>Fixing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Strategies Using Cues To Suggest Opening Problem-Solving Moves.</strong></td>
<td><strong>A. Strategies For Generating Examples.</strong></td>
<td><strong>A. Strategies for Deflecting Contradictions.</strong></td>
</tr>
<tr>
<td>1) Task guidance via cue saliency.</td>
<td>1) Examples extracted from mappings.</td>
<td>1) Resolution by frame embedding.</td>
</tr>
<tr>
<td>2) Problem-solving guidance from &quot;near misses.&quot;</td>
<td>2) Examples extracted from specialization.</td>
<td>2) Evasion by shifting frame brackets.</td>
</tr>
<tr>
<td>3) The &quot;wishful thinking&quot; heuristic.</td>
<td>3) Examples extracted from generalization.</td>
<td>3) Containment by &quot;residual categorization.&quot;</td>
</tr>
<tr>
<td>4) Working backwards.</td>
<td>4) Examples by association.</td>
<td>4) Avoidance by cue saliency.</td>
</tr>
<tr>
<td>5) Frame selection by contradiction avoidance.</td>
<td>5) Examples from extremes.</td>
<td>B. Strategies Of Frame Reinforcement.</td>
</tr>
<tr>
<td><strong>B. Strategies For Assigning Saliency To A Concept.</strong></td>
<td><strong>B. Strategies For Modifying Problem Formulations.</strong></td>
<td></td>
</tr>
<tr>
<td>1) Saliency by frequency of interesting appearances.</td>
<td>1) Using special case examples to clarify a problem.</td>
<td></td>
</tr>
<tr>
<td>2) Saliency by surprise.</td>
<td>2) Using special case examples to partition a problem.</td>
<td></td>
</tr>
<tr>
<td>3) Saliency by analogy.</td>
<td>3) Using examples to check for equivalence.</td>
<td></td>
</tr>
<tr>
<td>4) Saliency of an analogy.</td>
<td></td>
<td>B. Strategies Of Frame Reinforcement.</td>
</tr>
</tbody>
</table>
TABLE 2: Frame Heuristics For Problem-Solving (continued)

Frame Tasks:

<table>
<thead>
<tr>
<th>Finding</th>
<th>Altering</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) Saliency by inconspicuous uniqueness.</td>
<td>4) Using &quot;example-derived&quot; patterns to generate conjectures.</td>
</tr>
<tr>
<td>6) Saliency from boundary conditions.</td>
<td>5) Using examples to patch-up falsified conjectures.</td>
</tr>
<tr>
<td>7) Saliency by processing efficiency.</td>
<td>6) Conjectures suggested by conceptual specialization/generalization.</td>
</tr>
<tr>
<td>8) Saliency by exception.</td>
<td>7) Conjecture formulation by analogy.</td>
</tr>
<tr>
<td>9) Saliency by association.</td>
<td>8) The &quot;missing piece&quot; conjecture.</td>
</tr>
<tr>
<td>10) Saliency by extremes.</td>
<td>9) Problem modification via simplification.</td>
</tr>
<tr>
<td>11) Saliency bestowed by patterns.</td>
<td>10) Analogy extension.</td>
</tr>
<tr>
<td>12) Saliency by compatibility.</td>
<td>11) Action expansion and reduction.</td>
</tr>
<tr>
<td>13) Saliency from generalization or specialization.</td>
<td>12) Examining action inverses.</td>
</tr>
<tr>
<td>14) Saliency by equivalence.</td>
<td>13) Projecting intentions.</td>
</tr>
<tr>
<td>15) Saliency criteria for actions.</td>
<td>14) Checking for analogical changes.</td>
</tr>
</tbody>
</table>

C. Estimation Strategies.

1) Probability estimation via "representativeness".

2) Probability estimation via "availability."
TABLE 2: Frame Heuristics For Problem-Solving (Continued)

Frame Tasks:

**Altering**

3) Anchoring and adjustment.

4) Estimating drawn from outcomes.

D. Strategies For Selection Between Alternatives.

1) Optimization.

2) Satisficing.

3) Elimination by aspects.

4) Historical selection criteria.

5) Ordering Options.

E. Strategies For Diagnosing Unpromising Searches.

1) Generating useless, circular results.

2) The absence of useful relations, concepts, or intermediate results.

3) The absence of useful problem reformulations.

4) Time pressure.

5) Unpromising problem decompositions.

6) The "bare cupboard" heuristic.

7) The "contradiction" heuristic.
the more modest task of identifying individual heuristics. We shall examine the individual threads that might be used for the fabric; the possible fabric patterns and uses must be left for future study.

Third, this collection of heuristics is not meant to be unconditionally prescriptive. The soundness of these techniques varies considerably depending on the situation at hand. I do claim, however, that people frequently use these heuristics consciously or otherwise, and that even the least reliable of these is often the best that circumstances will allow. Accordingly, the heuristic examples cited below are intended to be neither proofs of frequency nor of efficacy; they are only proofs of existence.

Fourth, we observe that a particular problem-solving move might be generated by a number of different heuristics. Put another way, different heuristics need not necessarily mean different problem-solving procedures. Two people, using different heuristics can produce identical arguments. Further, although this study of heuristics is partitioned according to frame tasks (i.e., finding, altering, and fixing), we shall soon see that overlap exists — a frame altering heuristic, for example, might be employed in frame finding. Accordingly, because boundaries between heuristic domains cannot be sharp or impermeable, it seems reasonable to imagine intellect as a repertoire of problem-
solving moves organized in a single, long-term, heuristic-addressable fashion that can be accessed by a variety of heuristics. One's personal reasoning style is determined by the particular heuristics one chooses in searching for and integrating problem-solving moves.

Finally, this collection of heuristics is not meant to be exhaustive. The inventiveness of the human mind cannot be captured on any such list, no matter how long. According to von Neumann:

Nobody would attempt to describe and define within any practical amount of space the general concept of analogy which dominates our interpretation of vision. There is no basis for saying whether such an enterprise would require thousands or millions or altogether impractical numbers of volumes. 4

Von Neumann was addressing, in the quote above, one small component of problem-solving, namely analogies for visual interpreting. How much more involved would a completed theory of problem-solving be?

II. Frame Finding Heuristics (See the first column of Table 2, p. 185-186).

This first group of heuristics assists in the finding of perspectives (Heuristics 1 - 5 Table 2, p. 185). When faced with a problem or problematic situation, it is necessary to:

1) identify salient elements to assemble or retrieve relevant frames, and
2) find cues suggesting possible problem-solving paths. Heuristics serving these functions are likely to provide new, fresh problem outlooks. They encourage the "broad views;" they encourage broad comparisons; they encourage frame switching; they encourage discovery.

We shall consider two categories of such frame finding heuristics:

A. Strategies Using Cues To Suggest Opening Problem-Solving Moves. (Heuristics 1 - 5 in Table 2, p. 185)

Momentum toward the realizing of some solution can be quickly arrested by "mental blocks." Opening moves or moves from one intermediate step to another may be unclear. The strategies below suggest how cues marking plausible detours around such mental blocks might be found and used.

1) Task guidance via cue saliency -- focus on cues to find problem-solving steps. If one's environment has referenced or responded to a particular cue, then consider any task involving that cue.
This heuristic can be useful for: 1) formulating sub-tasks related to a larger problem of interest, 2) surveying the possibility of using a solution to one problem for solving other problems, or 3) assembling new, unconsidered problems "designed around" the information at hand. We consider each of these items in turn.

A salient cue can sometimes suggest plausible subtasks pointing the way to a final, overall solution. Schelling focal points are a special example. In games or negotiations with partial conflicts of interest, any prominent discontinuity is a potential "compromise point" especially if no clear solution exists. Such discontinuities are cues suggesting tactical objectives that can lead to a strategic settlement.

A salient, "task-guiding" cue can be derived from the solution to a past problem. Edward Teller's work with the hydrogen bomb, for example, led him to a lifelong interest in the peaceful uses of fusion explosives (e.g., exploring the earth's crust, retorting oil shale, digging canals and harbors, collecting natural gas, etc.). For Teller, the H-bomb was a powerful cue providing strong task guidance.

An even more successful, scientific example of task guidance comes from Lawrence Bragg's masterful handling of

---


Cambridge's physics research. He had an instinct for the "grand lines of research;" an instinct guided, in part, by his keen interest in optics. Optics was for Bragg what the H-bomb was for Teller. It led him to foster, in particular, two of the most important branches of science to emerge in the last thirty years -- radio astronomy and X-ray diffraction analysis of macromolecules. Notes Bragg, in connection with his role in DNA research:

Remember, I'm not a biologist, I'm an X-ray crystallographer. My part, my great interest, has been in seeing how one could push X-ray analysis to do more difficult problems of structure. What that structure means biologically -- what little I know about it -- I only learn through (others). This -- art, let's call it, of finding out what the structure is actually like, by purely physical means, optical means, is the thing that I've been interested in all my life...

And, you see, that's why I was interested in Ryle's (a pioneer in radio astronomy-HYT) work, too. Because, as you know, radio astronomy is entirely interferometry. The difference is just a matter of scale. 7

The two examples above, Teller's H-bomb and Bragg's diffraction techniques, dealt primarily with instruments used in new ways. Even more powerful consequences arise when one borrows strategies from different fields of discourse, taking interesting problem-solving approaches from one field and

using them in another. This sort of "frame switching" might produce not only new solutions but new fields of research.

In terms of scope, the rise of linguistic analysis in the 1940's and 1950's offers a vivid example. Under the leadership of J.L. Austin, Gilbert Ryle, and Ludwig Wittgenstein, philosophers began to argue that word meanings resided in the sum total of their possible uses and not in some prelinguistic reality. This belief led naturally to linguistic analysis -- the study of word usage as a means of investigating categories of human thought. This philosophical technique proved powerful enough to extend philosophical inquiry into areas previously seen as unrelated. Indeed, every field of human discourse was fair game for linguistic analysis. New specialties such as the philosophy of medicine, biology, and economics arose. In political science, the preoccupation with the multiple meanings of concepts such as power, deterrence, conflict, and peace reflect this legacy of linguistic analysis. Perhaps no better example exists showing why one should seek "cross fertilizing" cues across different frames.

Finally, we note that salient cues can be used to formulate new problems. This practice is common in most disciplines. Using this approach, a fact connected with a salient cue is selected and then one imagines what it might be used for, so that, one moves from the means to the end. The
answer is given and one constructs a question to fit it. This problem-formulating approach can be abused, as, for example, when a methodology is used exclusively to select "suitable" problems (this is Abraham Kaplan's famous "Law of the Hammer" -- give a small boy a hammer and he discovers everything needs pounding). However, in general, it has proved useful in a variety of contexts.

2) Problem-solving guidance from "near-misses" or partial successes -- focus on cues that were recently referenced and connected with earlier, promising, problem-solving attempts. Search for entities related to or resembling these cues (e.g., either generalizations or specializations) and reattempt the problem-solving activity.

This heuristic directs the search for problem-solving ideas towards past, partial successes. Past, problem-solving attempts that come close to a solution or produce promising progress can offer a host of lessons for later, more ambitious tries.

Military history, with its strong "trial and error" flavor, provides some prominent examples. A raid or a reconnaissance in force, for instance, that makes unexpectedly

---

large headway might be transformed into a full scale offensive. The military probe, in this case, would be the "almost successful" cue that leads into the "successful" military offensive. Erwin Rommel, in his North African campaigns, used this mode of seizing unexpected opportunities with great success.

At times a new weapon, improperly used, can produce promising failures and grist for new solutions. The premature use of the tank at Cambrai in 1917 is an example.

Finally, problem-solving guidance from "near misses" can be used to select new leaders. A period of general military failure can throw into strong relief the humbler successes of junior officers, successes that might be less conspicuous in more prosperous times. In this context, such officers (the "promising cues" of our heuristic) might be selected for unusually rapid promotion, hence, increasing command efficiency and the chances for larger successes. This sort of officer recognition process operated to the benefit of the Soviet Army in the early, desperate years of the war against Hitler.

An even more striking example involves the rise of Mao Tse-tung to Communist party leadership. In the late 1920's and early 1930's, when the Chinese Communist Party's primary program for building an urban proletarian base floundered,

---

Mao's successes with peasant armies and guerrilla warfare in the countryside gained increasing attention within the Party, especially among other red army leaders. By 1935 at the Tsunyi Conference, Mao's agrarian achievements propelled him to the chairmanship of the Politburo, supplanting the orthodox, urban Party Centre. The eventual triumph of the Chinese Communist Party began from this point. This 1935 reshuffling of the Politburo was, in part, an application of problem-solving guidance from partial successes. Mao's seemingly peripheral, rural triumphs eventually convinced the Chinese Communist Party elite to turn to him for direction.

3) Generating cues for identifying primary subtasks in a problem and estimating the difficulty of attainment (the "wishful thinking" heuristic) -- assume the problem has been solved and ask what necessary conditions must be satisfied as a consequence.

Effective problem-solving requires a clean, precise understanding of the goal to be achieved. Indeed, one measure of rigorous problem-formulating, as well as problem-solving, is a precise and accurate description of one's goal. Unfortunately, the complexity of international politics makes achieving this level of exactitude difficult. The above heuristic

---

10

is useful for increasing one's understanding of a problem as well as the possibilities for solution. It forces one to build a more detailed representation of the goal than might be provided in the original problem-formulation. It forces one to be concrete.

As proposed in Polya, you assume the problem is solved and then imagine what you have. This exercise might lead to a more detailed view of the goal: 1) it may provide working concepts required by the goal but which may not appear explicitly in the original problem-formulation, 2) it may provide insights into related properties of the goal either by inferences, conjectures, or other heuristic aids, 3) it may reveal important time or coordinating matters not apparent in the initial problem representation, 4) it may suggest a natural partitioning of the problem into a number of more manageable subtasks, and 5) it may convey some feel for the difficulties of the problem.

The Arab-Israeli conflict offers a nice, illustrative exercise. Following Anwar el-Sadat's visit to Jerusalem in November, 1977, a flurry of speculation on an impending, comprehensive settlement appeared in the press. As an antidote to wishful thinking about a near-term, comprehensive

11

settlement in the Middle East, one might assume such an Arab-Israeli agreement has been reached and then consider some events realized by its achievement:

a) Begin drops his commitment to reclaim Judea and Samaria and accepts compromise lines placing some historic lands outside Jewish authority.

b) Sadat accepts compromise borders on the West Bank and the Golan, and persuades his Arab neighbors to accept these borders.

c) Jordan agrees to resume political/economic responsibilities for the West Bank Palestinians, to accept an Israeli military presence in the Jordan Valley, Judea, and Samaria, to accept demilitarization of areas surrendered by Israel, and to grant extraterritorial status to Jewish settlements in those areas.

d) Syria accepts Israeli occupation of areas on the Golan Heights, or, alternatively, agrees to demilitarization agreements extending from the Heights to the Bashan plateau leading back to Damascus.

e) A non-PLO, moderate group, representing Palestinians of Gaza and the West Bank, must agree to conditional autonomy linked to Jordan, and under de facto Israeli military control.

f) In return for Israeli security compromises with respect to Palestinian "autonomy," the US must
offer Israel acceptable military/political guarantees.

Besides revealing the number of working concepts, actors, and subtasks subsumed under the blanket term "comprehensive settlement," this "wishful thinking" exercise suggests the enormous political difficulties involved in finding an acceptable solution.

4) Working backwards -- start from your objective and try to determine preceding steps, which, when taken together, will produce that goal.

This heuristic is a specialized version of the preceding one. Unlike the one above, however, working backwards not only reveals necessary steps for attaining a goal, it also uncovers the necessary ordering of these steps. This ordering property makes working backwards especially useful for tackling problems requiring "one-to-one" deductive processes. For such cases, working backwards may generate a smaller branching tree of alternatives than will working forward. In this regard, the proof problems of mathematics provide an especially fertile field of application.

Why might reversing direction, proceeding from the goal to the givens rather from the givens to the goal, prove useful? At least three major reasons exist. First, given a
clearly specified goal and a large number of givens, no ambiguity exists over the starting point when working backwards, whereas ambiguity is considerable when working forward. As Newell, Shaw, and Simon argue, working forward under such conditions is like finding a needle in a haystack, while working backwards is like working a needle out of the haystack. The number of starting points outside the haystack to the needle's location is very large; hence complicating one's search task. In contrast, the problem of removing a needle must begin unambiguously at the needle's location. Further, the number of acceptable locations outside the haystack is very large. Hence, one's search task is much easier.

The second reason for the effectiveness of reversing direction goes to the very heart of human reasoning. Working backwards is, Piaget argues, a basic requirement of rational thought. Notes a student of Piaget:

Rational activity occurs in the child when his trial-and-error gropings attain a definite pattern of order that may be inverted in thought. At this rational stage, if the child makes a mistake in performing a task, he is able to return to his starting point. This characteristic of thought that enables us to reverse a train of ideas or actions Piaget calls "reversibility." It is the basis of our ability to perform mental

experiments, as well as the psychological foundation of the deductive process. 13

In short, when stumped in the midst of a problem, we can always work backwards to some earlier step, both as a check on our reasoning and as a search for other, alternative paths missed earlier. Reversibility is necessary for recovery from error.

The third reason for starting from one's goal and working backwards concerns one's understanding of the goal itself. Often when addressing a problem, the initial representation of the goal is not very detailed. By starting from the goal, by imagining what one would have if the goal were realized, one's understanding of the problem can be increased. In particular, when starting with the goal as a given one might: 1) introduce new concepts embodied in the goal but not explicit in the original problem statement, 2) derive additional properties or conjectures using the more detailed goal representation, and 3) identify subgoals that any acceptable solution would be expected to achieve. Basically, by focusing on the goal, one hopes to find the necessary working concepts for achieving an overall solution.

This "backward" procedure is especially useful in disciplines where findings are scarce and no comprehensive

theories exist. In such cases a formal theory would be premature. Rather than try to construct one, a weaker, "backward" approach is more appropriate. Assume you already have a theory and then try to imagine what its inputs, nature, and outputs might be. To the extent this exercise is successful, you will generate a number of subgoals that such a theory would be expected to achieve. Partitioning the original problem in this fashion may produce subgoals that are tractable. This approach has been used with some success to explore the possibilities of formal theories of perception. The mathematician Henri Poincare also used it to construct the theta-Fuchsian series.

Finally, we observe that historians often "work backwards" when assembling historical explanations for current circumstances. From the starting points of the present, they collect and link past events in some plausible order. This is the basic process for generating "historical hindsight."

Dean Acheson provides a political example showing the power of this heuristic. The Communist takeover of Czechoslovakia and the Berlin blockade in 1948 exposed the serious military weakness of Western Europe and of the US.


Propelled by these events, urgent planning for the defense of Europe began among allied officers at Field Marshall Montgomery's Western Union headquarters at Fonainebleau. Very quickly it became clear the pricetag for these plans was impractically high. Acheson describes how this impasse was broken:

The soldiers properly began by considering what would be required to stop a Russian attack from overrunning Europe while American strength of all sorts was being brought to bear. The result was an impossible initial investment of between thirty and forty billion dollars and annual burdens far beyond practical capabilities. Paul Nitze of the Policy Planning Staff, after a tour of inquiry, suggested reversing the process and working backward from attainable figures to an appraisal of the military results they would produce. Accepting the principle that the first task of the European economies was recovery, the amounts available for defense could be fairly accurately judged...

By the time the prime ministers met in Washington during April 1949 we were able to get a request from our allies for military aid on a basis which at least approached practicality. 16 (emphasis added)

A neater lesson in extracting a "military needle from a budgetary haystack" would be difficult to find.

5) Frame selection by contradiction avoidance -- given a set of alternative perspectives and a contradiction, select the perspective that eliminates the contradiction.

The previous heuristics have suggested how different cues (e.g., goals, subtasks, Schelling focal points, etc.) might be used to suggest problem-solving frames. This heuristic focuses on contradictions as a device for selecting between different frames or assumptions. The frame or set of assumptions that resolve the given contradiction is the winning candidate.

Unfortunately, this heuristic is subject to three major limitations. First, the contradiction at hand can usually be resolved by more than one frame. For example, the contradiction between Soviet proclamations and long-term self interest on the one hand and Soviet strategic arms accumulation on the other can be resolved by a number of different frames (e.g., bureaucratic politics, organizational SOP's, a bid for strategic superiority, extreme defensiveness, fear of the PRC and East European unreliability, etc.). Selection by contradiction avoidance is of little help here.

Second, if the contradiction at hand is the kernel of one's problem, then this heuristic reduces to the trivial advice to select the viewpoint that solves the problem. To be useful the contradiction employed for frame selection must be related to but not identical with the problem under consideration. Finally, even if one can apply this heuristic successfully, one may still be led astray. Human behavior is often contradictory, sometimes intentionally so (as in strategies
of deceit). Eliminating an inconsistency that is an artifact of one's environment and not of one's misguided beliefs may lead one to assume a more orderly and predictable world than really exists.

For these reasons then conspicuous examples of this heuristic in political problem-solving are not plentiful. The one application I found was, characteristically perhaps, not fruitful. During Dean Acheson's 1949 confirmation hearings for Secretary of State, the Chambers-Hiss controversy was examined. The previous year Whittaker Chambers, a former Communist, had charged Alger Hiss, a former State Department officer, with espionage. Acheson had had dealings with Hiss and was, therefore questioned about the case. In grappling with the mystery Acheson tried the "contradiction avoidance" heuristic, without notable success. His report:

In executive session the committee returned to the Chambers-Hiss controversy, trying to puzzle out some rational explanation. We tried the experiment of examining the conduct of both on the assumption that what Chambers had said was true, and then on the assumption that it was false. On neither assumption was their conduct explicable on any reasonable basis. Some parts of the puzzle seemed to be missing. The mystery remained, as it does today. 17

17 Ibid., p. 335.
All the above heuristics dealt with cues for suggesting problem solving moves. We now turn to a far larger category dealing with strategies for identifying saliency. These heuristics are basically "focus of attention" devices. They help identify ideas or concepts that might prove fruitful in one's problem-solving attempts or, more fundamentally, in one's frame finding task.

To place the importance of saliency heuristics in a larger context, we briefly consider the notion of "searching" in problem-solving. In the 1960's and 1970's a group of researchers at Carnegie-Mellon University, headed by Newell and Simon, introduced a way of describing problem-solving that has profoundly influenced cognitive psychology.

Basically, they characterized a problem by a state space -- the set of all possible actions that might be tried to solve the problem. But problem-solvers, because of time and resource constraints, usually operate within a restricted portion of the state space -- the problem space -- that does

---

not contain all possible actions. The subset of all possible solution attempts that actually produce a solution is called a goal set. Problems are vexing because the problem space is usually very large while the goal set is small.

This image of problem-solving, with a few solutions dispersed within a vast problem space, naturally directed much attention towards the notion of "searching." The idea of searching is deceptively simple; but, can produce much theoretical mischief if not treated carefully.

At least two kinds of searches can be distinguished -- algorithmic and heuristic. An algorithmic approach bounds the problem space within some frame, divides and orders it, and then systematically examines each part. This search process is tedious, tiring, and time consuming. It is usually a last resort measure when few clues exist to guide one's efforts. Military sweeps for submarines, mines, or guerrillas are possible examples of algorithmic, "by the book" searching.

In contrast to algorithmic methods that depend upon "brute force" and exhaustion, heuristic searches depend on contextual clues to find "short cuts." Patterns rather than plodding is emphasized. Heuristics are used to concentrate the search on promising areas of the problem space without getting trapped in blind alleys.

Seen in this fashion we begin to see that the process of searching involves a repertoire of different heuristics.
One class is required to select among elements gathered in the "collecting" stage of a search; another class is needed for breaking off unpromised explorations; still another class is necessary for gathering useful clues. We shall examine examples of these types later. In this section we introduce saliency-assigning heuristics.

Perhaps the most basic class of heuristics in a search routine, these saliency heuristics manage one's attention, suggest what things in the environment might be worth investigating, and separate the important from the unimportant. To these crucial guides, the foundation of the heuristic search process, we now turn.

1) Saliency by frequency of interesting appearances — a concept or event is interesting if referenced in several, interesting conjectures.

This heuristic is straightforward. Any entity or process that repeatedly seems related to other interesting things is apt to possess traits worth investigating. Of course, this heuristic requires a base of conjectures or elements already deemed interesting before one can begin identifying common, heretofore unrecognized entities or processes.

Successes and failures are often used to define a "standard of interest" against which to measure the interest-level of new events. Consider, for example, the following incident connected with a failure, which helped trigger Israeli
interest in the F-15 Eagle:

During the summer of 1973, an Israeli F-4 armed with Sparrow missiles took off to intercept a Soviet MIG-25 Foxbat performing a reconnaissance overflight. The F-4 was flying at an optimum altitude of 44,000 ft. at Mach 1.4 at an angle of attack of 45 degrees nose up when two Sparrows were fired. Both missiles failed to intercept the MIG-25 which was flying at 72,000 feet and at a speed too fast for the missiles. The inability of Phantoms to reach a new generation of Soviet aircraft is the reason Israel has requested F-15 Eagles. 19

Saliency by frequency of appearance at important social functions, negotiations, and so on is a key heuristic used by Kremlinologists and Hong Kong watchers of the PRC for identifying new elite figures.

A lighter example of this heuristic comes from Halberstam's psychological and political portrait of President Johnson:

Hugh Sidey of Life, who had written of Kennedy's reading habits, decided to do a similar article on Johnson's. He started with George Reedy, who told him that yes, Johnson was an avid reader. What books? Sidey asked. All Reedy could think of was Barbara Ward's The Rich Nations and the Poor Nations, a book on how the rich should help the poor which Johnson had liked because it was similar to his own ideas. From there Sidey went to see Moyers. Yes, said Moyers, he was an avid reader. What books? Well, there was Barbara Ward's book The Rich Nations and the Poor Nations.) And from there to Valenti, who

said Johnson read more books than almost anyone he knew. What books? Valenti hesitated and thought for a moment, then his face lit up. Barbara Ward's *The Rich Nations and the Poor Nations*...20

Finally, we should note the relative nature of this heuristic. What constitutes an interesting appearance depends on the contest and the actors. A sharp improvement in US antisubmarine capabilities, for instance, would probably be noted with great interest in Moscow but less so in Hanoi. Further, saliency is apt to vary considerably among social groups within a single country. Perceptions of interest or even relevance will not be the same for policy-makers, media representatives, and the general public. In general, this perceptual relativity holds for all the saliency and interest heuristics.

2) Saliency by surprise — a concept is interesting if it is related in a rare or surprising way to another concept that arose in a very different way.

Unexpected connections often attract attention. While such saliency is no guarantee of significance it is often the case that novel connections herald new, important discoveries. This is especially likely if a surprising appearance is also accompanied by other saliency signals such as success, frequency, extreme outcomes, and so forth.

In general, this heuristic has proven so "natural" and useful both in the sciences and everyday life that it barely enters the consciousness of its many users.

We provide two examples. First, the participation of Japanese Red Army members in Palestinian terrorist activities during the early 1970's surprised many. This unexpected "Japanese connection" prompted researchers to examine the international links between different radical and regional guerilla organizations. Interesting cooperative networks were thus discovered.

A second, even more astonishing example of saliency by surprise arises from work being done on a type of noise called 1/f noise or flicker noise. Such noise has the special property that its fluctuations look the same no matter how closely you inspect it. Both global and local statistical analyses give the same results. Surprisingly, each 1/f fluctuations are widespread in nature. The following are all 1/f noise patterns: 1) the annual flood levels of the Nile, 2) variations in sunspots, 3) the wobbling of the earth's axis, 4) undersea currents, 5) membrane currents in the nervous system of animals, 6) temporal uncertainties in atomic clocks, 7) traffic flow patterns, and 8) pitch and volume changes in almost all music. This underlying commonality of statistical structure for such wildly disparate phenomena is alone surprising. But even more surprising,
the human mind seems to require $1/f$ noise patterns. The human nervous system acts like a complex filter, screening out irrelevant elements and transmitting only those pattern changes that the brain can process. These pattern changes approach $1/f$ as they get closer to the brain from some sensory area like the finger tips. Hence, in some mysterious way, our perceptions seem to cluster around $1/f$ noise experiences.

These findings suggest new, exciting applications to come (already $1/f$ approaches have been used to "explain" the appeal of certain types of abstract art. The saliency of this work is, in part, due to the surprising manner in which noise analysis in electronics has begun to illuminate other, seemingly unrelated areas. This "saliency by surprise" might even recommend $1/f$ approaches to political scientists for closer inspection.

3. Saliency by analogy -- a concept is interesting if it is linked analogically to another concept of great interest.

Before moving into a discussion of this heuristic, we shall first examine the notion of an analogy and its potential dangers.

---

The analogy is a basic and vital form of reasoning. Intuitively, it is based on a feeling of vague resemblance between two entities. To illustrate how basic analogies are in thought, consider its role in language. In this regard Edward Sapir has observed:

The fact of grammar, a universal trait of language, is simply a generalized expression of the feeling that analogous concepts and relations are most conveniently symbolized in analogous forms. Were a language ever completely "grammatical," it would be a perfect engine of conceptual expression. 22

The analogy is a method of extrapolation, moving from the known in one domain to the unknown in another domain. Induction is, for instance, a form of reasoning by analogy. Basically, an analogy is a map between two entities. More formally, an analogy is the invariance of a relation under some transformation or mapping between two sets of elements. Explains Rosen:

In the case of a relation between only two elements the analogy takes the form "A is to B as C is to D." This means that the relation holding between A and B holds equally well between C and D, with C taking the place of A and D replacing B. Then the pair "A, B" and the pair "C, D" are said to be analogous with each other, and we say that there is an analogy between the pairs. 23


Therefore, an analogy must have three components: 1) two sets of entities, 2) some kind of structure (not necessarily the same) defined on each set, and 3) a mapping between these two sets. This mapping preserves some property shared by both sets, this property, in turn, being the whole point of the analogy.

Having described an analogy's structure we can now consider its dangers. Intuitively, the closer the similarity between the two sets being compared the safer the analogy. But, as this similarity decreases, the supporting evidence, and hence, the strength of the analogy diminishes proportionately. Unfortunately, analogies are apt to be most useful when linking disparate sets. A tradeoff between usefulness and safety exists. For some uses of analogy (e.g., illustrating established, general principles, teaching, providing emotional continuity and psychological support), emphasis might be placed on usefulness rather than caution. But, for most problem-solving purposes (e.g., estimating probabilities, canvassing consequences or contingencies, generating hypotheses) analogical plausibility is crucial.

Estimating this plausibility requires the structure of the sets being compared, as well as the mapping between these sets, be specified clearly -- the more detailed the specifications the better. Unfortunately, most analogies, whether historical or structural-functional, lack much of this background structure, often because it is assumed to
be understood. For casual conversation this may be acceptable, for problem-solving, less so. These considerations suggest the strength of any heuristic using an analogy can vary widely depending on the quality of that analogy. In general, the more analogical structure offered, the less likely one is dealing with a facile resemblance, and, hence, the more useful the given heuristic is likely to be.

Saliency by analogy is perhaps less risky than most other analogical heuristics. Here, one is not necessarily trying to preserve structural resemblances. Preserving interest is all that counts. Vague resemblances between entities may have, therefore, as much suggestive power as strict, structural linkages.

President Carter, at his June 1979 Vienna meeting with Brezhnev, clearly had this suggestive power in mind when he tried to discourage the use of this heuristic among reporters. James Reston, present at the conference, observed that the President was:

... obviously concerned about the charges of appeasement leveled against him by Senator Jackson of the State of Washington. When he arrived in Vienna in Air Force One, it looked like rain. And remembering Neville Chamberlain and Chamberlain's symbol of the umbrella as a mark of appeasement, he ordered, "No umbrellas!" -- even if he had to be drenched in rain. 24

---

24 James Reston, "The Vienna Waltz," The New York Times (June 17, 1979), Sec. 4, p. 19.
A more positive example of saliency by analogy comes from Jean Monnet's supranational dream of a United States of Europe. "During the First World War he had been impressed, through the work of the Allied Maritime Transport Council, by the degree to which an international staff could transcend national considerations, and even pressures, in administering the use of the merchant fleets of all the allies to achieve an agreed common purpose through agreed procedures." This intriguing personal experience with a supranational organization led to Monnet's lifelong interest in establishing an analogous, supranatural organization spanning all Europe. His zeal helped produce the European Coal and Steel Community and, later, the EEC.

4) Saliency of an analogy — an analogy is interesting if it associates two concepts, each having many conjectures, many examples, and high interest.

This heuristic is not to be confused with the preceding one; the first is the converse of the second. The last heuristic suggests how interesting concepts can be spotted using analogies. This heuristic suggests how interesting analogies can be spotted using concepts.

Clearly, some analogies are more useful than others for illuminating political concerns. One reasonable way of

---

25
Acheson, p. 499.
judging an analogy's power is by inspecting the concepts linked by that analogy; the more interesting the concepts, the more interesting the analogy. This is the basis of the "analogical saliency" heuristic.

Consider the two examples offered for the preceding analogy heuristic -- the Carter-Neville Chamberlain analogy over umbrellas and the Jean Monnet analogy. The vague resemblances suggested by the first are interesting but in a largely cosmetic, public relations sense. Carter's sensitivity over the umbrella as an appeasement symbol offers few structural insights. Analytically, it will not take us far. In contrast, Monnet's analogy between his First World War maritime council experiences and his dream for a United States of Europe laid the foundation for all sorts of insights and plans that have still to be exhausted. In this sense the Monnet analogy is deeper and more salient than the Carter-Chamberlain one.

But, the caveat discussed above on the tradeoff between the usefulness and validity of an analogy applies here with equal force. Analogies that are structurally interesting must satisfy stringent, structure preserving criteria if they are to be useful. Analogies of lesser structural interest need not meet such standards in order to retain their more limited, suggestive usefulness.

5) Saliency by inconspicuous uniqueness -- an entity is interesting if it is an example of some
larger class, but lacks those distinctive, interesting features often associated with that class.

This heuristic suggests that unusual blandness, paradoxically, can be a source of interest, especially if this blandness is unique. At least two variations on this theme of "inconspicuous uniqueness" are possible: saliency by obscurity and modal saliency. Saliency by obscurity arises when an entity fails to attract or exhibit some normally expected degree of attention-getting behavior. Such "obscurity" might invite closer examination. A dog who never barks, a child who never gets into mischief, a businessman who never chases profits, or a politician who never seeks publicity might serve as illustrations.

A real-life example of the latter can be found in Rep. William Natcher of Kentucky. In general, politicians crave publicity and have many ploys for attracting it (e.g., leaks, press releases, feuds, organizing caucuses, etc.). Even then it is tough work. But not, it turned out, for Rep. Natcher. He achieved press fame by inconspicuous uniqueness — that

The motivation for this heuristic comes from mathematics. Edward Beckenbach observed that a similar paradox arises when one tries to classify numbers as either interesting or dull. No dull numbers exist because if such a set existed, the first of them would be interesting precisely because of its dullness. See Beckenbach's note in The American Mathematical Monthly, Vol. 52, No. 4 (April, 1945), p. 211.
is, by doing nothing for a very long time. According to Joseph Nocera, a Washington reporter, in a tongue-in-cheek report:

Natcher has been in Congress for 24 years and has one of the most abysmal legislative records in history. He has no legislative or administrative assistants -- just some secretaries. He spends his days reading all his own mail and answering it. He gets his kicks presiding over the House floor, an activity he is allowed to do quite often, since no one else wants to ... His only claim to fame is that he has answered every vote call, every quorum call, every roll call, since he came to Congress, 10,443 of them in a row -- a record of non-accomplishment that boggles the mind. 27

Rep. Natcher, who actively dispises and shuns reporters, has been paradoxically rewarded for this legislative obscurity with the sort of lauditory press coverage (a "model congressman," an "ideal legislator") that often escape his more active, publicity-seeking colleagues. Saliency by inconspicuous uniqueness seems to be operating here.

Another, more serious example of inconspicuous uniqueness concerns Canada. Canada is a heavily Americanized society with many of the same traits and problems associated with the U.S. These common features include:

1) ethnic diversity and attendant, racial problems,
2) urban areas comparable to the U.S.,
3) common popular cultures (e.g., shared TV programs, youth cultures and fads,

magazines, foods, dress, etc.), 4) internal, sectional disputes, 5) pollution problems, 6) a British, colonial heritage and frontier tradition, 7) long-term, economic sluggishness and high unemployment, and 8) lax gun control laws. So far, no surprises; Canada seems to be a twin or at least a close cousin of the US.

But, Canada is "inconspicuously interesting" because she lacks a key, distinctive trait of American Society. Canada has very low levels of domestic violence.

Inconspicuous uniqueness can also arise when an entity, as a member of some population, possesses all the modal traits of that population and no distinctive, outlier attributes; in other words, when the entity is "average" in all ways. Such mediocrity is highly prized and sought after by opinion samplers and marketing specialists because it provides a convenient context for predicting population responses. This is why, for example, Columbus, Ohio is an important, corporate test market for new products. The city fits the sociological image of middle America and, hence, is regarded as a reliable predictor of national tastes. This inconspicuous uniqueness might also explain why Columbus lacks a distinctive, urban personality.

In general, saliency by inconspicuous uniqueness is one of the more difficult saliency heuristics to use. As such,
it is not found often in international politics, with the possible exception of high quality intelligence analysis or very subtle bargaining behavior. The sensitivity and intuition of a Sherlock Holmes appear to be a requirement for its frequent and successful use.

6) Saliency from boundary conditions -- the boundary of a concept consists of all items that barely fall into or barely miss satisfying the definition of that concept. Accordingly, an item is interesting if it falls on the boundary of one or more interesting concepts.

The use of boundary conditions for marking out interesting concepts and pointing to new discoveries has a long and fruitful history in the sciences. Consider the following, hardly exhaustive, list of examples: 1) in topology, the study of boundary properties and propositions is of fundamental importance, 2) in biology, the intermediate position of the virus between animate and inanimate matter is a constant source of new insights into the molecular basis of life, and 3) in paleontology and genetics, the search for "missing links" and hybrids introduces new views on evolutionary mechanisms and the origins of species.

For a recent example of how hybrid research is altering traditional views on speciation and evolutionary changes, see Stephen Gould, "The Siabon: Interesting But Probably Not Fruitful." The New York Times (August 3, 1979), Sec. 4, p. 9.
In each of these cases, concepts or entities that press against the limits of some categorization produce new theoretical concerns that lead to more refined categories or entirely new categorizing systems. Often too, saliency derived from boundaries reveal counterexamples that, in turn, nurture new theories. In general, boundary questions, when they push one's definitions and knowledge to the limits, shade into extremal methods of assigning saliency (this point is expanded upon in heuristic 10, saliency by extremes, discussed below).

In international politics, boundary concerns are a common means of focusing attention. For example, boundaries, taken literally as borders between nation-states, are an important source of interest and conflict. Boundaries, taken conceptually, are also an important source of interest. For example, weapons that fall between categories of various sorts (e.g., the cruise missile, the Backfire bomber, and other forward-based systems that can span both tactical and strategic roles, the SS-19 missile that falls somewhere between a "light" and "heavy" ICBM, the pocketbattleship that combines the tonnage of a heavy cruiser with the armament of

---

29

For preliminary research results on the relationships between international borders, on the one hand, and alliances and war, on the other, see Harvey Starr and Benjamin Most, "The Substance and Study of Borders in International Relations Research," International Studies Quarterly, Vol. 20, No. 4 (December, 1976), pp. 581-620.
a battleship, the chemical fireball that realizes "nuclear-like" temperatures via conventional, nonnuclear methods) have often attracted much political attention, especially within arms control contexts.

7) Saliency by processing efficiency -- an item is interesting with respect to some operation if that item can be processed extraordinarily efficiently while other items cannot.

All heuristics embody a certain amount of knowledge. Those that require little knowledge tend to have wide applicability but little power; those that require much knowledge tend to have narrow applicability but great power. The above heuristic is an example of the latter. The operation defining processing efficiency must be known in advance since saliency is identified relative to this operation. In general, this information requirement is high. But, because this heuristic stresses operational utility, when it does find use, it is quite practical.

Consider, for example, verification in arms control arrangements. Verification, as an operation, can be used to assign saliency to weaponry. Those weapons that can be easily inspected without intrusive on-site inspections, for instance, are of great interest to arms control specialists because of their symbolic importance, their use as deployment indicators,
and their confidence building effects. Indeed, a concept known as FROD in the literature (Functionally Representational Observable Differences) has been specially coined to mark out this weapons category. Saliency by processing (in this case inspection) efficiency was the primary heuristic that produced this conceptual distinction.

8) Saliency by exception -- an item is interesting if it meets a rarely satisfied condition.

This heuristic is almost a synonym for interestingness. The exceptions, the nonconformities, the singular, the infrequent, the inimitable, or the scarce are all fingered here. Hard exams, interviews, nominations, "Management by exception," elections, awards, social registers, and so forth are concrete applications of this heuristic, screening the interesting from the uninteresting. This heuristic's basic importance is also revealed by its close ties to all the other saliency heuristics. Each possible mode of characterizing saliency (e.g., success, surprise, association, processing efficiency, etc.) might be viewed as some "conspicuously fulfilled condition." Hence, all saliency heuristics might be seen as variations on a common heuristical theme -- i.e.,

saliency by exception.

Many examples of this heuristic in international politics exist: 1) Swedish and Swiss foreign policies are interesting because they have avoided war for well over a century, 2) Japan is endlessly interesting, in part, because she is a non-Western nation that has modernized extraordinarily quickly and successfully, 3) the cruise missile is interesting because it is a rarity among strategic weapons -- cheap, accurate, reliable, readily adaptable for a variety of roles, and potent, 4) Cuban foreign policy in Africa is interesting because it has shaken the assumption that small, economically weak developing countries cannot exercise far-reaching political/military influence in world affairs, and 5) many "firsts" in politics represent the achievement of difficult, rarely satisfied conditions and, hence, are interesting (e.g., the Russo-Japanese War -- the first victory of a modern, non-Western power over a Western one, Watergate -- the first scandal to force a President to resign, Anwar el-Sadat's 1977 visit to Jerusalem -- the first visit by an Egyptian head of state to Israel, etc.).

9) Saliency by association -- a concept is interesting if it is closely related to another, very interesting concept.

This heuristic is very basic. It is a more general form of saliency by analogy.
We learn very early that interesting things, like mushrooms, appear in bunches. We note closely those who advise the mighty. We single out those who associate with the guilty. We envy those who hobnob with the famous. And, as with people, so with ideas. Sputnik started an extended review of American science and education, Castro sparked renewed interest in Latin American stability (and the Alliance for Progress), Vietnam stimulated concern over guerrilla warfare, and OPEC's 1973 oil embargo led to energy worries. Each of these instances suggest how events or personages can awaken keen interest in associated areas. The examples are legion; the heuristic, all prevailing.

One particularly intriguing example of this heuristic concerns the notion of entropy. Entropy is a technical concept arising from thermodynamics that can only be rigorously defined mathematically. However, its import is made greater because it is connected to other important concepts like disorder, probability, information, and time irreversibility. For instance, with respect to entropy and disorder, Feynman notes:

We measure "disorder" by the number of ways that the insides (of a system) can be arranged, so that from the outside it looks the same. The logarithm of that number of ways is entropy. 31

More generally, the Second Law of Thermodynamics can be expressed in a number of equivalent ways -- that is, 1) the

---

entropy in an isolated system constantly increases, 2) an isolated system, on the average, changes toward a condition of maximum probability (i.e., a more and more probable configuration), and 3) any spontaneous, irreversible process acting on an isolated system will result in a loss of information. These different associations suggest entropy is a concept of remarkable importance.

10) Saliency by extremes -- a concept is interesting if its extreme values or special cases are interesting.

This heuristic is a favorite among mathematicians. In the limit, intriguing things often occur whether they be about the differentiability of "snow flake" curves or about points of singularity (e.g. black holes). Saliency extremes is no less important in international politics. Worst case analysis as a means of evaluating defense plans is one example.

Another example is sensitivity analysis. In such an approach one introduces extreme values in parts of a simulation to estimate output reaction. Unexpected robustness or sensitivities can highlight simulation elements or scenarios having unsuspected theoretical interest.

A third example is trend discontinuity. In this approach key societal or political trends are identified and extrapolated far into the future. All trend discontinuities and absurdities forced by such extreme extra-
polations are then noted (e.g., if the 1964 US student enrollment growth rate were extrapolated, then in a few decades students would exceed the total, estimated US population). These discontinuities, in turn, suggest future problems that might arise. This sort of trend analysis is popular among futurists.

A final, suggestive example concerns taboos. Most taboos deal with social matters of little interest to international relations specialists. But, some special cases may prove to be valuable exceptions. One interesting taboo deals with CIA-KGB operating procedures. It is an unwritten code of behavior that the CIA and KGB do not murder each other's operatives, except under extreme circumstances. This interesting special case suggests that, in general, some classes of taboos may be a fruitful field of study in international politics — that is, why do governments choose not to do certain things that are within their powers? How do such inhibitions develop?

One more point on this "extremal" heuristic should be noted. While it is useful for promoting the "broad view" associated with frame switching (and hence, is classified here as a multiple frame heuristic), it can also focus and

32

fix perspectives. It can close off inquiry, promoting the neglect of hard, cost-risk choices. For example, assume a policymaker wants to avoid some, extreme outcome. This desire may grow so obsessive as to justify any avoidance policy, no matter how unpromising. By focusing on an extreme possibility and using it as a guideline for policy-formulation, cost-risk matters are suspended. All tradeoffs in the service of avoidance will appear acceptable.

Ellsberg has argued such a perspective dominated US planning in Vietnam, what he calls the "Desperate Proposal Pattern." His view of the pattern:

To avoid an "intolerable" (infinitely negative) outcome, any measure with some chance of success is justified, no matter how low its probability of success, or how high its cost and risks. Hence their is no need to report or even calculate the latter considerations; it is enough to say that, unlike current policy, the one proposed is not certain to fail. 33 (emphasis in original)

11) Saliency bestowed by patterns -- all key concepts associated with patterns or regularities are interesting.

Context helps determine meaning. This theme has surfaced in a number of different guises throughout this paper. The above heuristic is still another variation on this familiar theme.

Pattern recognition is important for learning. For example, in memory studies, recall is clearly enhanced when

items are embedded in some readily perceived pattern. In an earlier chapter we noted the ease with which expert chess players can memorize board positions because of recognizable patterns. But without such patterns recall falls to the level of the beginner. The ancients, because they frequently had to deliver long speeches without notes, developed systems of memorization based on patterns.

But, even more fundamentally, pattern recognition is needed for intelligibility. Observes Norwood Hanson:

Perceiving the pattern in phenomena is central to their being "explicable as a matter of course." Thus the significance of any blob or line in earlier diagrams eludes one until the organization of the whole is grasped; then this spot, or that patch, becomes understood as a matter of course. 36

In short, patterns make meaningful details that might otherwise have gone unnoticed. This is the nub of the "saliency by pattern" heuristic. Historians often use this heuristic to call attention to events. In writing history, they weave a pattern (i.e., an account, narrative, historical

34 For a brief summary of these studies, see Walter Kintsch, Memory and Cognition (New York, John Wiley and Sons, 1977), pp. 229-233.

35 See Kenneth Higbee, Your Memory: How It Works And How To Improve It (Englewood Cliffs, N.J., Prentice-Hall, 1977), for specific examples of such memory systems.

36 Norwood Hanson, Patterns of Discovery (Cambridge, Cambridge University Press, 1958), p. 87
that, by its design, highlights certain events, which might otherwise have been ignored. If such a story gains currency these events then assume the level of "historical facts, causes, or effects."

For a concrete illustration of how a historical account establishes historical facts, consider the following description by E.H. Carr:

Let us take a look at the process by which a mere fact about the past is transformed into a fact of history. At Stalybridge Wakes in 1850, a vendor of gingerbread, as the result of some petty dispute, was deliberately kicked to death by an angry mob. Is this a fact of history? A year ago I should unhesitatingly have said "no." It was recorded by an eyewitness in some little-known memoirs; but I had never seen it judged worthy of mention by any historian. A year ago Dr. Kitson Clark cited it in his Ford lectures at Oxford. Does this make it into a historical fact? Not, I think, yet. Its present status, I suggest, is that it has been proposed for membership of the select club of historical facts. It now awaits a seconder and sponsors. It may be that in the course of the next few years we shall see this fact appearing first in footnotes, then in the text, of articles and books about the nineteenth-century England, and that in twenty or thirty years' time it may be a well established historical fact. Alternatively, nobody may take it up, in which case it will relapse into the limbo of unhistorical facts about the past from which Dr. Kitson Clark has gallantly attempted to rescue it.

Carr notes further:

History...is a process of selection in terms of historical significance...just as from the infinite ocean of facts the historian selects those which are significant for his purpose, so from the multiplicity of sequences of cause and effect he extracts those, and only those, which are historically significant; and the standard of historical significance is his ability to fit them into his pattern of rational explanation and interpretation. Other sequences of cause and effect have to be rejected as accidental, not because the relation between cause and effect is different, but because the sequence itself is irrelevant. The
The notion of a "story" in the epistemology of politics has been proposed for assigning saliency to events and concepts (stories are simply worldviews encompassing myths, principles, and events). Again, this is another example of the "saliency by pattern" heuristic; the pattern, in this case, being furnished by the story.

Another example comes from the 1979 Guadeloupe meeting of the world's top industrial states. On the eve of the conference one observer noted an increasingly common career path among foreign leaders -- "more former finance ministers were now occupying the top political offices in the leading industrial nations than ever." Starting with this interesting pattern he then analyzed domestic forces abroad that might account for this and noted how US politics differed in this regard.

The stimulus for this whole analysis was the "pattern" heuristic -- that is, the initial recognition that the path to the top in many industrial states was now through the finance ministry.


A final example comes from a recent essay by Michael Walzer on religion as a reemerging political force in the third world. Reflecting on events of the last two decades, Walzer observed that Islam's growth as a political force has gone unrecognized by Western analysts because of their myopic, cultural secularism. The pattern of world events however, Walzer argued, is unmistakable: the 1975 Moroccan march into the Spanish Sahara, the 1965 "Moslem pogrom" in Indonesia against Communists and Chinese, the Moslem uprisings in the southern Philippines, the 1971 Pakistani repression in Bengal, the Lebanese civil war, the Arab struggle against Israel, the Moslem repression in the southern Sudan, the Moslem rebellion in Chad, and the rise of Khomeini in Iran. This pattern, he concludes, marks the arrival of Islamic political culture as a potent world force, bringing with it tremendous popular energy and future religious-based conflicts. Once again, questions of validity aside, we note this analysis depends heavily on the "pattern" heuristic. The force of Walzer's arguments and predictions rest on his patterning of events -- repression, rebellions, holy wars -- assembled from different national settings and times.

12) Saliency by compatibility -- when comparing two choices, all common dimensions are given greater,

40

relative weight.

Psychological experiments on gambling probabilities and payoffs show that when making choices, people focus on the shared attributes of alternatives while ignoring unshared attributes. This observation suggests the above heuristic.

Integrating many sources of information into an overall judgment is very difficult. One way of selecting elements to be given the greatest attention is compatibility. In particular, faced with some choice, emphasize dimensions common to each alternative and overlook unshared dimensions — this is the "saliency by compatibility" heuristic in a nutshell. The existence of this heuristic has been tested by Slovic and MacPhillamy. Reports Slovic:

We asked subjects to compare pairs of students and predict which would get the higher college Grade Point Average. The subjects were given each student's scores on two cue dimensions (tests) on which to base their judgments. One dimension was common to both students and the other was unique. For example, Student A might be described in terms of his scores on Need for Achievement and Quantitative Ability, while Student B might be described by his scores on Need for Achievement and English Skill. In this example, since Need for Achievement is a dimension common to both students, it should be weighted heavily. That is, a comparison between two students along the same dimension should be easier, cognitively, than a comparison between

different dimensions, and this ease of use should lead to greater reliance on the common dimension. The data strongly confirmed this hypothesis. 42

Slovic further shows how this "compatibility" effect can lead to inconsistent preferences and choices.

Yet, despite these defects (and we must remember no heuristic is foolproof) saliency by compatibility is frequently used. Comparisons between rival scientific theories and the impact of "critical experiments," for example, depend upon it. Commensurability in science requires, in part, the picking out overlapping jurisdictions among rival theories before experimental testing can begin. The attention paid to these overlapping areas is in part the result of the "compatibility" heuristic.

Finally, we note the impact of this heuristic on the SALT-II debates. Because of different strategies, objectives, geographies, histories, political commitments, and so forth, the US and Soviet Union have assembled very different sorts of strategic weaponry, greatly complicating the task of drawing comparisons and defining "strategic equivalence." As a result much attention in the SALT-II debate (especially by its critics) has been directed at narrow weapons or monitoring categories where rough US-Soviet comparisons might be easily made (e.g., heavy silo-based ICBM's -- Soviet

ICBM's — Soviet SS-18's vs. none for the US; strategic bombers — Backfire vs. FB-111's; verification possibilities -- a closed Soviet society vs. an open US one). Larger, contextual factors that are unique to each superpower and, hence, not easily compared, are given less debating attention (e.g., differences in economic and political vulnerability to nuclear attack, differences in resource allocation for defense, differences in political commitments and dependability of allies, geographical differences, etc.) yet these factors are probably more important for assessing SALT-II than shared US-Soviet weapons categories. Saliency by compatibility is probably operating here inducing "box-score" comparisons on shared (and mostly narrow) US-Soviet weapons attributes.


A fair amount of debating energy over SALT-II centers on the appropriate weapons comparisons to be made. Is Soviet Backfire bomber strength to be measured against FB-111's alone or all forward-based systems (the US has 67 FB-111's as part of a strategic bomber force and 500 other aircraft in Europe and the Pacific capable of hitting Soviet territory; the Russians produce 30 Backfires a year and had about 150 as of August, 1979)? Is the Soviet SS-18 heavy ICBM force to be measured against US European-based aircraft and the nuclear weaponry of US allies (as suggested by the Vladivostok bargaining of 1974)? Should US forward-based systems be measured against the Soviet medium-range ballistic missile force? These debating details not withstanding, the suspicion that "compatibility" effects are operating remains. "Weapons categorizing" disagreements are over the exact nature of the strategic dimensions shared by the US and Soviet Union; not whether these shared dimensions are really suitable for making US-Soviet strategic comparisons.
13) Saliency from generalization or specialization -- a concept is interesting if its generalizations or specializations turn out to be unexpectedly interesting. Further, if a concept has an interesting property lacked by one of its specializations (or generalizations), then both the concept and its specialization (or generalization) become more interesting.

Using existing knowledge to produce new knowledge is very difficult. Generalizing and specializing are two important ways for moving from the old to the new. The above heuristic, in particular, uses generalizing and specializing to explore the "conceptual neighborhood" of an idea as a means of assigning saliency. If an idea's neighborhood (i.e., the idea's generalizations or specializations) turns out to be unexpectedly interesting, then the idea itself is also considered interesting.

Here, the term "unexpectedly interesting" only refers to interesting neighborhood traits not previously connected with the initial, generating idea. Put another way, if an idea is interesting in some way, and one of its generalizations is interesting in the same way, then that sort of saliency is "expected." No one would be surprised if a young girl's interest in a particular horse grew into an infatuation with horses in general. We are not interested
here in such "expected" associations.

Further, if an idea is interesting in some way, but, its conceptual neighborhood proves uninteresting, this is "unexpected." And, hence, both the original idea and its neighborhood become more interesting -- at least, to the extent that one is intrigued by the question "Why doesn't the conceptual neighborhood of an interesting idea preserve that idea's interesting properties?" Examples include level of analysis problems (e.g., ecological or individualistic fallacies) whereby successful policies on one level fail when generalized or specialized to other levels.

Problem-solving research shows generalizing or specializing is not intuitive, but must be taught. Learning means obtaining specific skills under special conditions. Such skills are not easily transferred to other social contexts. After reviewing some cross-cultural research on education one researcher concluded:

Like apprenticeship for the tailor, education apparently provides children with specific instruments that may be useful to them as adult members of their culture. But there is no evidence that formal education induces children to transform their mental operations in any general way. Instead, it seems far more useful to view education as the way in which societies organize children's experience to fit the demands of their adult lives in specific rather than in general terms. 44

Less pessimistically, Richard Mayer believes problem-solving skills can be transferred if one's encodings and problem representations are rich and extensive. Mayer cites research showing:

... that the same mathematical problem-solving behavior can be maintained by a set of discrete, low-level rules (e.g., single associations) or by a more general, higher order rule system that can generate discrete rules. In one study, Ehrenpreis and Scandura taught a mathematical skill by presenting the discrete, low-level rules or the higher order rules: although both instructional groups performed similarly on a test of the specifically taught skill, the higher order group showed superior transfer to new tasks.45 (emphasis added)

The point here is that the above heuristic is an example of a "higher order rule" because: 1) it is not tied to one context; it promotes frame shifting, and 2) it encourages richer problem representations and encoding by forcing one to examine conceptual neighborhoods when searching for saliencies.

Alexander George, in a plea for policy-relevant theorizing, argued that political scientists "need to study and learn more about what a person does when he 'goes beyond'

available generalizations in order to deal with a single case." The above heuristic represents a partial answer to George's question with respect to saliency.

Policy-makers and historians often move from the specific to the general or vice versa in order to identify saliencies and mark out ideas for closer study. This exploring of "conceptual neighborhoods" often is usually accompanied by other heuristics (e.g., saliency by analogy, saliency by frequency of interesting appearances) as will be apparent by the following examples.

Our first example deals with US environmental impact statements. These statements have proven politically useful for halting domestic projects endangering the environment. International environmentalists are now interested in these impact statements. They are pushing for generalized versions of such statements to cover US exports financed by the Export-Import bank. All such exports, under present proposals, would require impact statements about the sale's effects on the environment of the client country. This is a nice example of saliency from generalization.

Impact statements have attracted international attention


because their generalized versions are unexpectedly interesting -- unexpectedly interesting in that US environmental laws might be used to secure environmental improvements in other countries that lack strong environmental constituencies.

A final example deals with US antitrust laws and their relation, if any, to international commodity cartels such as OPEC. Ordinarily US antitrust regulations would be of little interest to international relations specialists. But, this may change. The New Republic recently noted:

... a federal district court in California is hearing a case brought by the International Association of Machinists against OPEC for price fixing in violation of US antitrust laws. Since OPEC is the purest form of cartel, existing for the sole purpose of fixing prices, the Machinists seem to have a good case if they can get past some jurisdictional questions. The White House, in mid-June (1979), seriously considered filing a "friend of the court" brief supporting OPEC... The New York Times reported that the White House feared the Machinists' action could "prompt Saudi Arabia to withdraw billions of dollars it has invested in United States Treasury notes." 48

This affair is another instance of "generalizing" saliency. Antitrust laws will become interesting to many international relations students if these domestic regulations are extended to cover international cartels.

A further application of this saliency heuristic arises from a recent proposal calling for an international antitrust agency within the UN. This agency, patterned after US trust-busting authorities, would block price-fixing in international trade — in short "cartel-busting." Despite the doubtful prospects for this proposal's acceptance, it is an interesting example of "generalizing" saliency. It suggests how laws of purely domestic interest might suddenly acquire international saliency when appropriately generalized.

14) Saliency by equivalence — if two, seemingly unconnected concepts turn out to be equivalent, then they are both interesting.

This "unifying" heuristic embodies a primary aim of science, and is, therefore, a hallmark of the more advanced disciplines such as physics. It provides a large amount of intellectual satisfaction (the "aha" effect) as well as signifying theoretical progress of a very high order.

As noted in a previous chapter, perhaps the most remarkable example of this heuristic comes from the early development of quantum mechanics in the mid 1920's, when physicists discovered the matrix mechanics of Heisenberg and the wave mechanics of Schrödinger were equivalent. This

connection was startling because the two approaches were thought to have different physical and mathematical assumptions. Once this equivalence was established however, its fundamental importance was immediately recognized by all.

My research suggests this "equivalence" heuristic is not readily applied to international politics. Unlike the "hard sciences," where the notion of equivalence is defined mathematically, political science has no precise, commonly accepted definition for the term. Equivalence in social contexts often is synonymous with analogy or association. In this sense the "equivalence" heuristic might be viewed as a stronger version of the "saliency by association" or "saliency by analogy" heuristics.

Despite the apparent feebleness of the "equivalence" heuristic in political problem-solving it does find use in nonmathematical contexts. The following are suggestive:

i) Equivalence as identity -- two concepts might be considered equivalent if they are identical. For example, a concept might be interesting if it is unexpectedly the boundary of some other, interesting thing. The range of some weapons system (presumably derived from hardware considerations) would take on added saliency if it accidentally coincided with the distance necessary to hit some foreign capital (whose location presumably derived from totally independent, historical-cultural
considerations). The B-25 bomber together with the operational radius of the carrier Hornet, as employed in the 1942 Doolittle raid on Tokyo, provides a specific illustration.

**ii) Equivalence as to function** — two entities, no matter how different in origin or character, might be considered equivalent if they satisfied the same social functions. The notions of manifest and latent functions in sociology provide an example. Universities, churches, and bars, all satisfy vastly different tasks — education, worship, refreshment (i.e., manifest functions). Yet, from a courtship perspective, they all satisfy the same task — providing a social context for male-female introductions (i.e., a latent function). Hence, universities, churches, and bars take on added social saliency because of their "latent functional" equivalences.

The idea of exchanging hostages in antiquity to bind agreements, and the "tripwire" mission of the US garrison in Berlin to demonstrate our resolve both to the Soviets and NATO are other "functional equivalence" examples.

**iii) Equivalence by foreshadowing** — two entities, widely separated in time, might be considered equivalent
if they are seen as like in some thematic sense and yet historically unconnected from one another. This sort of equivalence is rare, but when it does arise it takes on a saliency that can be striking, even profoundly disturbing. The presaging of the 1960's minimalist art movement within the isolated Russian art world of the 1920's is an example. Even more striking are the uncanny, modern themes treated by the early nineteenth century German playwright, Georg Buchner. Consider Stanley Kauffmann's startled reaction:

Buchner is always somewhat frightening to me. The sudden irruption of this giant innovative genius -- he died in 1837 at the age of 23,... -- is past my understanding. It's scary. Mozart, dead at 36, is equally incomprehensible, but at least it's clear that Mozart came out of the music of his time. Buchner did not grow out of the drama of his time...

And when I remember that Buchner's plays were more or less buried for 60 or 70 years, my spine chills further. Imagine what the history of Western drama might have been if those plays had been known. There they were, extant but invisible, while Hebbel and Isben and Strindberg were forging ahead. It's hard to believe that, if those men and others had known Buchner's plays, their own would not have been affected. The "if" is staggering. 50

50

15) Saliency criteria for actions -- an action or policy is interesting if:

i) it preserves interesting properties,

ii) it eliminates undesirable properties,

iii) it creates new, interesting properties,

iv) its initial conditions (starting points) are interesting,

v) it is of recent origin, or

vi) other, interesting actions exist having the same initial conditions or consequences.

I originally collected these heuristics from mathematics rather than international politics. Much of modern mathematics is the study of mappings (at times referred to as transformations, operations, correspondances) between sets. A mapping is simply some rule that associates each element of one set with precisely one element of another set. This mapping idea, although extremely simple, provides tremendous analytical power. Simply consider, for example, some special sorts of mappings that characterize different branches of mathematics: linear transformations in linear algebra, homeomorphisms in topology, homomorphisms in group theory, functors in category theory, conformal mapping as a special topic in complex analysis.

Given the importance of mappings, mathematicians use informal saliency criteria for selecting mappings that might
prove interesting. Some of these criteria provide the contents of the above heuristic -- saliency criteria for actions.

But how are mappings relevant to international politics? Because the notion of a map is so general, one can view many, seemingly far-removed processes as mappings -- counting and physical deformations, for example. In particular, foreign policy actions might be viewed as maps whereby some "pre-policy" situation is associated with some "post-policy" consequence. Actions, from this perspective, are viewed as operations or transformations of various sorts. An earlier heuristic, saliency by processing efficiency, assumed this perspective. We now consider the specific criteria of salient actions viewed as maps.

i) actions that create new, interesting properties -- most actions or policies introduce changes or have some goal. When these changes or goals lead to new, interesting constructions, additions, expansions, etc., then the actions connected with these changes are also interesting. The 1962 actions that led to the sudden appearance of Soviet missile sites in Cuba is one vivid example.

ii) actions that eliminate undesirable properties -- actions or policies can remove or destroy as well as add or create. When those items being removed
or eliminated are deemed interesting, then the actions connected with the removal are also interesting. From this perspective, WHO's policies aimed at the eradication of disease is of great interest.

iii) actions that preserve interesting properties -- besides creating or removing, policies can leave things unchanged -- what mathematicians call invariances. If these invariances are interesting, then the associated action is also interesting. Part of the interest generated by enhanced radiation warheads (i.e., the neutron bomb) and precision guided munitions is related to their damage-limiting properties. This is an invariance of sorts.

iv) actions that have interesting initial conditions (starting points) -- actions can become salient by their starting points, by those initial states that they seek to alter. For example, the State Department issues visas to thousands of foreign nationals every year. These actions, for the most part, are not especially noteworthy. But, if visas had been issued to controversial figures like Yasir Arafat or the Shah of Iran, then these normally routine actions would become very salient.
v) actions of recent origin -- in general, all other things equal, recency increases the saliency of an action. Numerous studies on memory and encoding provide confirmation.

vi) actions that have similar initial conditions or consequences as other actions already deemed important -- comparisons between actions serve to increase saliency when one of the actions is already considered important for independent reasons. Making saliency-enhancing comparisons easier -- this is the main point here. Common dimensions shared by two alternatives reduces the cognitive strain in drawing comparisons (see the discussion on saliency by compatibility). If two actions share similar initial conditions or consequences, this is akin to sharing common dimensions. Such sharing makes comparisons easier which, in turn, increases the saliency of both actions. For example, consider all methods of energy generation (e.g., synthetic fuel processing, atomic energy,

51 See Walter Kintsch, Memory and Cognition, pp. 238-239.
oil, etc.) as different actions having the same general consequences — namely, promoting national growth. Interest in synthetic fuel processing and solar energy is great now because they seem to offer alternatives to foreign oil and atomic energy. If oil or atomic energy were less controversial today, interest in synthetic fuels or solar energy would be correspondingly lower (as was true in the 1950's). In a sense, the high interest in oil and atomic energy spills over into synthetic fuels and solar energy because comparisons can be drawn between them all.
III. Frame Altering Heuristics  
(See the second column of Table 2, pp. 185-187).

We have covered much territory so a backward glance may be useful before pressing forward. All the heuristics introduced so far were frame finding heuristics. They help provide orientation within some problematic context. Two subclasses of such heuristics were discussed -- heuristics suggesting initial problem-solving moves and heuristics for assigning saliency.

Now, we turn to a second, larger family of heuristics -- the frame altering ones. Once a frame has been established, "within-frame" techniques come into play. In particular, once a particular problem representation has been set, one must add to or alter this representation until some suitable solution has been assembled. The frame altering heuristics below help meet this need.

We shall cover five categories of such frame altering heuristics: 1) strategies for generating examples, 2) strategies for modifying problem formulations, 3) strategies of estimation, 4) strategies for selection between alternatives, and 5) strategies for breaking off unpromising searches.
A. Strategies For Generating Examples
(Heuristics 1 – 7 in Table 2, p. 185).

An extremely powerful way of constructing and testing conjectures is the use of examples. Highly abstract approaches sometimes lack the suggestive power inherent in the concrete. Examples serve to prod one towards clearer thinking, to clarify the ambiguous, to confront inconsistencies, and to recognize hidden possibilities. Examples impose a certain "discipline of the realizable;" they promote intellectual and moral honesty (it was Jean-Paul Sartre's dictum that "evil consists in making abstract that which is concrete.")

Example generating, no less than other classes of heuristics, embodies the idea that all inquiries after knowledge are empirical inquiries. Exploration and discovery, whether in pure mathematics, philosophy, or plumbing, require the performance of "thought experiments." Example manipulating is a necessary part of this mental scratch pad activity. Examples can support other cognitive processes such as searching, recognizing, learning, and recalling. They can provide an aid for focusing and maintaining attention; they can serve as reminders of key features; they can suggest search tests; they can reveal problem-solving moves. It is in this general sense that examples, by supporting mental experiments, expose the empirical nature of knowledge inquiries.
Heuristics for example generating are basically "suggesting" rules. They can suggest the frequency of a given class of events, they can suggest new moves or considerations in pursuing a line of inquiry, they can suggest new tasks, they can suggest new concepts to investigate, and they can suggest the plausibility of an argument (by either the collecting of supportive examples or the constructing of counter-examples). This "suggestive" nature of example generating is a natural extension of the saliency heuristics covered earlier. Each saliency heuristic directs attention to certain classes of entities that can, in turn, often provide a rich source of examples. In short, each saliency heuristic has an "example generating" analogue. However, since a lot of the discussion on saliency carries over to example generating processes, we shall not cover all possible extensions. The sketches below should suggest this "saliency/example generating" connection.

1) Examples extracted from mappings—to find examples of a concept, consider maps related to the concept.

In an earlier saliency heuristic (saliency criteria for actions) we noted maps could be used to identify interesting actions. Maps, viewed as transformations, can also be naturally extended to generate examples. Given some abstract concept, mappings can suggest instances, perhaps even categories of instances, illustrating that concept.
Consider the following exercise.

Assume performance uncertainty in complex weaponry is the concept for which instances are needed. Carefully selected maps can guide you to such instances. Here, one might ask what sorts of processes (maps) give rise to malfunctions? This restatement of the problem in terms of maps led me to consider five categories: 1) combat failures, 2) testing failures, 3) alert failures, 4) accidents, and 5) irreversible design errors. These categories, in turn, sharpen, and therefore simplify, one's research tasks. To complete the exercise, consider the examples satisfying these categories, each one an example of the original "performance uncertainty" concept:

i) combat failures -- before the Vietnam war, the US spent $2 billion developing the Falcon air-to-air missile. It had a theoretical kill probability somewhere between 95 to 99 percent. In Vietnam, only 7 or 8 percent hit their targets. The US eventually dropped it.

ii) testing failures -- the US has never successfully fired a Minuteman ICBM (as of 1979) from a normal, operational silo; after 4 unsuccessful tries the Air Force quit testing.

---

Another example. The Department of Energy has admitted that about three-quarters of the A-1 Polaris warheads deployed on submarines in the mid 1960's were probably "duds." The defects took several years to correct.

iii) alert failures — at the beginning of the 1967 Six-Day War, the Joint Chiefs of Staff decided to move the US intelligence ship Liberty into safer waters. They sent their order in at least four messages. Two messages were misrouted to the Philippines and one of these was forwarded to the National Security Agency in Maryland to be filed. Another message was routed over two paths for added reliability. In the first path it was lost in a relay station, in the second delayed until too late. The fourth message also arrived too late. The Liberty was hit by the Israelis. This failure in emergency communications occurred under almost perfect conditions: no facilities had been disabled, there was no enemy jamming, and no

53 Ibid., p. 70. For the details on the Polaris warhead defects, see "Many Polaris Warheads In 1960's Said To Be 'Duds,'" The New York Times (December 3, 1978), p. 32.
restrictions existed on the communication modes to be used.

iv) accidents -- in 1961, after a B-52 crashed with nuclear weapons near Goldsboro, N.C., four of the five interlocking safety devices that had to be thrown in sequence for detonation were activated. The remaining one prevented an explosion. This accident encouraged the AEC and armed services to improve nuclear safety devices.

v) irreversible design errors -- the F-111 inlet was originally designed to minimize drag; but when the prototypes were built it was discovered the inlets did not deliver the amount of air required by turbofan engines under high-performance conditions. The redesign changes for the inlet were so radical, they could not be retrofitted on planes built under the original design. Because production was running concurrently with development 70 percent of the F-111 production run was and is technically deficient.

---


Two final comments. First, in the preceding exercise the sort of map chosen to generate examples can vary considerably. Instead of asking what processes producer malfunctions, we might have asked what processes produce cost overruns, production delays, short weapons' livespans, extreme electronic countermeasures (ECM) vulnerability, personnel training difficulties, or man/machine interfacing problems. How one structures the mapping approach depends upon one's expertise and interest. The point is the general strategy of using maps can be an effective way of uncovering examples, apart from the particular character of one's knowledge base.

Second, this heuristic cannot create examples out of thin air. All heuristics must operate on something. One must have a knowledge base to work from. This heuristic, like all heuristics, simply aids information searches and recall, making them more systematic, reliable, and efficient. It can help you get maximum mileage from available knowledge; but, it cannot substitute for the absence of such knowledge.

2) Examples extracted from specialization -- to find examples of a concept, specialize the concept by adding new constraints or conditions, and then look for examples of that new specialization.

This heuristic, along with the next one below, is closely related to the saliency heuristic dealing with generalizations
and specializations. We noted earlier that specializing a concept could uncover salient elements. It can also uncover examples.

Constructing examples by specializing implies a harder or more confined task might sometimes be easier to accomplish. Polya calls this the "inventor's paradox." It often works because it focuses one's search on narrower, more specialized frames. For example, if pressed for names of US women military leaders one could easily draw a blank. But, if the search were focused on women commanders of the WACs or military nurses (e.g., Brig. Gen. Claire Garrecht, the Chief of Nurses of the Air Force as of 1978), the task might be easier to accomplish. At least, one would have a better idea of how to go about collecting the necessary information.

Moreover, this heuristic can be extended. Given an interesting specialization of some concept, try imposing more constraints on this specialization, or try specializing the original concept again in some other, different way. Either approach might produce more, new examples.

3) Examples extracted from generalization -- to find examples of a concept, generalize the concept by removing constraints or conditions, and then look for examples of that new generalization.

This heuristic is a natural variation on the previous one. It is effective because at times information encoded in
our memories may be organized on a higher level of generality than is required for the immediate task at hand. For instance, in trying to find examples of US-initiated wars, a convenient procedure is to run through a list of all wars involving the US, selecting those cases relevant to one's task. This list is simply a generalized collection including all US-initiated wars as a subset. Indeed, it is rather difficult not to organize one's search procedure in this fashion. This compelling quality probably reflects the manner in which most of us have learned American history. If the same task were given to a Soviet or Vietnamese national, another heuristic might be more "natural," reflecting a very different, culture-dependent encoding scheme.

Finally, this heuristic can be extended. Given an interesting generalization of some concept, try removing more constraints from this generalization, or try generalizing the original concept again in some other, different way. Either approach might produce more, new examples.

4) Examples by association -- given an example of a concept, examine other, closely related variations of your example. They too may be useful examples of the original concept.

This heuristic suggests how known examples might be used as guides for producing more examples. Basically, it depends
on the intuitive notion that "like" concepts have similar relations to more general concerns. For instance, Sweden's suicide rate has been relatively high since the run of the century. It normally stands among the top seven worldwide (20.8 per 100,000 in 1973). To locate other states with high suicide rates, one might examine countries considered similar to Sweden (e.g., the other Nordic countries).

5) Examples from extremes — to find examples of a concept, consider all extreme cases of that concept.

This heuristic is very common in mathematics where the investigation of "pathological" situations is routinely pressed to construct vivid examples and even new branches of mathematics (e.g., Russell's paradox, transfinite arithmetic, infinite abelian groups, etc.). It is probably no less common in the study of international politics, which, in large measure, has been the study of extreme situations (e.g., international crises, revolutions, wars, trade conflicts, terrorism, overpopulation, economic under-development, etc.).

A vivid instance of this heuristic in a contemporary context comes from a report filed by the New York Times Cairo correspondent after a visit to Israel. He observed:

It seems the Israelis are still unwilling to grapple with the problems of the Palestinians. It is almost as though many persist in labeling all three million of them as terrorists. 58

If extreme elements (terrorists) are taken to be representative of the Palestinians, this would be a precarious use of our "extremal" heuristic. This heuristic can often produce interesting examples, but not necessarily "representative" ones, as the story above illustrates.

6) Examples from boundary conditions -- examine all entities near the boundaries of a concept for examples.

This heuristic is the "example generating" counterpart to the "saliency from boundary conditions" heuristic introduced much earlier. Recall that we defined the boundary of a concept as those items which barely fall into or barely miss satisfying the definition of that concept. Such boundary items can often provide useful examples.

For an illustration of the clarifying power of boundary examples, consider the vexing issue of ICBM modification during the SALT-II negotiations. The US stubbornly pressed for a plus or minus 5% limit on the permissible changes in the size and weight of existing ICBM's. American

58
determination on this issue cannot be fully appreciated without understanding the "SS-19 boundary loophole" of SALT-I, a loophole that the US was determined to close in SALT-II. According to Edward Luttwak, a critic of SALT-II:

... the whole rationale for the American acceptance of the unequal limits on ICBM's in the 1972 SALT accords (1,608 for the USSR versus 1,054 for the US) was that the Soviet Union would limit the overall throw-weight of its ICBM's by not building any more "heavy" ICBM (SS-9/SS-18) silos -- otherwise, we were told, the US Minuteman ICBM's would be endangered. To obtain the 308-unit limit on "heavy" ICBM silos in SALT-I, the United States agreed to the higher overall ceiling for Soviet ICBM's of all types. Obviously the presumption was that those ICBM silos which were not for "heavy" missiles would be used for "light" ICBM's. As we now know, the Soviet Union was even then building SS-19 ICBM's, which are not "light" by any imaginable definition: their throw-weight is more than three times as great as that of the "light" SS-11's or Minuteman III's ... In 1972 it was commonly understood that the Soviet Union would not be allowed to replace "light" ICBM's with heavy ones. By replacing SS-11's (no threat to Minuteman) with SS-19's, the Soviet Union has in effect done just that.59 (emphasis in original)

In short, the SS-19 was on the boundary between "heavy" and "light" ICBM's, and the Soviets chose to label them "light" to exploit a SALT-I loophole. This "SS-19 loophole", in turn, stiffened US resolve over the 5%


For a description of the SALT-II negotiating struggle over ICBM modification limits, see Strobe Talbott, "Who Conceded What To Whom," Time (May 21, 1979), pp. 34-35.
modification limits during the SALT-II negotiations (indeed, in response to the SS-19 boundary problem, the US coined a new weapons category — "long range theatre nuclear forces" (LRTNF) — for classifying and negotiating purposes). The point here is that the SS-19 as a boundary example, is very useful for understanding certain aspects of US negotiating behavior during SALT-II that might be puzzling otherwise.

7) Examples by instantiation — given a proposition, instantiate its variables to find examples.

This example generating heuristic is probably the least imaginative of the lot. It is basically a rudimentary, syntactic trick taught in all introductory logic courses. One uses the conditions set forth, either explicitly or implicitly in the proposition to guide one's search. As one systematically runs through the conditions, demanding that each be satisfied, then, as one's demands accumulate, the possibilities are narrowed, until hopefully, one is left with a residue of examples that satisfy all the given conditions. For instance, I am now thinking of a country that: 1) is Asian, 2) is friendly with the US, 3) has a population of over 100 million, and 4) is a member of OECD. Guess the country or countries.
The method of instantiation is, in general, useful when specifications are fairly detailed and clear. In such instances it can be a routine, rather dull procedure. But not in all cases. Instantiation of general, psychological theories of perception or cognition, for example, by the construction of electromechanical automatons or computer simulations is often far from trivial.
B. Strategies For Modifying Problem Formulations.  
(Heuristics 1 - 14 in Table 2, pp. 185-186).

In the last section we saw how examples might be generated. In this section we shall, in part, see how examples can be used to improve problem formulations. More generally, we shall review a number of strategies for sharpening problem perspectives -- some of these strategies utilize examples, others resort to different principles.

When working on a problem, we often find it tactically convenient to alter portions of it. This may occur because of unexpected setbacks, unforeseen but promising openings, attempts to link problem elements to one's background knowledge, added precision as more is learned about the problem, unexpected subproblems, or other sundry peculiarities. These intermediate, problem-solving moves are the focal point of this section. The heuristics we shall consider fall into four, very general categories: 1) problem clarification, 2) patching-up falsified conjectures, 3) problem reorganization, and 4) intermediate or "middle game," problem-solving moves. These are the tricks one resorts to when the basic problem frame has been established and the "struggle" joined.

Before we start a clarification is offered. A number of heuristics below deal with conjecture formulating as a means of sharpening problems. Earlier, in the section on frame finding, we treated a similar heuristic on task guidance
(task guidance via cue saliency). Why, the reader may wonder, is the task guidance heuristic treated under frame finding while the conjecture formulating ones below are classified under frame altering?

I offer two reasons and one concession. The two reasons are: 1) the task guidance heuristic is an "opening-move" strategy to suggest avenues of attack before a frame has been fixed; in contrast, the conjecture heuristics below are intended as "middle-game" strategies to suggest intermediate moves given a fixed problem frame, and 2) the conjecture heuristics below lend themselves to focused, limited investigations of separable phenomena, rather than holistic, frame-shifting inquiries. But (and this is the concession) I see no reason why conjecture heuristics cannot be used in "opening game" strategies. My choice of organization is, therefore, somewhat arbitrary; but, I do not think this matters much. The most prudent course is to assume conjecture formulation can be used both in frame finding and frame altering modes. With this qualification we now examine these problem modifying heuristics in greater detail.

1) Using special case examples to clarify a problem — consider the special conditions, constraints, specifications, or other properties contained in a particular example. Try using these properties: 1) to illuminate important, but perhaps too abstractly formulated, portions of a problem, 2) to explore
boundary conditions, focal points, or extreme conditions within the problem's context, 3) to identify the problem's domain of applicability, or 4) to identify modal, "garden variety" situations within the problem context.

Using examples to deepen one's understanding is both a time-honored and effective means of characterizing issues of great complexity. In mathematics, for example, it is standard procedure to construct examples (or counterexamples) as a means of anchoring and deepening one's understanding of definitions and concepts. In law school, students study borderline cases, which play the role of examples, to clarify concepts and to develop a facility for legal reasoning. And so also in international politics.

In negotiations over complicated principles, examples are often useful for clarifying understanding, pressing an issue, defining tolerance limits, and developing a consensus. The problem of Soviet encryption of missile telemetry in SALT-II is one instance. One key way the US monitors Soviet compliance with arms control agreements is by intercepting and analyzing telemetry. In July and December, 1978, the Soviets introduced encrypted telemetry during SS-18 ICBM tests. The encryption deeply troubled the US intelligence community because it threatened US verification efforts.
Thereafter, the US SALT-II negotiating team worked mightily to establish a "common understanding" with the Soviets to limit such encryption.

In a series of talks, the Soviets sought to keep the encryption issue on a high level of generality; the US, preferring the concrete, persistently cited the July-December SS-18 tests as examples of impermissible encryption. Eventually, Soviet acceptance of these special cases provided the foundation for an acceptable compromise. Without these cases to work from, the US would probably have had a more difficult time extracting an acceptable negotiating outcome.

2) Using special case examples to partition a problem — consider the special conditions, constraints, or specifications a particular example might possess. Try forming a subproblem by introducing these special features into the original problem formulation.

Earlier, we observed how specializing could suggest saliencies and examples. The above heuristic on problem partitioning is a further extension on this theme. Using a special case to "particularize" a general problem, reducing it in scope and variability, can often suggest solutions both for the particularized subproblem and the initial, more general problem.

60 Ibid., pp. 33-35.
This ploy is very important in constructing mathematical proofs. Frequently, a theorem contains a general relation that covers a number of cases. The careful examination of examples can point out special cases that might ease the proof construction. Proving such a theorem for such a special case is often easier than tackling the theorem in toto. The method of mathematical induction, for example, depends upon such problem partitioning -- under proof by induction you first prove the theorem for \( n = 1 \) (a special case) and then show that if the theorem is true for \( n \) it is true for \( n+1 \).

Further, problem partitioning by examples is often useful for rejecting theorem candidates. Disproving such a proposition by counterexample saves time that might otherwise be wasted on attempts to prove a false conjecture.

Problem partitioning by examples also appears in international politics under many guises. The use of precedents, in formulating a negotiating program is one example. The precedents are the special examples; the negotiating program is the specialized version of the more general, prenegotiating question. In general, the use of such precedent-oriented strategies seems very effective. In a recent study on International business/government negotiations one observer notes:

In justifying a decision, a precedent-oriented approach is safer than a nonprecedented approach. In formulating terms of investment, both the foreign companies and the host government should
attach particular importance to relatively recent precedents where they exist. 61

Another version of problem partitioning is the "divide and conquer" ploy. The weak spots in your opponent's negotiating front are the special cases; the selectively focused strategies aimed at these weak points represent the specialized subproblem. By isolating and dealing separately with the weakest members of an opposing group, for example, the better one's negotiating chances. Kissinger's Middle East "shuttle diplomacy" depended on this principle. Another striking example of this ploy was Col. Moamer Qaddafi's successful 1970 confrontation with the oil companies operating in Libya. Following his power seizure in 1969 Qaddafi decided to ignore the existing OPEC pricing standards and hike oil revenues dramatically as a prelude to an eventual oil industry takeover. His strategy: strike first at those oil companies that were unduly dependent upon Libyan oil production. These companies were the least likely to resist inordinate Libyan demands and their surrender would


would permit the Libyan government to survive economic retaliation from the other oil majors. His "divide and conquer" approach worked spectacularly. It increased Libyan income and power, it strengthened OPEC multilateral coordination, it led to a chain reaction of oil price hikes throughout OPEC, and it began the era of international oil politics aimed at US Middle Eastern policy.

3) Using examples to check for equivalence — assume you have some concept and a specialization of that concept. Further, assume all examples of the concept are also examples of the specialization. Then, conjecture that the concept and its specialization are equivalent. Check this conjecture when new boundary examples of the original concept are found.

Alternatively, assume you have some concept and a generalization of that concept. Further, assume all examples of the original concept are also examples of its generalization. Then, conjecture that the concept and its generalization are equivalent. Again, check this conjecture when new boundary examples of the original concept are found.

Although the above description of the "equivalence" heuristic appears involved it is basically very simple. Given a set and some subset of that set, if all known examples fall in the subset, then the set and subset may be identical (i.e., in set theoretic terms, the subset is not a proper subset). Equivalence checking of this sort is a common method of tidying up theories, integrating knowledge, and introducing parsimony in empirical research. If, for instance, one initially believes a number of different agents, either in combination or separately, can produce a given outcome, but supporting case studies only exist for one of the agents, then perhaps that agent is the only efficacious one. A classic paper in molecular genetics, published by Oswald Avery in 1944, and perhaps one of the most important biological reports of this century, followed an elaborate line of reasoning akin to the equivalence heuristic. The scientific consensus before Avery's paper held that genetic transformations were probably not due solely, if at all, to DNA because DNA did not have the required molecular complexity — it was thought to be a "stupid substance." Protein was considered a more likely candidate. But Avery, with an intricate series of experiments, showed that DNA was present in all examples of genetic transformation for pneumococci; protein presence

---

was neither necessary nor sufficient. DNA and the "active
genetic principle" appeared to be, Avery concluded, one
and the same substance.

A less spectacular, but politically relevant example of
"equivalence checking" concerns a conjecture that surfaced
in the 1960's, amidst the Vietnam war and the attendant
interest in counterguerrilla warfare. In particular, why
were some revolutionary guerrilla movements (in contrast
to subordinate, partisan activities in support of conven­tional military operations) successful and others not?
The equivalence heuristic produced one simple conjecture
-- all examples of successful revolutionary guerrilla
movements (e.g., Viet-Minh, Viet Cong, Algerian PLN, Chinese
Communists, etc) appeared to have secure sanctuaries,
usually in neighboring countries. In short, secure
sanctuaries = success.

4) Using "example-derived" patterns or saliencies to
generate conjectures -- try conjecturing from any
patterns or saliencies observed from a few examples,
and test the conjecture with later, incoming
examples.

This heuristic is a very general heuristic -- perhaps
it is too general to offer much problem-solving guidance
since "example-derived patterns" depend so heavily on
observer expectations. Nonetheless, I mention it because it is the foundation of inductive reasoning, and because it has been so often used in international politics.

One common variation of this heuristic is the "demonstrated effect", the process in which people of a lower living standard become acquainted with the higher standard enjoyed by some reference group. This knowledge leads to demands for the benefits of the higher standard. The higher standards of the reference group are the "example-derived" saliencies; the resulting conjecture usually goes something like this: "I am as good as them; I deserve what they have; and I'm just the guy to see that I get it." Illustrations are legion. The 1979 revolution that ultimately toppled the Somoza regime in Nicaragua is one instance. Noted a Times correspondent:

The "demonstration effect" of Nicaragua is already evident. Since the guerrilla-backed popular offensive to overthrow the Somoza family began 18 months ago, unrest has grown among workers and peasants in El Salvador, Guatemala and Honduras, as has Government repression. Nicaragua is all the more pivotal because General Somoza has long been the dominant political figure of the region.64

---

64 Alan Riding, "Central American 'Dominos' Are Upset," The New York Times (April 1, 1979), Sec. 4, p. 3.
Another, closely related version of this heuristic is the inclination to generate policies from specific examples. Dean Acheson has argued that this was the standard procedure of the old, pre-war State Department. He noted, with not a little irritation:

...most matters that concerned the Department arose from specific incidents or problems and then evolved into policies, rather than beginning as matters of broad decision and ending in specific action. In this way the departmental division having jurisdiction to deal with the incident became the basic instrument for the formulation and execution of policy. 65 (emphasis added)

Not all uses of this "conjecture-generating" heuristic are so artless. Instead of generating conjectures to aid problem-solving, it can, at times, be used to find conjectures about problem-solving itself. Consider the following, fairly common exercise found in mathematics: i) solve the assigned problem, ii) solve it again using a different approach, iii) solve it again with still another approach, iv) compare the three problem-solving methods, determine the common elements found in each, and formulate a generalized problem-solving approach.

Here, the three separate solutions are the specific examples from which a conjecture must be drawn; the conjecture itself is the required general solution.

5) Using examples to patch-up falsified conjectures —
if a universally quantified conjecture (i.e., a
conjecture dealing with all elements of a given
set as opposed to a conjecture dealing merely with
the existence of a particular element) is falsified
by some instance, try to find some pattern in these
counter-examples. If some regularity does exist,
try to restate the conjecture so as to exclude
these "patterned" counter-examples.

In general, we dislike abandoning conjectures in the
face of counter-examples — understandably so. Usually,
much time and effort has been expended in their formulation
(besides such things as pride, reputation, etc.); hence,
the thought of starting over "from scratch" is not appealing.
More often one is tempted, in the fact of glaring counter-
examples, to modify the old conjecture in some suitable
fashion. The above heuristic attempts this; it offers one
way of sidestepping unpleasant refutations.

Consider the following hypothetical illustration.
Suppose you suspect that defeated nations are very likely
to suffer severe, postwar, political instability (i.e.,
revolutions, coups, civil wars, widespread riots, strikes,
etc.). Resentment and frustration at losing is, you
believe, likely to be directed internally. It seems
reasonable. And a number of supporting examples come
easily to mind: the Paris Commune struggle following the French defeat in the Franco-Prussian War (1871), the 1905 Russian Revolution following the defeat in the Russo-Japanese War, the Russian Civil War following Brest-Litovsk, and the Spartikist disorders following Germany's World War I surrender.

Then, a critic bursts your balloon. "What of the US defeat in Vietnam?", he asks, "or the British-French-Israeli failure at Suez in 1956, or the Dutch defeat in the Dutch-Indonesia conflict over West Irian in 1960?" "None of these defeats led to postwar, political instabilities in the losing countries!"

Searching for some way to salvage your initial conjecture (and pride), you examine your critic's counter-examples. Does some pattern exist here? Yes. You notice all the counter-examples pertain to open, democratic states -- the US, Britain, France, Israel, and the Netherlands. This suggests a way of avoiding these counter-examples. You simply modify your initial conjecture by restricting it to closed, autocratic, or dictatorial states -- to wit, defeated, closed nations are very likely to suffer severe, postwar, political instability. You have used your critic's counter-examples to patch-up your conjecture. This is the heuristic in a nutshell.
Taking this little story further, assume your critic returns, examines your modified conjecture, and leaves you with more counter-examples. "What of the Sudanese defeat in the 1978 war over the Ogaden region?", he challenges, "or the Syrian defeat in the 1973 Yom Kippur War, or the Russian defeat in the 1920 Russo-Polish War?" "None of these defeated, autocratic nations suffered severe, postwar, political instabilities!"

Again you search for some common thread linking these counter-examples, and, again, you succeed. All the counter-examples involve defeated states that suffered no salient territorial losses in the postwar period. Again you modify your conjecture by restricting it further to closed states suffering major territorial dispossessions -- to wit, defeated closed nations sustaining major territorial losses are very likely to suffer severe, postwar, political instability. Once more you have used your critic's counter-examples to shore up your conjecture. This exchange might continue on; however, limits are apparent. Everytime the "patching-up" heuristic is invoked, your conjecture becomes more restricted. At some point the qualifications might grow so bulky so as to bury your conjecture.

One real-world example of this "patching up" heuristic concerns the changing official American perception of the Communist world during the 1960's when the US simultaneously pursued a policy of détente with Moscow while fighting in
Vietnam. The Vietnam commitment appeared consistent with older, Cold War notions; but, the cooperative overtures towards Moscow did not. This tension in approaches, if not objectives, demanded a modification in the simpler, 1950's view of the international Communist movement. The "patching up" heuristics proved useful here. Increasingly, US officials (e.g., McGeorge Bundy, Walt Rostow) began stressing the differences between European (i.e., Russian) and Asian Communist movements. The latter were still in the primitive, militaristic stage and, hence, so the line went, subject to the old, Cold War formulas -- that is, the 1950's, military-oriented, containment conjectures on Communist behavior remained applicable in Asia, and Vietnam, in particular. In short, the conjectures of the 1950's were "patched up" to justify the war effort.

6) Conjectures suggested by conceptual specializations/generalizations -- if no substantive connection is known between two concepts but they both are specializations or generalizations of some other, core idea, then try finding some conjecture tying both concepts together.

---

This heuristic is relatively straightforward. One simply tries to convert some specialized/generalized relationships into a conjecture. The heuristic does not tell you how to do this, only that such relationships are promising candidates for conjecturing. In this respect its directive power is weak.

For an example of this heuristic, consider the concept of foreign policy. Traditionally in political science foreign policy has been treated largely as a process and product of governments. Fairly recently, however, the concept of foreign policy has been generalized. It is now necessary to consider the "foreign policies" of nongovernment actors such as multi-national corporations, labor unions, cities, churches, and other private organizations. The heuristic above raises the possibility of conjectures linking these different, newly recognized "foreign policies."

In essence, our heuristic points out that: 1) all these new foreign policy types are variations on the old, "governmental foreign policy" theme, and 2) given this common origin, might there not exist interesting conjectures linking these new varieties of foreign policy? In particular, labor-management rivalry has long been a fixture of

For a clear exposition along these lines, see Chadwick Alger, "'Foreign Policies' of US Publics," International Studies Quarterly, Vol. 21, No. 2 (June, 1977), pp. 277-318.
US domestic politics. But, as labor and management place increased attention on their respective foreign policies, will this rivalry take on a strong international dimension? And if so, will the character of this struggle mirror US labor-management contests or will it take forms reflecting other traditions (e.g., West European democratic socialism)? Similarly, will other competitive or cooperative traditions be transferred to the international arena as additional private groups (e.g., religious groups, ecology groups, etc.) develop stronger foreign policy interests? The point here is that by extending the notion of foreign policy all sorts of possibilities for conjecturing have blossomed.

---

This, in essence, is the promise of the conjecture-formulating heuristic above.

7) Conjecture formulation by analogy -- given
a particular analogy connecting two sets
of concepts, one set filled with interesting
conjectures, the other set less so, then,
using the conjectures in the first set,
consider the analogous conjectures in the
second set.

This heuristic represents the "hypothesis generating"
use of analogies. One locates a well established domain
with interesting conjectures and finds the counterparts
of these conjectures in other, less-well developed,
analogically related domains. For example, assume an analogy
is established between chess and a new form of warfare.
Given the extensive collection of conjectures on the
proper strategies for the opening, middle, and end games
in chess, consider the analogues of these strategic
conjectures for your war. In fact, an imaginative attempt
along these very lines has been pursued by Scott Boorman
in his analysis of Chinese Communist military campaigns in
terms of Wei-Ch'i (otherwise known as "go" to the
Japanese) playing strategies.

Another example of this heuristic is provided by Voyager 1's exploration of Jupiter. Data collected by the fly-by indicate Jupiter and its moons resemble the solar system in miniature. This analogy, while interesting, has provided scientists with an even more interesting conjecture. The Voyager flight revealed a ring of material orbiting Jupiter inside its innermost moon. This discovery, together with the solar system analogy, suggests a huge ring may encircle the Sun inside the orbit of Mercury.

Still another example would be Bruce Mazlish's attempt to use an elaborate historical analogy between railroads and the US space program as a device to forecast the impact of the space effort on society. Conjectures were collected from historical studies on railroads by Mazlish's project (e.g., the impact of technological innovation on society is felt long after the period of maximum development), and then examined for their applicability to the space program.


70 Walter Sullivan, "Cosmic Evolution-- the View Through Voyager," The New York Times (March 18, 1979), Sec. 4, p. 22.

Noted one researcher on the project:

... our primary purpose in drawing an analogy between railroads and the space program has not been to establish general laws but to secure "insight into the space program." Thus, our "probable inferences from the railroad are not to be validated in terms of other historical examples in general, but "against the space program." 72

This practically-focused characterization holds, in general, for analogies used as devices of anticipation.

Our final example suggests the pitfalls of this heuristic. Throughout the Vietnam war, President Johnson saw a Communist takeover in Vietnam as analogous to the one in mainland China. In particular, he conjectured that a US defeat in Vietnam would produce a vicious domestic split comparable to the Joe McCarthy period of the early 1950's. This belief explains much about Johnson's war policies. 73

We note here one potential pitfall of such analogies as suggested by the last example. When an analogy does not preserve those structural characteristics relevant to the analysis at hand, one's final assessments may spring from superfluous structural traits in the analogy. Put another way, analogies can be thought of as having two sets of components

---

72 Ibid., p. xii.

-- those properties relevant to the evaluation and those properties that are not. Confusing these two sets of components, an all too likely possibility in international politics where theoretical guidelines are sparse, can render the analogy, and any evaluations based on them, seriously misleading.

8) The "missing piece" conjecture -- given a set (e.g., propositions, concepts, etc.) defining the conditions of a problem, assume this set is incomplete. Expand it in various ways, discovering what new "givens" might be useful for solving the problem.

Unlike the other "conjecture formulating" heuristics, this one does not identify promising conditions for hypothesizing. Instead, it promotes an attitude designed to prevent premature problem closure. When faced with a problem assume you do not have all the necessary information to reach a solution. This approach encourages searching, rearranging, and even frame switching; it discourages "grooved thinking" and complacency.

Dean Acheson, according to some observers, was a prime advocate of this heuristic:

Acheson believed that many problems can be solved provided the statesman discovers the "missing component," the introduction of which would make a difficult situation manageable. The art of finding the "missing component" lies in mastering a knowledge of all the present and
potential elements in a situation and determining what new increment, if added by United States policy, would make a critical difference in making the difficult situation more manageable. Acheson tried to apply his theory of the "missing component" to the perennial question of whether to give economic and military aid to underdeveloped countries. He recommended against it in those instances in which United States aid could not provide the local governments in question with the other necessary elements they lacked; namely, the loyalty of their people and honest and efficient administration. 74

Finally, we note that a weaker version of this "missing piece" heuristic has been used in a computer problem-solving system called STRIPS (STanford Research Institute Problem Solver). Basically, the system is given a goal and some initial conditions. It tries to construct a sequence of actions (called a "proof") that transforms the initial conditions to the desired goal state. The system uses a modified trial-and-error approach. It produces a series of partial proofs, each one an improvement over the preceding one, until a completed proof is found. The way STRIPS revises its partial proofs is the primary point of interest for us. It analyzes its unsuccessful proofs, asking itself which proof components, if changed, would allow the goal to be realized. Basically, this is no different from Acheson's search for a "missing component".


to transform difficult situations into acceptable ones. Acheson's domain of search is simply larger than STRIPS'.

9) Problem modification via simplification — try the relaxing specifications on a problem. The simplified form may be easier to solve and may provide insights leading to the solution of the original problem.

In problem-solving, delimiting a problem too closely is a common error. Eliminating constraints on a given problem, making it simpler, might provide valuable insights and correctives. This the main intent of the above heuristic.

In particular, posing a similar, simpler problem before tackling a more complex one can offer the following benefits: 1) relevant problem representations and solution approaches may be common to both, 2) you may already have solved the simpler problem in the past, 3) the simpler problem may suggest ways of partitioning the more complex one, 4) the simpler problem may suggest how misleading or extraneous information may be trimmed from the complex one, 5) the additional complications separating the simple problem from the complex one will become clearer, and 6) these additional complications may be more easily handled incrementally than
if you tackled the complex problem in toto.

A number of these advantages are apparent in the following political example. Secretary of State Dean Acheson used this heuristic in 1949 to swiftly assemble a common Allied policy on Germany. Initially, the German issue appeared hopelessly muddled. Recalls Acheson:

My first impression on going over the material prepared in London by British, French, and American "experts" in anticipation of the April meetings was one of despair. The papers were long, tremendously complex, and totally incomprehensible. Nearly two hundred questions had been "reserved" for decision by the ministers because of disagreement among the experts. The draft of the occupation statute was fifty pages long, almost all of it subject to dissents. The chances of the three ministers even understanding, to say nothing of disentangling, this mess seemed small. 76

Acheson, perceiving that the German problem was really a more involved version of the previously settled Austrian arrangements, reached the following solution. Guessing that the Allies would find the basic operating details in Austria acceptable in Germany also, he introduced the simpler Austrian agreement as the basis for German arrangements. This tactic reduced the initial negotiating material to about six pages. Allied agreement followed swiftly.

We end with two caveats. First, in posing a simpler problem all the difficult elements of the original problem

76 Acheson, Present At the Creation, pp. 376-378.
may be lost. In such cases, solving the simpler problem will offer little guidance for solving the original, more complicated one.

Second, sometimes posing a "simpler" problem may actually introduce more complexity than was found in the original. In particular, reducing the elements in a problem or eliminating certain constraints can occasionally produce a problem more difficult to solve. Mathematics is filled with such "simple" problems. In this situation, the "simplification" heuristic will be of little help.

10) Analogy extension -- given an analogy between two concepts, search for analogies between their specifications or generalizations.

A base tenet of problem-solving is to stick with successful methods, to push them as far as possible with a problem, and to extend them to new problems. The heuristic above embodies this spirit. In particular, when one is lucky enough to find a fruitful analogy, try expanding it to see if further insights in related areas of specialization or generalization might be discovered. Often investigations of this sort produce attractive dividends for theory development.
For example, recall Scott Boorman's work on Wei-Ch'i interpretations of Chinese Communist military strategies mentioned earlier. He found that the elaborate development of an analogy between Wei-Ch'i, a Chinese board game, and Maoist revolutionary strategy produced many intriguing historical explanations, illustrations, and conjectures. Encouraged by this success, he extended his analogy beyond Chinese battlefield behavior to a sort of multi-dimensional version of Wei-Ch'i that encompassed not only Chinese military strategy, but Chinese international, political, and economic behavior as well. This is a direct application of the "analogy extending" heuristic.

11) Action expansion and reduction -- given some action of policy, try enlarging or shrinking the "pre-policy" domain to be processed without changing the nature of the action itself.

This heuristic is related to the preceding one. Both deal with maps that are altered to gain insights. The previous heuristic dealt with analogies, this one deals with actions viewed as maps (this perspective was introduced 77 Boorman, The Protracted Game, pp. 154-184.)
in the earlier discussion on saliency criteria for actions). In particular, for this action heuristic, one either enlarges or restricts a given policy's domain.

Enlarging a policy's domain can improve performance by treating important, previously neglected elements. For instance, the heroin traffic into the US was temporarily eased in the mid 1970's when Turkey agreed to cooperate with US anti-drug efforts. In a sense, the US narcotics campaign had been expanded into Turkey.

Restricting a policy's domain can improve performance by focusing and concentrating resources on key elements. One avoids "spreading oneself too thin." A more intriguing use of the "action reduction" heuristic comes from governmental budgetary battles. To resist cuts, bureaucrats sometimes threaten to drop essential services or programs that are politically sacrosanct. This is a form of "action reduction" that can get interesting results:

If the National Park Services is faced with a budget cut...it threatens to close down the Washington Monument to tourists, knowing that Congress, fearful of a peevish public, will rescind the OMB (Office of Management and Budget -- HYT) cut. Or, under the restrictions imposed by OMB, the agency regretfully finds it will have to abolish Program X; as it happens, Program X
is the pet project of Congressman Clout, a power whom nobody in his right mind wants to antagonize.78

12) Examining action inverses — if the outcomes of some action or policy are salient, then consider "counteractions" that might undo those salient outcomes.

This heuristic is very important in mathematics. Given some interesting map $M$, mathematicians routinely investigate its inverse image under $M^{-1}$, if one exists. This mathematical procedure is quite powerful and can uncover interesting patterns and conjectures. The same dividends are available outside mathematics.

For example, until very recently, aircraft designers often overlooked the countermeasures that an enemy might take to "undo the designer's creations in combat." Defensive efforts (e.g., armor plating, bullet-resistant glass, redundant flight control systems, electronic countermeasures,

etc.) were sporadic and often the products of reaction to, rather than anticipation of, a new threat. Moreover, improvisation became increasingly difficult as weapons systems grew more complex. Vietnam finally brought this problem to a head.

As US aircraft fell victim to North Vietnamese flak and missiles in frightening numbers, the military started emergency work on electronic countermeasures and hardened airframes. The design consequences, according to one observer, were unsatisfactory:

The resulting humps, bumps and bulges invariably added weight and drag which could have no other effect than to reduce range, performance, and payload ... The electronic counter-measures systems that went into service were often jury rigged, poorly tested and maintenance nightmares.79

The lesson was clear:

(aircraft survivability -- HYT) must be addressed from the first day the need for a

new aircraft is envisioned. That need must be tied to a clear-cut mission requirement and must, at the same time, be matched with the threat it can expect to face. The art of aircraft design lies in being able to fit ten pounds of marbles into a two-pound box. Once a design is frozen, once the lines are drawn in ink, the chance to optimize is lost, and we are back to those humps, bumps, and bulges and to paying the attendant penalties. 80

This lesson spawned a new field called "combat survivability," research where experts try to anticipate enemy defensive countermeasures, assess weapons survivability, and propose design solutions. Basically, such vulnerability studies are technical applications of the "inverse" heuristic -- that is, given some weapon with certain performance levels how might your opponent "undo" your threat and what can you do about it?

The anticipatory value of this heuristic, however, extends beyond hardware design. For instance, in arms control, hard thinking about Soviet countermeasures to US weapons deployment can produce useful political insights (e.g., Will stationing Poseidon submarines in the Indian Ocean increase Soviet naval presence there? Will this seriously undermine arms control efforts in that region? Will this make an Indian Ocean nuclear-free zone politically impossible? Is this ultimately in the US interest?).

80 Ibid, p. 62.
This "inverse" heuristic has also produced a new subfield in political science called "dependency reversal" -- the study of ways small states use to overcome dependency or excessive external reliance. The notion of inverting a map (in this case, the dependency relation) to explore new political patterns is especially clear in this example.

13) Projecting intentions -- in the absence of contrary information, resolve ambiguities by assuming the actions of others are intentional; further, assume others will also resolve their perceptual ambiguities by imputing intentionality.

This "intentionality" heuristic reflects an interpretive principle so basic that one might argue we are predisposed towards it on evolutionary grounds. We normally perceive others as intending to achieve various goals according to preconceived plans and voluntary actions. We further attribute intentions to others even when these intentions are unclear to us. In such cases we assume some intention and try to guess it from their behavior (what some economists call a "revealed preference" approach). This is the "conjecture by projection" heuristic in a nutshell. We

assume others, like ourselves, are intentional beings, and further, that others will likewise "project" this intentionality assumption onto us.

Research in physiological psychology suggests "a conservative tendency to attribute changes to intelligible sources is characteristic of the perceptual system at every level of its functioning." Because projecting intentions plays such a pivotal role in determining intelligibility, the perception of intentions may therefore be inherent in the very nature of human perceptual processes. But this does not mean intentional judgments are involuntary products of the perceptual system. Conceptual formulations and contextual interpretations are crucial. People distinguish between intentional actions and accidents. How they do this depends on their reference frame of attributed goals, plans, and background information. Sometimes an event is labeled an accident because of insufficient information about its causes. Sometimes an event is classified as an

82 I am not arguing for the existence of other minds on the basis of analogies to oneself. This is a controversial philosophical issue I wish to avoid. Instead, I am adopting "person" as a psychologically primitive concept for political problem-solving issues. This position is defined in some detail by George Miller and Philip Johnson-Laird. See Miller and Johnson-Laird, Language and Perception, pp. 101-103.

83 Ibid, p. 79
accident not because its causes are unknown, but because the knowledge of such causes would be irrelevant. An airline crash may be seen as a matter of chance by the victims, but not by insurance companies or air traffic controllers. Different frames can lead one to different conclusions about what is intentional and what is accidental.

Further, as is often the case in politics, how one separates the accidental from the intentional is closely related to trust. If an innocent party commits a puzzling act we may be more likely to see it as an accident than if an enemy commits it. The reason is simple. We need not fear the innocent. Our trust allows us to be satisfied with the simple explanation of "accident" to account for the puzzling act. But, if we are dealing with an enemy, we cannot be so relaxed. The puzzling act may be part of an elaborate ruse to do us harm. Prudence requires the use of the "intentionality" heuristic. To maintain vigilance we must assume the enemy's puzzling act was intentional; we must then guess his goals and plans before it is too late. For this reason, distrust encourages the use of the "intentionality" heuristic. It is a form of worst case analysis.

An anecdote taken from the byzantine world of Metternich makes the point. So distrustful was he that on learning of a Russian diplomat's sudden death he remarked, "I wonder what he meant by that?"
Consider too, the cliche of Communist rhetoric, "It is no accident that..." In explaining the denial of accidents and the distrust implicit in the Bolshevik worldview (and therefore the strong dependence on the intentionality heuristic), Alexander George notes:

The classical Bolshevik answer was that all politically important events are explainable by the laws of Marxism-Leninism; therefore, that history can be importantly shaped by "accidental" events is rejected.

Consistent with this general belief was the Politburo's tendency, often noted by Western observers, to perceive connections between events where we see none; to regard unrelated details as symptomatic of major political trends; and to believe there is complicated planning behind events which we know to be fortuitous. Bolshevik thought minimized the role of chance -- with all its unsettling implications for their belief system -- by distorting the image of the opponent and perceiving him as preternaturally calculating and powerful, which, in turn, had other unsettling implications. 84

One final observation on the tie between distrust and the intentionality heuristic within a competitive context. By assuming everyone imputes intentionality to resolve ambiguities (i.e., by assuming the intentionality heuristic), strategics acts become possible. Without this heuristic, strategic thought would not exist. The reason: a strategic

act is designed to mislead others about one's plans; it is a ruse. If no one imputed intentions or plans to others, such ruses would be impossible. So the intentionality heuristic opens possibilities for strategic surprise, which in turn, promotes defensive vigilance and distrust.

14) Checking for analogical changes — given some map $M$ associating two collections of elements, see if changes (e.g., conceptual changes, physical changes, representational changes, functional changes, etc.) in one collection are naturally associated with changes in the other. Sometimes changes in one collection will be analogous to changes in the other where the original map $M$ represents the analogy.

In the earlier sections we saw how maps could be used for: 1) identifying interesting actions, 2) generating examples, and 3) suggesting conjectures. Here, we shall see how maps can sometimes produce analogies. The above "analogy-suggesting" heuristic provides the means. While this heuristic is not easily applied, it is important because: 1) productive analogies are, in general, difficult to construct, and 2) analogies are extremely useful for many purposes (e.g., saliency identification, conjecture formulation, etc.), and 3) "analogy-suggesting" heuristics are not numerous.

In order to interpret the heuristic above, we should re-examine the nature of an analogy. Recall that an analogy
must have three components: 1) two collections of elements, 2) some sort of structure (not necessarily identical) characterizing each collection, and 3) a mapping between these two collections. The map preserves some structural property shared by both sets. This preserved property is what determines the analogy's value for us.

Not all maps are analogies. The above heuristic explains how, given some map, we can examine it to see if a useful analogy can be discovered. Consider the following example from mathematics. To the Greeks, the fundamental mathematical object was length and mathematics was essentially geometry. To Europeans of the 17th century, following the introduction of Cartesian coordinates, the fundamental object was the number and mathematics blossomed into analysis (e.g., the infinitesimal calculus). To modern mathematicians, following the development of set theory in the late 19th century, the fundamental mathematical object is the set and mathematics moved into metamathematics and proof theory. This thumbnail sketch of changes in mathematical thought gives us three simple associations or maps:

\[ M1 \) lengths \[ \rightarrow \text{geometry} \]

\[ M2 \) numbers \[ \rightarrow \text{analysis} \]

\[ M3 \) sets \[ \rightarrow \text{metamathematics, proof theory} \]
These associations highlight historical changes and do not, individually, constitute analogies. But, we can set up simple analogies from these maps using our "analogy-generating" heuristic above. Map (1) associates the collection of lengths with the collection of problems we call geometry. Map (2) represents the 17th century change whereby the fundamental mathematical object changed from lengths to numbers and geometry was "arithmetized" into analysis. In the case of an analogy between maps (1) and (2), then, we have "lengths are to numbers as geometry is to analysis." This might be interpreted as "the structural relation holding between length and number holds also between geometry and analysis." Another way of stating this is "the visually concrete vs. abstract contrast between lengths and numbers carries over to the perceptual distinctiveness between geometric problems and analytical problems." Similar analogies can be fashioned using map (3) paired with either of the others. We note, in passing that these analogies have been appealed to, at least implicitly, in discussions on whether abstraction is robbing modern mathematics of intuitive meaning.

85 For example, see Allan Calder, "Constructive Mathematics," Scientific American, Vol. 241, No. 4 (October, 1979), pp. 146-171.
C. Estimation Strategies
(Heuristics 1 - 4 in Table 2, pp. 186-187).

The complexity and ambiguity of human affairs require estimating techniques. In forecasting, in choosing, in searching, in any decision under uncertainty methods of approximation are needed. The literature on such formal methods is vast. We shall deal with the informal here.

In particular, we shall cover a few, common heuristics for approximating. Some of these suggest starting points for estimating action consequences, others deal with probability estimation, all are at best methods of informed guessing.

This cautionary note is especially appropriate for the "probability estimating" heuristics. No more problematical class of heuristics exists than this one. First, even among specialists, wide disagreement exists over the interpretation and proper use of probabilistic information. Second, it is not clear that methods of mathematical statistics will be as fruitful in international politics as it has proven to be in the physical sciences. The mathematician Benoit Mandelbrot has argued the statistical character of "noise" in social phenomena (i.e., the slow or nonexistent convergence of the mean value of a series of observations towards some limit) may require impractically large data collection efforts to

---

86 See, for example, Terrance Fine, Theories of Probability (New York, Academic Press, 1973), for an extended treatment of a number of contending interpretations of probability theory.
validate stochastically based theories, if validation is possible at all. Third, even if these technical objections are dismissed, it is clear the cognitive demands required for calculating probabilities are formidable. Robert Jervis, for example, has argued statesmen prefer to avoid such difficulties by ignoring probabilities and acting as if events are either certain or impossible. The Bolshevik operational code, in particular, seemed to reject probability calculations because such cognitive burdens inhibited political action.

Nonetheless, heuristic devices for probability estimation and intuitive prediction are used. The following, three heuristics are from the research of Daniel Kahneman and Amos Tversky.

---


We should note here Gregory Chaitin's recent mathematical research treating Gödel's incompleteness theorem from an algorithmic probability approach. His findings, offered as a variation of Godel's famous incompleteness theorem, indicate the validation of stochastically-based theories cannot be shown to be impossible. Hence, Mandelbrot's contention must remain a conjecture. See Gregory Chaitin, "Randomness and Mathematical Proof," Scientific American, Vol. 232, No. 5 (May, 1975), pp. 47-52.


1) Probability estimation via "representativeness"

-- the closer event A resembles a class or process B, the higher the confidence or probability estimate that A belongs to, originates from, or is generated by B.

Intuitive probability estimation by this representativeness heuristic is probably more common than most policymakers recognize. It is often implicit in the use of historical analogies. For example, when parallels are drawn between the Washington Naval Conference of 1921-1922 and the 1930 London Naval Conference, on one hand, and SALT-II on the other, the implication is the probability of beneficial consequences from SALT-II approximate those of the Washington and London conferences.

Of course, the representativeness heuristic neglects several factors that can lead to severe, systematic errors. Among these factors are:

1) Insensitivity to the base-rate frequency of the referent class -- Even if event A closely resembles

91 For one example, see Eugene Rostow, "The Case Against SALT-II," Commentary, Vol. 67, No. 2 (February, 1979), pp. 23-32.

Of course, the analysis one selects depends on one's intents. Supporters of SALT-II contend the 1920 Senate rejection of the League of Nations would be a more appropriate analogy. For a brief discussion of the historical parallels between the 1919-1920 Senate debates and the SALT-II controversy, see James Reston, "60 Years Later," The New York Times (March 11, 1979), Sec. 4, P. 21.
the referent class B, the occurrence of B may be so rare as to be of little value in estimating the probability of A. Kahneman and Tversky have collected research evidence demonstrating people often ignore such base-rate considerations.

ii) Insensitivity to sample size -- Kahneman and Tversky have shown users of the representativeness heuristic, while relating sample characteristics to a specified population, ignore sample sizes. This is like arguing that the probability of realizing success in arms control should be assigned the same value for samples of one (SALT-1), two (SALT-1, SALT-2), three (SALT-1, SALT-2, SALT-3), ... one hundred (SALT-1, ..., SALT-100).

iii) Misconceptions over the meaning of "representativeness" in probability theory -- Assume one has a set of observations A and must decide if A represents the essential characteristics of some process B. If process B is highly structured (i.e., has low complexity, in an information theoretic sense), one has reason to hope set A represents locally the global traits of B. But, if B is highly unstructured or, worse, random (i.e., has high complexity), one cannot assume A is locally representative of process B. Indeed, as noted earlier, Mandelbrot has suggested the complexity of many social processes is of such a high order (Pareto distributions) that observational efforts of staggering dimensions are required before global traits of such processes become clear, if ever.

Kahneman and Tversky, however, have discovered people consistently underestimate the number of observations necessary to characterize a population (they label this tendency the "law of small numbers"). This psychological tendency to overinterpret evidence, that is, to perceive structure where none exists, renders the representativeness heuristic suspect in complex situations. 92

92 Some have argued the tendency to see structure where none exists reflects redundancies built into our nervous systems. See L.B. Mayer, Music, the Arts, and Ideas (Chicago, University of Chicago Press, 1967).
2) Probability estimation via "availability" -- the greater the ease with which instances of an event are imagined or remembered, the higher the probability estimate for the occurrence of that event.

This heuristic uses "mental effort" to evaluate probability. When examples of an event are easily recalled or when many examples are readily remembered, the event's probability of occurrence is rated high. This availability heuristic can be useful for assessing frequency because elements from large classes are often more easily recalled than elements from small ones. However, the usefulness of this heuristic is reduced to the extent that mental availability is affected by factors other than the event's frequency. Some of these confounding factors are:

i) Saliency, familiarity, recency -- Ease of recall may not accurately reflect frequency of occurrence. Saliency, familiarity, and recency can easily facilitate recall and yet have little connection with frequency. For example, the average American may rate very high the probability of a given industry in Sweden being government-owned simply
because socialism is a salient trait connected with Sweden. Yet, about 90% of the businesses in Sweden are private concerns. An American military officer may rate relatively high the probability of a Soviet attack because of his greater familiarity with past Soviet aggression and present Soviet war-waging potential. Yet, the past frequency of Soviet-inspired wars is not high. Finally, subjective probabilities of air-traffic mishaps might rise temporarily following a major air accident.

ii) Biases due to the effectiveness of one's search strategy -- We encode information in our memories in a fashion that makes retrieval easier by some search strategies than by others. For example, the letter k is three times more likely to appear as the third letter of an English word than as the first letter. Yet, most people guess k is more likely to be a first letter. Kahneman and Tversky believe people find it much easier to search for words by first letter than by third letter. Hence, it is easier to think of words
starting with k. This, in turn, leads people to the conclusion that words beginning with k are more probable when the opposite is, in fact, the case.

iii) Biases due to computational or imaginative limitations --- Sometimes rules for generating information rather than separate pieces of information are stored in memory (e.g., the different systems of rules for assessing one's bidding strength in contract bridge). Separate instances can then be generated from memory using these rules. In particular, frequency estimates can be made depending on the ease of constructing such instances. Unfortunately, the computational limits of the human brain render frequency estimation based on rule-generation highly suspect in all but the simplest cases. This is especially true for rules that produce instances in an exponential fashion. People consistently underestimate frequencies in such situations. Variation in imagination can also distort probability estimates. The risks of a new policy may be greatly exaggerated if many difficulties can be imagined, even if the likelihood
of these dangers is very small. Conversely, risks may be greatly underestimated if difficulties are difficult to conceive.

iv) Biases due to stereotyping -- Stereotyping can seriously interfere with frequency estimates on the co-occurrence of two events (illusory correlation). For example, research has revealed such illusory correlations in clinical diagnoses by laymen. These arise because of stereotyped expectations surrounding illness. The existence of some symptoms led to the "discovery" of other symptoms that actually did not exist. This sort of illusory correlation proved extremely resistant to corrective information and effectively blocked the discovery of relationships that were in fact present.

3) Anchoring and adjustment -- select a natural or salient starting point as a first approximation to some judgment (the anchor). Then, adjust the

---

93 Tversky and Kahneman, p. 1128
anchor as new information is received and integrated.

This heuristic has received extensive experimental treatment by psychologists. It is a common method of easing the strain of integrating new information; however, experiments suggest this heuristic is open to systematic error. Adjustments made on the anchor often do not fully reflect the importance of additional information. This conservative bias emerges in a number of specific ways:

i) Different starting points or anchors yield different, final estimates. Because adjustments are typically insufficient, these final estimates are biased toward their respective starting points.

ii) People usually overestimate the probability of conjunctive events (i.e., the probability of events $A_1$ and $A_2$ and ... $A_n$ occurring) and underestimate the probability of disjunctive events (i.e., the probability of events $A_1$ or $A_2$ or ... $A_n$ occurring). Kahneman and Tversky argue people naturally use the probabilities of simple events (i.e., the probability of event $A_1$, the probability of event

94 See the Tversky and Kahneman article for references on a number of "anchoring and adjustment" experiments.
A_2, \ldots \text{ etc.}) as anchors to estimate the probabilities of conjunctive and disjunctive events. Mathematically, the probability of a conjunctive event is greater than the probability of each simple event. But, because people typically adjust their starting points too conservatively, their final estimates remain too close to the probabilities of the simple events (their anchors). Hence, the pattern of overestimation and underestimation for the probabilities of conjunctive and disjunctive events noted above. Kahneman and Tversky speculate that this bias leads people to overestimate the chances of success for a complex system (e.g., a nuclear reactor) composed of many essential components. Even when each component is highly reliable, the probability of overall system failure can be high if a large number of components exist.

\begin{itemize}
  \item[iii)] People usually produce overly-narrow confidence intervals when trying to estimate some unknown quantity. For example, one study found that people's 98\% confidence interval (i.e., the subject is 98\% certain his upper and lower
estimates bracket the unknown quantity sought) missed the true value about 30% of the time. Kahneman and Tversky argue people often construct their confidence bands by using their best estimate as an anchor from which to fix upper and lower limits. Because these adjustments from the anchor are typically insufficient, overly-narrow confidence ranges result.

The reason for this conservative bias in the "anchoring and adjustment" heuristic is unclear. At least two possibilities exist: 1) people stop adjusting too soon because of mental fatigue, or 2) the special saliency of the anchor discourages estimates deviating too far from it.

Despite experimental evidence of systematic, cognitive bias, anchoring and adjustment is firmly rooted in "everyday" estimation procedures. One example is Charles Lindblom's description of incremental policy-making. Instead of weighing the strengths and faults of a large

95 Tversky and Kahneman, p. 1129.

number of diverse policy alternatives, administrators simplify matters by considering only those alternatives that differ in limited respects from the policy status quo. This cuts down on the number of alternatives to be screened and eases the problem of estimating consequences.

Anchoring and adjustment is especially useful in finance. Businessmen often use wholesale prices as an anchor and then add a fixed percentage mark-up to set their retail prices. In budgeting, the previous year's budget often serves as an anchor for calculating the next year's budget request. Notes Wildavsky:

Budgeting is incremental, not comprehensive. The beginning of wisdom about an agency budget is that it is almost never actively reviewed as a whole every year in the sense of reconsidering the value of all existing programs as compared to all possible alternatives. Instead, it is based on last year's budget with special attention given to a narrow range of increases or decreases. Thus the men who make the budget are concerned with relatively small increments to an existing base. 97

Finally, anchoring and adjustment is important in weapons acquisition. In setting the performance levels of a new weapons system, the performance levels of the previous weapons system to be replaced are often used as an anchor with improvements "tacked on." Military requirements, in

such cases, are defined by this anchoring and adjustment procedure, not by prior judgments of actual military need.

4) Estimating drawn from outcomes -- when faced with the problem of evaluating an action, estimate first the outcomes of that action for all salient elements (e.g., elements that are boundary values, extremal, interesting, etc.).

This heuristic is a guideline for directing estimating efforts. It suggests what to estimate; not how to estimate. In character this heuristic is a natural extension of the "saliency by extremes" heuristic discussed earlier. You seek out salient elements and ask how a particular action under investigation would affect them. This approach can quickly uncover important information about that action. The action might be a map, a theory, or a program. For instance, mathematicians routinely examine functions (a type of map) by calculating their behavior for extreme values; researchers

Sometimes this procedure works well, making expensive reviews of alternative military missions unnecessary. But, anchoring and adjustment entails risks, as the development of the F-111 shows. Intended to replace the F-105, the F-111's military requirements were derived from the F-105 in anchoring and adjustment fashion. Unfortunately, the resulting performance specifications unexpectedly "drove the designers against aerodynamic limits." The result: an expensive "lemon." See John Steinbruner and Barry Carter, "Organizational and Political Dimensions of the Strategic Posture: The Problems of Reform," Daedalus, Vol. 104, No. 3 (Summer, 1975), pp. 143-145.
screen proposed theories by studying how successfully these theories explain salient puzzles; policy-makers evaluate programs using "worst case" scenarios. In all these cases, people are making *ad hoc* estimates of some action based on the action's consequences in special situations. This is the "estimating from outcomes" heuristic.

Because foreign policy-makers often use this heuristic to evaluate programs, we examine this activity in greater detail. First, critical or special events, hypothetical or otherwise, are identified to serve as evaluation "bench marks." These critical events are often, but need not be confined to, such "worst case" affairs as threats, emergencies, or crisis. Program effectiveness is then inferred from its handling of these critical events. If the program deals competently with these special events, it is adjudged effective; if not, the program is ineffective. Program capability, in short, is measured using critical events as bench marks.

For example, in 1951-1952, RAND evaluated the Air Force strategic, air-basing posture in the light of a Soviet nuclear attack (the critical event), and concluded Air Force policy was unacceptable. At the time, Air Force installation programs stressed cost minimization by concentrating utilities, pipelines, roads, and the like. Minimizing peacetime costs in this fashion, RAND argued, rendered air bases highly vulnerable to nuclear strikes. Dispersal was the recommended policy alternative.
This sort of worst case approach is useful for assessing programs open to extremes, high-risk conditions as often characterizes, for example, military planning or weapons design. Even when the probability of program failure is remote, worst case approaches can introduce illuminating perspectives.

But, because this heuristic uses extreme situations as a basis for comparison it usually cannot provide a balanced perspective. It is easily mobilized for partisan purposes. Groups with vested interests in the commendation or condemnation of a particular policy may use marginal situations to flatter or fault. Proponents of the manned bomber dwell on the special "false alarm" scenario, arguing bombers can be recalled while missiles can't. Opponents stress "surprise attack" scenarios, arguing bomber vulnerability to surprise attack. Proponents of nuclear reactors dwell on "Arab oil embargo" scenarios and skyrocketing energy needs. Opponents stress the possibilities of reactor accidents and nuclear meltdowns. Examples might be multiplied many times over. The point is critical events can be selected to prejudice the evaluation of a particular program.

Hence, the "estimating from outcomes" heuristic is useful for exploring possibilities and eliminating weak program
candidates. It can suggest the number and type of circumstances possible under extreme conditions. But it can neither determine the probabilities nor the appropriateness of these critical events for program assessment. Accordingly, this heuristic can never serve as a genuine basis for planning.
D. Strategies For Selection Between Alternatives
(Heuristics 1 - 5 Table 2, p. 187).

All previous heuristics dealt with gathering information about problem structure. They provide the setting that prepares the way for selection between alternatives. We now consider the heuristics dealing with selection.

Every stage of problem-formulating and problem-solving involves choice, whether between alternative problem representations, between alternate problem-solving heuristics, or between alternative solutions. The heuristics guiding these choices are primarily "testing" rules. They suggest how alternatives should be screened according to certain criteria to produce a choice.

For many, choosing a problem solution rather than building problem structure is the heart of the problem-solving process. Certainly, it has attracted more attention than most other aspects of problem-solving. Economists, for instance, have devoted much study to collective choice and the nature of rational choice; social psychologists and political scientists have long been interested in decision-making, which again basically boils down to choosing. Therefore, the sampling of heuristics offered below will not uncover new ground. Their treatments will, accordingly, be cursory.

1) Optimization -- select the option that satisfies one's maximal acceptance criteria.
Basically, optimizing means choosing the alternative with the highest payoff. If one's problem is well-defined and mathematically tractable, computational techniques exist for determining optimality (e.g., linear programming, dynamic programming, geometric programming, queuing theory, control theory). But, real-life problems are often too intricate for such techniques.

The standard criticisms of optimizing are: 1) optimal strategies can require astronomical computations beyond the capabilities of all foreseeable computer designs, 2) optimal strategies are often impractically expensive and time consuming, 3) psychological and sociological factors (e.g., emotions, habit, traditions, etc.) resist formal, optimizing treatment, and 4) miscalculations in optimizing (i.e., suboptimizing) might produce severe penalties.

Given the force of these criticisms, together with the computational nature of optimization, one might wonder why optimizing is treated here as an informal heuristic. Indeed, why bother with it at all? The answer: optimization was an important tenet of "classical" Bolshevik thought and, hence, worthy of study on historical and political grounds alone. Moreover, the Bolshevik style of optimizing was a special

---

sort—it was nonmathematical, informal, and intuitive. It shaped perceptions, it guided diagnoses of political events, and it provided standards for planning political actions. In short, it was a practical heuristic of major importance in the Bolshevik "operational code," and this practical relevance lives on today.

Being revolutionaries, the Bolsheviks placed great emphasis on seizing all opportunities for making advances. Tactics of moderation, temporizing, and "playing it safe" favored the status quo, and hence, were shunned. Shaping revolutions demanded the pushing of gains in the face of difficult odds. Optimization was the answer; but Bolshevik optimizing of a special kind.

First, one must not try to calculate probabilities, predict outcomes, or engage in detailed means-ends calculations. Political actions must begin with incomplete knowledge. What can be achieved will only be revealed in the process of "struggle" pursued to the maximum. This tenet removed the onerous computational burdens associated with formal optimizing methods. Second, to avoid the penalties of suboptimization, one must have not a single goal, but a set of graduated goals. Bolshevik optimizing meant striving simultaneously for a maximum payoff as well as lesser

For an extended treatment of optimization in the Bolshevik operational code, see George, "The 'Operational Code'," pp. 205-211.
objectives. If the maximum eluded you, one could still strive for a lesser payoff that represented the best possible return under the circumstances. Graduated objectives, in short, were a safeguard against "all or nothing" adventures.

In this context, we might cite the 1962 Cuban missile crisis as a specific case of graduated objectives. In calculating Soviet intentions, US decision-makers concluded the Soviets could derive a variety of advantages from the crisis, some more threatening than others. Unicausal explanations or motives did not satisfactorily account for Soviet behavior. Further, we note the US "terminated" the crisis by offering the Soviets a modest concession (foreswearing a US-sponsored Cuban invasion) while convincing them that more ambitious gains would be strongly resisted. The Soviets, it seems, decided to accept a lesser payoff than risk war for their maximal objectives.

2) Satisficing — select the first option that satisfies one's minimal acceptance criteria.

Several analysts have argued that the optimizing approach is a poor description of actual decision-making. In its more formal modes, optimizing makes unrealistic demands on a decision-maker's time, information, and resources. In the less formal, "bolshevik" approach, optimizing requires levels of aggressiveness and risk-acceptance not often found in
In searching for a more useful description of organizational behavior, Herbert Simon has argued that "satisficing" rather than "optimizing" is a more suitable explanation.

Under this "satisficing" heuristic, a decision-maker will end his search for alternatives as soon as he finds one meeting his minimal criteria. In contrast to optimization, one scales down objectives to minimize search costs and time.

Satisficing eases cognitive strain in at least six ways:

1) the minimal acceptance criteria under the satisficing procedure are often less complicated and less exacting than the maximal criteria in optimization, 2) satisficing often means examining a few alternatives while under optimizing, all possible alternatives must be examined, 3) satisficing means testing an alternative once against one's acceptance criteria in contrast to optimizing where alternatives are constantly reviewed and compared with each other, 4) satisficing is less likely to require calculations of relative payoffs and tradeoffs among alternatives than optimization procedures, 5) satisficing is a more conservative, risk-averse strategy than "Bolshevik" optimizing, and 6) satisficing, because it is designed to give quick decisions,

protects people from the psychological uncertainties and pressures of extended decision-making.

Specific examples of satisficing include businessmen who assemble investment strategies designed for "satisfactory profit" rather than maximum profit, people who accept medical or legal advice without seeking second opinions, consumers who buy on impulse, and Federal bureaucrats who operate according to the timeless adage, "its close enough for government work."

3) Elimination by aspects -- eliminate all options that fail to satisfy one or more acceptance criteria.

Another effective, practical heuristic for decision-makers is Amos Tversky's "elimination by aspects" approach. In this approach one rapidly narrows down the possible alternatives by discarding all options that fail to meet one's acceptance standards until a single option remains. Using the following television commercial, Tversky establishes the heuristic's power:

There are more than two dozen companies in the San Francisco area which offer training in computer programming. (He puts some two dozen eggs and one walnut on the table to represent the alternatives). Let us examine the facts. How many of these schools have on-line computer

---

facilities for training? (He removes several eggs.) How many of these schools have placement services that would help you find a job? (He removes some more eggs.) How many of these schools are approved for veterans' benefits? (This continues until the walnut alone remains. The announcer cracks the nutshell, revealing the name of the advertised company.) This is all you need to know, in a nutshell.103

Elimination by aspects is effective for a number of reasons: 1) It depends on the recognition of incongruences, a task that is cognitively comfortable (Notes psychologist George Miller: "The mind is a mismatch detector. It is easier to see what is wrong than what is right." ), 2) it allows the use of multiple selection criteria in a quick, sequential process, 3) it eliminates options without requiring their reexamination at a later stage of decision, hence, the choice problem grows simpler as the elimination process progresses, 4) it can be used as a preliminary, simplifying procedure in combination with other selection heuristics, and 5) it promotes quick decisions.

Elimination by aspects is basic to politics. Since politics is the "art of the possible," a politician must distinguish the politically attainable from the unattainable,

103 Janis and Mann, Decision Making, p. 31.

and select options from the former, no matter how attractive the latter. This studied neglect of the infeasible is Tversky's elimination procedure in practice.

One concrete political example comes from Clark Clifford's efforts, as Secretary of Defense, to persuade President Johnson to deescalate the Vietnam war. Convinced of the war's futility, Clifford pushed for a major, unconditional bombing halt in early 1968 as a prelude to a compromise settlement with North Vietnam. In opposition, Secretary of State Rusk proposed a partial bombing cutback north of the DMZ while keeping military pressure up elsewhere. For Rusk, the partial bombing cutback was a small military sacrifice (bad weather hampered bombing in North Vietnam anyway) to exchange for placating the US public. Rusk did not see the bombing cutback as a major strategy change, but a tactical maneuver consistent with the old policy of defeating North Vietnamese efforts in the South. Johnson agreed with Rusk. In the ensuing bureaucratic struggle Clifford could not convince the President otherwise:

So it was Clifford who was brought on board. He finally was persuaded to accept Rusk's partial bombing halt as a peace initiative, not because he was convinced that it would be useful but because he was convinced that it was as far as the president would go. 105

105 Schandler, The Unmaking of a President, p. 312.
Taking the President's measure, Clifford discarded his peace proposals in this instance and settled for the single expedient remaining -- this is Tversky's elimination procedure, grounded not in heroics but in practicality.

Another example of elimination by aspects shows its pedagogical potential in complex settings. In chess, a student studies the masters to deepen and develop his skills. One tries to learn the "right" moves. But, perhaps of equal importance, especially for the novice, one must learn to recognize the "wrong" moves. A study of common strategic and tactical errors, misconceptions, and disorientations can be useful for purging weak moves from a beginner's repertoire of maneuvers. This educational use of elimination by aspects is generalizable to most activities from politics to painting. The instructional power of this heuristic depends on the "mismatch detecting" habits of the human mind. Error is often more prominent and more easily remembered than correctness (perhaps this helps explain why truth is so hard to apprehend).

4) Historical selection criteria -- select or reject options based on your knowledge of precedents. In particular:

i) reject all options that resemble unacceptable options chosen in the past (past-oriented elimination).
ii) select the option that most resembles relevant, acceptable options chosen in the past (past-oriented selection).

The last three heuristics (optimizing, satisficing, and elimination by aspects) were selecting procedures. They assumed some screening criterion as given (e.g., optimization) and used it to make selections. Each of the three heuristics, with its own screening criteria, was autonomous; each could operate alone and was not necessarily dependant on other, selecting heuristics.

In contrast, the "historical" heuristic above is not independent in the same way. It presupposes some other selection heuristics to provide "choice" precedents. In particular, it might be used with some selecting procedure like optimizing, satisficing, or elimination by aspects. For instance, combining satisficing with a "past success" criterion gives the following decision rule "select the first option that resembles relevant, acceptable options chosen in the past." Or, combining optimizing with a "past success" criterion would give the rule "select the best option that resembles relevant, acceptable options chosen in the past."

The above "historical" heuristic is frequently used. When faced with a major decision, a leader will often try something that worked in the past or avoid an option if it failed. This is the "historical" heuristic in
a nutshell, and its cognitive assistance is sizable. It can help decision-makers avoid uncertainty, the need to integrate inconsistent values, and the problem of weighting and combining information. For example, a study of business investment strategy noted:

In estimating the value to their company of a potential investment, the managers in the organizations studied are preoccupied with searching for a comparable prior investment rather than identifying the relevant variables and forecasting the underlying uncertainty. Uncertainty is avoided like the plague, while the certainty of historical information is accorded such a premium that it dominates the managers' mental processes completely. 106

This sort of reasoning is not limited to business circles. Consider the following example of "past-oriented" eliminating. One of the legacies of the Vietnam war is a strong distaste for military intervention and counter-insurgency operations among American policymakers. Such policy options were political "non-starters" in all the following post-Vietnam cases involving US strategic interests --- the Angolan civil war, the Ethiopian-Somalia war, the Lebanese civil war, and the Iranian revolution.

A political example of past-oriented selecting can be seen in the 1965 decision to bomb North Vietnam. Major administration supporters of the policy saw it as an exercise in crisis management. The controlled intensification of military pressure, combined with appeals for negotiations, would force the North Vietnamese to abandon their expansionist ambitions. It all seemed like a straightforward replay of the successful Cuban missile crisis, in which many of the key US policymakers of the time had previously participated.

Unfortunately, as perhaps suggested by the last example on Vietnam, the cognitive simplicity of past-oriented selection can discourage the use of more demanding modes of reasoning. Rigidity and narrowness are the results. Such patterns have been observed in international crisis behavior. But, the time pressures of a crisis are not necessary for generating past-oriented inflexibility. A remarkable, long-term example from 19th century Imperial China makes the point.

---


For centuries the Chinese government had used trade as a device to control barbarians. In return for trading privileges, neighboring peoples paid tribute to China. Economically, the tribute system was a deficit enterprise for the government; however, the Chinese never regarded trade in terms of profit. Trade and the tribute system were political methods to control barbarians; methods that had worked for centuries -- until the arrival of the West. Notes Werner Levi:

Because the tribute system as a diplomatic device had been effective for centuries -- even when applied to the visiting Portugese in the sixteenth century -- the Chinese had got the idea that it was adequate to handle every kind of "barbarian." They had developed a false sense of security, and they hung on to the system with great tenacity after 1842, when objectively the conditions for its survival were changing completely. Their growing awareness that the ambitions of the Westerners and the new kind and volume of their trade would force the abandonment of the tribute system had no immediate effect upon their traditional conduct of affairs. The spirit of the tribute system permeating Chinese officialdom long outlasted the conditions of its successful application. 109

The Chinese, in part because of their ancient reverence for the past, were captives of past-oriented selection. Their decision rules were frozen. It took fifty years, marked from the arrival of Westerners in the mid-nineteenth

century, before the imperial court unthawed and was ready to meet the new situation.

5) Ordering options -- given several options:
   i) if their ordering is critical (i.e., using one particular option forecloses the use of some others later), then first use those options that foreclose the least number of other options (the "LBJ" heuristic).
   ii) if their ordering is not critical, arrange them by frequency of successful use, with the most useful option first.

Unlike the previous heuristics, this one is neither a screening nor selecting device. It is, however, closely related in that it can be used in conjunction with most of the others.

The first variation of the ordering heuristic deals with mutually exclusive options. In order to maintain one's freedom of movement, to defend against unforeseen contingencies, to exploit sudden openings, to maintain control, and to preserve choice this heuristic directs that options foreclosing the least number of other alternatives should be chosen first. This is Lyndon Johnson's famous "maintaining

110 Ibid., p. 15.
Because of its stress on choice preserving and control, the "LBJ" approach is central to theories of crisis management. Kennedy, for example, in the Cuban missile crisis chose the blockade over the airstrike option mainly because the former kept more choices open. President Carter's restrained and measured handling of the 1979-1980 Iranian hostage crisis suggests the same sort of reasoning.

Finally, we note a corollary to the "LBJ" approach: select options that have the greatest chance of producing new opportunities. Again, the emphasis here is on expanding choice and maintaining freedom to maneuver.

The second variation of the ordering heuristic deals with options that do not preclude one another. One simply selects the option that has proven most reliable in the past. This resembles past-oriented selecting; but, in this case, one has a list of options to move through. Hence, less chance exists for becoming fixated on one option. This is especially important if decision time is limited. Examples of this approach include problem-solving in certain areas of mathematics where many solution techniques existe.g., solving differential equations, constructing formulas for numerical sequences, integrating, etc.). Cryptoanalysis

See, for example, Elie Abel, The Missile Crisis (New York, Bantam, 1966), p. 67, pp. 78-79.
(the breaking of cyphers) is a prominent, national security example.
E. Strategies For Diagnosing Unpromising Searches
(Heuristics 1 - 7 in Table 2, p. 187)

We usually equate creativity with fruitfulness, the ability to produce new things in prolific fashion. Hence, it is somewhat of a shock to discover how much creative people emphasize erasing, extinguishing, renouncing, and destroying in their work. Consider, for example, Picasso on painting:

With me, a picture is a sum of destructions. I make a picture, and proceed to destroy it. But in the end nothing is lost; the red I have removed from one part shows up in another. 112

Or Kuniyoshi:

I have often obtained in painting directly from the object that which appears to be real results at the very first shot, but when that does happen, I purposely destroy what I have accomplished and re-do it over and over again. In other words that which comes easily I distrust. 113


Or Duchamp:

I force myself to contradict myself to avoid conforming to my own taste. 114

Or Francis Crick on the key to boldness in scientific research:

Just as important as having ideas is getting rid of them. 115

Seeing anew requires closing one's eyes to the old. Dropping old routines, old rules, and old frames is necessary for creation. And, judging from the quotes above, renouncing the old is hard work. Clearly, the core of the difficulty is mental exhaustion and effort. We all tend to fall back on our old habits -- especially when engaged in strenuous activities like thinking. Problem-formulating and -solving are very tiring, and when one is tired or frustrated, it is hard not to do the easy thing, the thing one knows, the thing that feels natural, the thing that feels comfortable.

But such comfort is the enemy of creativity; hence, the artists' constant fight against natural, easy impulses.


Creative thinking means being able to destroy an old, comfortable frame in favor of a better one. And the willingness to do this requires, it seems, constant vigilance and effort.

Everyone, in the course of everyday activities, discards old information. One must repeatedly update one's memory as new data replaces old data. But, the extent of such modifying is important here. When dealing with high levels of creativity, we are not talking about minor deletions within a frame; we are talking about frame switching on a high level. And such frame switching demands a high degree of mental nimbleness that elite artists seek to attain through the continuous challenging, transforming, and reevaluation of their work.

In this section, we shall introduce some heuristics that play an intermediate role prior to major frame shifts. In particular, these heuristics suggest when major shifts in a problem-solving approach may be necessary, when a particular path appears unpromising, and when to "cut one's losses" and break-off the effort in favor of some other approach.

These diagnostic heuristics can promote the skeptical alertness and agility prized by all creative problem-solvers, as suggested earlier. But, we should note that

under conditions of either very low or very high stress, these same diagnostic heuristics may lead to poor decision-making (e.g., procrastinating, shifting responsibility, rationalizing, selective forgetting, distorting of information, etc.). For example, with a high threat, low decision time context, some of these heuristics might lead to impulsive frame switching (sometimes called hypervigilance, or in its most extreme form, panic). On the other hand, if no hope exists, these same heuristics could lead to frame fixing in the form of avoidance. Finally, if no stress exists, these heuristics might simply produce inertia. These different possibilities raise a technical question -- how should these diagnostic heuristics be classified? Are they frame fixing, frame finding, or frame altering?

I have chosen to classify these diagnostic heuristics as "altering" frame strategies. They might have been treated as "fixing" strategies when, for example, one reinforces a favored perspective by discrediting all other candidates by the diagnostic criteria below. Or, these diagnostic heuristics might have been treated as "finding" strategies because they can promote major frame searches. I chose to present them as altering strategies because

117 For more details, see Janis and Mann, Decision Making, pp. 45-133.
they appear to me to be primarily intermediate steps operating within a given frame after the opening moves of some search process have been initiated. These diagnostic heuristics need not be a prelude to frame switching or fixing.

I recognize an element of arbitrariness exists in my choice. Other classifications clearly are possible. But, as noted at the beginning of this chapter, the borders dividing the different heuristic classes are not impenetrable. Human reasoning, given present knowledge, is too complicated to be completely and cleanly compartmentalized. In particular, a frame switching move might well be triggered, in a particular context, by a heuristic classified as "altering." This would not trouble me so long as this heuristic, in most instances, triggered frame "altering" moves. I seek to capture modal tendencies here. Exceptions will be tolerated.

1) Generating useless, circular results -- abandon any search that produces recurring patterns of failure without any sense of progress or promise of imminent breakthroughs.

Problem-solving approaches can "sour" in a number of ways. One way is the generating of repetitious cycles of failure that produce a sense of open-ended stalemate. Each
defeat seems like a replay of the last with no significant progress. Such circular effects suggest flaws in one's method of search. A major reorienting in approach might be required.

The Vietnam war, not surprisingly, offers a number of examples of this "vicious circle" syndrome. Francis Fitzgerald's description of US pacification programs captures this cyclic quality:

There was a timeless quality to the American effort -- which is not to say that it was static but that it was constantly moving over the same ground. Each year the new young men, so full of vague notions of "development," so certain of their own capacity to solve "problems," so anxious to "communicate" with the Vietnamese, eagerly took their places in this old, old war. "Last year's program fell short of its goal, but this year for the first time we've got some coordination between the ARVN, the RF-PF, and the RD. The hamlet chief here is sleeping in his hamlet. And Major Trinh, an outstanding guy, is giving us his full cooperation." Only the faces of the young men and the numbers of the hamlets changed year after year. For those who stayed in Vietnam long enough, it was like standing on the ground and watching a carousel revolve.

Nineteen sixty-seven was the year of the "oil spot" approach to pacification, the approach that General Westmoreland had attempted in 1964-1965, and the year of the Ap Doi Moi, the "Really New Life Hamlets." In parts of the country one could see fences of the Ap Doi Moi standing over the ruins of the New Life Hamlets, which in turn stood on the ruins of the Strategic Hamlets. There was an archaeology of pacification going back ten, sometimes twenty years. Many of the PF outposts, those pathetic mud-walled forts
circled with barbed wire, had been built by the French for the fathers of those same peasant soldiers. 118

With any complicated, multidimensional problem like Vietnam, (e.g., rural pacification, big unit combat in the central highlands, airstrikes along the Ho Chi Minh trail, strikes in the Hanoi-Haiphong area, DMZ security, building urban political participation, replenishing food stocks, maintaining currency stabilization, etc.) the appearance of circular results alone is not crucial. What is crucial is the appearance of circular results in areas deemed decisive to the problem. The "vicious circle" heuristic applies to primary trends, not secondary ones. To be useful, the heuristic requires a clear understanding of a problem's major and minor components, and its major and minor response patterns. Again returning to Vietnam, when Paul Warnke, assistant secretary of defense for international security affairs, dismissed 1967 Pentagon reports of military progress, he believed firmly that the political dimension was the decisive one in the war and that no progress was being made there. All other military trends were secondary. Warnke reasoned, in perceptive "vicious circle" fashion:

My view was that basically it (the optimistic military situation at the end of 1967 -- HYT) was irrelevant, because we were not making any sort of political progress. I figured that we were just focusing on the wrong thing. I figured we were winning, we could continue to win, we could win every year; it still wouldn't make any difference unless you could make political progress. My guess was that at the end of a year we would still be in the same place except another 10,000 Americans would have been killed. 119

2) The absence of useful relations, concepts, or intermediate results -- abandon any search that does not produce useful, intermediate concepts or results.

Given a problem, one's search must produce useful results -- i.e., results that can be related to one's background knowledge. In this fashion, findings become meaningful. We have treated some heuristics (e.g., those dealing with analogies) that establish links for this purpose.

But, if a search produces findings that cannot be connected usefully to one's knowledge base, these findings, no matter how intriguing, are of little problem-solving value. At best, they are "dead ends," at worst, meaningless.

119

Schandler, The Unmaking of a President, p. 127.
For further examples showing how the "vicious circle" pattern convinced other administration officials, both hawks and doves, of the need for major policy changes, see Schandler, pp. 43-44, p. 125, pp. 192-193.
Such consequences, in turn, suggest one's basic approach may be flawed.

A possible political example might be the extreme shift in opinion from the popular "peace through law" approach in international relations after the First World War to the opposed view, following the breakdown of the League of Nations, that international law is largely irrelevant. Discouraged observers in the post World War II period rejected legalistic exercises because they seemed devoid of useful connections or results in world politics, George Kennan, for example, in an implicit appeal to the above heuristic, concluded:

...as a result of this misplaced emphasis the United States Government, during the period from the turn of the century to the 1930's, signed and ratified a total of ninety-seven international agreements dealing with arbitration or conciliation, and negotiated a number of others which, for one reason or another, never took effect. Of the ninety-seven, seven were multilateral ones; the remainder, bilateral. The time, trouble, and correspondence that went into the negotiation of this great body of contractual material was stupendous. Yet so far as I can ascertain, only two of these treaties or conventions were ever invoked in any way. Only two disputes were actually arbitrated on the basis of any of these instruments; and there is no reason to suppose that these disputes would not have been arbitrated anyway, on the basis of special agreements, had the general treaties not existed. The other ninety-five treaties, including incidentally every single one negotiated
by Secretaries of State Bryan, Kellogg, and Stimson, appear to have remained wholly barren of any practical result. Nor is there any evidence that this antlike labor had the faintest effect on the development of the terrible wars and upheavals by which the first half of this century was marked. 120

But, we should note also that a search lacking useful results need not be a poor one; it might instead be premature; it might be ahead of its time. A famous example, taken from molecular genetics, is Oswald Avery's 1944 discovery that DNA is the key to heredity. Avery's work got scientific attention, was deemed interesting; but, had in the end little impact on genetics. The reason—geneticists did not know how to relate it to the accepted knowledge of the 1940's and 1950's. Avery's work did not fit. Noted a contemporary, Max Delbruck:

So, while it was true that Avery's discovery, after several years of refinement, led to the conviction that there had to be enough specificity in the DNA, you really did not know what to do with it. 121

Other premature searches in science include Mendel's work on heredity (it had to be "rediscovered" 35 years


later) and Polanyi's theory of the absorption of gases on solids. In both cases fruitless, sociological consequences had nothing to do with the quality of the research. In our day, ESP studies or the findings that memory traces can be transferred via macromolecules such as DNA, RNA, or protein may be candidates for prematurity.

3) The absence of useful problem reformulations — set aside any problem that does not appear to have tractable reformulations.

When faced with a difficult problem one cannot crack, one might seek another, more tractable formulation of the problem. We have already covered a number of "problem reformulating" heuristics designed for this purpose.

But, what if no useful problem reformulation can be found? In cases where the problem must be addressed, one has little choice but to plug away, hoping that time and changing circumstances will produce new possibilities. Many international issues are of this sort.

If, on the other hand, one has some choice over the matter, the above heuristic suggests all problems without useful, tractable reformulations should be shunned. Economy of effort and resources dictate this. Moreover, the

---

122 An extended discussion of premature results in science can be found in Gunther Stent, Paradoxes of Progress (San Francisco, W.H. Freeman, 1978), pp. 95-113.
absence of useful reformulations suggests the problem might, in the current context, be a plight without remedy.

A concrete example of this heuristic comes from a 1963 report to President Kennedy on the India-Pakistan dispute over Kashmir. Eager to help end this dispute in the face of what then seemed like a growing Chinese threat (in 1962, border fighting had erupted between India and China), Kennedy had sent observers to the area for candid, independent assessments on the prospects for a settlement. The report was gloomy. It concluded:

...assistance to Ayub and Nehru in finding their way through this political and psychological maze will be vastly more important than any direct bargaining pressure or exhortation we can mount in getting a solution ... Right now the central fact about Nehru and Ayub is that they do not see such a track, embracing the full complexity of the problem -- and neither does anyone else on the subcontinent. 123

Since, according to this report, no useful reformulation of the Kashmir issue existed, Kennedy pursued the problem no further.

4) Time pressure -- abandon any search that cannot be solved in a timely fashion.

Extreme time pressure in the form of deadlines or time limits is another indicator of an unpromising problematic

123 Rostow, The Diffusion of Power, p. 653.
situation. If all examined alternatives and problem formulations produce untimely results, this suggests one's search efforts should end.

Again, as noted for the preceding heuristic, many political issues simply impose themselves on decision-makers and cannot be dropped. Combined with extreme time constraints, the above "timeliness" heuristic can be irrelevant as a guide to action. If no time exists to execute any option, planning becomes futile. In such situations, different sets of coping mechanisms will appear (e.g., inertia, defensive avoidance, panic), most of which will be ineffective.

But, in cases where such problem imperatives are not salient, the "timeliness" heuristic, in the form of deadlines, is a common way of dropping problems and abandoning searches. For example, introducing deadlines is a fairly common way of breaking off fruitless negotiations while avoiding blame for the rupture. In a study of Japanese

124

See Janis and Mann, Decision Making, pp. 50-52.

In a famous study of World War I decision-making, Ole Holsti found European leaders operated under great time pressure, focused on immediate threats, considered few policy alternatives, believed their freedom to act was greatly restricted, and ignored long-range consequences. Needless to say, the quality of decision-making was poor. See Ole Holsti, "Time, Alternatives, and Communications: The 1914 and Cuban Missile Crises," in International Crisis: Insights From Behavioral Research, ed. by Charles Hermann (New York, Free Press, 1972), pp. 58-80.
international negotiating strategies, for instance, Blaker observed:

When breakoff was the selected Japanese option, a pattern of ending moves surfaced in a number of cases. This typical closing sequence had four parts: 1) set a deadline or time limit for agreement on Japanese terms, 2) urge negotiators to exert "great effort" to reach a settlement by diplomatic means before the deadline, 3) refuse, as before to make Japan's own offers explicit, and 4) terminate negotiations with the claim that "we have no choice," blaming the other side for the breakoff. 125

In particular, this closing procedure, with its implicit dependence on the "timeliness" heuristic, was used by the Japanese in the Dairen Conference (1922), the Cangchun Conference (1922), and the pre-Pearl Harbor Washington negotiations (1941).

As suggested by these examples, notions such as timeliness, time limits, deadlines, and time pressure have strong subjective components. We choose to recognize certain dates as deadlines, or mark certain events to define what timelessness means. These choices reflect the character of the frame one is using. These choices can change if one's frame changes. Sometimes the compelling quality of a frame may make obscure this freedom we have to structure time; but, this freedom always exists.

125
5) Unpromising problem decompositions -- set aside any problem that cannot be simplified by decomposition.

Partitioning a problem into a set of smaller subproblems is a powerful problem-solving tactic. Its failure suggests that problem-solving assaults may be premature or inexpedient. Research mathematicians, in particular, rely on this heuristic to determine which problems lie near the frontier of mathematical knowledge, and hence are tractable, and which lie far beyond it. When a problem decomposes into a large number of very difficult subproblems, only the most intrepid proceed further.

Unlike mathematics, this heuristic is a less reliable "stop" indicator in politics because the very process of trying to solve a problem may alter its dimensions and character significantly, perhaps transforming it into a more tractable form. But even with less systematic intent, foreign policy-makers can, at times, gain powerful insights with this heuristic. A striking example is Clark Clifford's conversion from a policy hardliner on Vietnam to a skeptic of US objectives there, and finally to an ardent supporter of a negotiated settlement.

Appointed Secretary of Defense in early 1968, Clifford saw his initial task as devising means for meeting military
troop requests, not questioning them. Decomposing these troop requests into their economic parts, however, provided a shock. Clifford quickly realized the subproblems generated by deferring to the Joint Chiefs were unacceptable. Among these were:

i) Financing -- meeting the 1968-1969 troop request (206,000 men) would require severe cuts, on the order of 25-30%, in domestic programs, other defense expenditures, and foreign aid (50% cuts here), together with a substantial tax hike. The economy and the dollar would be weakened severely. Credit controls and a freeze on wages and prices would be required.

ii) Military manpower procurement -- the troop request would require a national mobilization of reserve forces, something President Johnson had striven mightily in the past to avoid.

iii) Public response -- the troop request would require an "act of national will" and unity, in an election year, that was unlikely.
iv) Enemy response -- the North Vietnamese could and probably would match US troop increases.

Clifford rapidly concluded the problem of how to send more troops to Vietnam was a "nonstarter". Other alternatives had to be found to continue the war effort. The "decomposition" heuristic had ruthlessly launched Clifford's re-education on Vietnam. The next heuristic would complete it.

6) The "bare cupboard" heuristic -- abandon any search that produces only unsatisfactory alternatives.

Earlier we covered "elimination by aspects" as a useful method for selecting among alternatives -- simply eliminate all unsatisfactory ones and chose from those remaining. But what if all alternatives are unattractive?

One possibility, studied by Janis and Mann, is defensive avoidance -- selective forgetting, selective inattention, rationalizing of negative consequences, and the distorting incoming information. Another possibility is to quit one's search approach and attempt to reformulate the initial problem. Both possibilities are consistent with the above

---

126 Schandler, The Unmaking of a President, pp. 138-141, 151, 162-163.

127 Janis and Mann, Decision-Making, p. 50.
"bare cupboard" heuristic. Janis and Mann provide examples of the former possibility. We shall continue our description of Clark Clifford's changing Vietnam views to provide an example of the latter.

Having seen the tremendous problems surrounding the 1968-1969 troop request, Clifford sought alternatives consistent with the original US mission of destroying and routing enemy forces in South Vietnam. A complicated, bureaucratic debate between hawks and doves ensued, feeding Clifford's doubts. All alternatives consistent with the old military strategy seemed unacceptable. In Clifford's words:

I couldn't get hold of a plan to win the war, there was no plan for winning the war. It was like quicksilver to me. If you picked up one ball, there would be two or three others bouncing around. Our plan seemed to be that continual attrition hopefully would force the enemy at some unknown time in the future to come to terms. But when I attempted to find out how long it would take to achieve our goal, there was no answer. When I asked how many more men it would take, would 206,000 men do the job, no one could be certain. I couldn't find out how many more guns and planes, how much more time was needed. It was a dead end.128

In the end, concluding the "cupboard was bare," Clifford focused hard on the fundamental assumptions underlying the war effort and finally decided the search for a US military

128 Schandler, The Unmaking of a President, p. 162.
victory was futile. By late March, 1968, he had concluded his primary tasks were to level off American troop involvement, work toward gradual disengagement, and convince President Johnson and administration hawks to agree to this strategy reformulation. The next heuristic helped Clifford in his purposes.

129
Ibid., pp. 215-217
It is instructive to speculate why Clifford did not fall into the Janis and Mann "defensive avoidance" trap after realizing no favorable alternatives existed in Vietnam. Several factors probably helped Clifford withstand the stresses of facing rather than fleeing his responsibilities. Among these are:

1) Clifford was by nature a dispassionate, highly intelligent, highly confident person who was known for, prided in, and cultivated his powers of sound judgment;

2) He was an old and trusted friend of President Johnson who was treated as an equal, something unique in the Johnson administration. Clifford recalled, "The President and I had a frank relationship throughout. He had nothing I wanted. I was older than he. Our relationship was on an entirely different basis than some of his other advisors." (Schandler, p. 122) In short, the social distance and deference that might intimidate others facing Johnson had less impact on Clifford;

3) Clifford had extensive experience in government service, serving as personal ao Truman;

4) He had not been a principal architect of Vietnam policy; hence, he did not have the vested interests, the invested personal prestige, or the hardened views of others such as Rusk, Rostow, Westmoreland, or the Joint Chiefs;
5) As Secretary of Defense, he was surrounded by subcabinet officials who had strong doubts about US policy in Vietnam (e.g., Paul Warnke, Assistant Secretary of Defense for International Security Affairs, Paul Nitze, Deputy Secretary of Defense, Phil Goulding, Assistant Secretary of Defense for Public Affairs). As an incoming secretary, Clifford depended heavily on them for orientation. Selective avoidance of bad news would have been difficult;

6) Clifford was probably aware that these senior subcabinet officials had considered resigning upon his appointment to Secretary of Defense, and were waiting to see if they could work with him before making any final decisions to leave;

7) Clifford's many contacts and friends on Capital Hill and in the business world were disenchanted with Vietnam policy; and

8) Soon after his appointment to office, Clifford was called by the hostile Senate Foreign Relations Committee to defend Vietnam policy. Schandler believes this crystalized Clifford's doubts over Vietnam. He notes:

    ...the idea of having to defend this dubious and unsuccessful policy before informed and hostile congressional critics focused his doubts. "When Clark Clifford had to face up to the possibility that he might have to defend the administration's policy before the Fulbright committee, his views changed," recalled Nitze. (Schandler, p. 215)

Given these underlying factors and pressures, Clifford, when faced with a bankrupt situation, chose to broaden his frame rather than narrow it, chose to examine fundamental assumptions rather than escape into details, and chose to question grand strategy rather than minor tactics.
7) The "contradiction" heuristic -- abandon any search or problem formulation that reveals contradictions between its working assumptions and its goals.

Logical contradictions provide a powerful tool for mathematicians. In the form of indirect proofs, contradictions are used to show which alternatives cannot be derived from a set of given assumptions. Those propositions that survive this "test" are, by the canons of logic, accepted as proved. Empirical research also depends heavily on a variation of this approach by contradiction. A well-known strategy here involves refuting the "null hypothesis," which affirms the opposite of whatever is under investigation at the initial stage of one's statistical analysis.

The method of contradiction is used also in politics, but in a less rigorous form. In mathematics, indirect proofs are applied to problems where exactly one of several alternative-goals can be derived from the given information. Alternatives and problem interpretations are clear, precise, and commonly agreed upon. In politics, where meanings are fuzzy and disputed, the method of contradiction often depends on a particular, con interpretation. Given this strong subjective element, disclosing inconsistencies in political matters does not carry the logical definitiveness found in mathematics. It can, however, carry significant psychological impact.
In particular, inconsistencies, no matter how informal, between the givens and goals of a particular search or problem formulation can lead to the discrediting of that search or problem formulation. This is the "contradiction" heuristic cited above. Vietnam provides a number of illuminating examples.

During the 1968 Tet offensive, the credibility of US policy in Vietnam was severely damaged. One single quotation in a press report had particular impact:

"It became necessary to destroy the town to save it," an American major was reported to have said to newsmen in explaining how it had been necessary to rout the Viet Cong who had occupied the delta village of Ben Tre. This widely repeated sentence seemed to sum up the irony and the contradictions in the use of American power in Vietnam and caused many to question the purpose of our being there. If we had to destroy our friends in order to save them, was the effort really worthwhile, either for us or for our friends? 130

Another dramatic inconsistency suggested itself when the New York Times published the 1968-1969 troop request, heretofore an administration secret:

The article, which was precise, accurate, and difficult to refute, increased public skepticism concerning our policy in Vietnam. If things were really going so well and if the Tet battles had been such a great victory as the administration continued to proclaim, why, the public asked, was it necessary to send an

130 Ibid., p. 81.
additional 200,000 American troops to Vietnam? 131

These contradictions convinced important segments of the American public that victory in Vietnam was too costly and remote, and that a new policy was required.

Finally, in this last example, we note how Secretary of Defense Clark Clifford skillfully used the "contradiction" heuristic to slowly steer administration policy in Vietnam from the search for victory to a negotiated settlement.

On March 31, 1968 President Johnson announced he would:
1) make only a token increase in US forces in Vietnam, 2) expand South Vietnamese fighting capability, 3) stop bombing most of North Vietnam, and 4) not run for a second term. Johnson did not see these decisions as a fundamental change in policy. He still sought victory in South Vietnam. The limitations on troop deployments and bombing were not intended as irrevocable decisions.

Clifford, realizing he could not change Johnson's mind on basic strategy objectives, decided to publicly interpret Johnson's March 31 actions as a fundamental change in US policy away from victory and towards a negotiated settlement. To fend off administration hawks and keep the negotiating option on track, he used the "contradiction" heuristic,

131 Ibid., p. 201.
together with his own personal, "deescalating" interpretation of Johnson's March 31 statement. Escalation, Clifford argued again and again, would be inconsistent with the conciliatory intent of the March 31 formula. Notes one observer:

Whenever a resumption of the bombing was considered within the administration, Clifford publicly reemphasized why such a move would be both contradictory to the president's position and why such resumption was not warranted. 132

In this manner Clifford was able to discredit the old bombing policy and prevent its return. This example, moreover, shows how the force of a contradiction is inextricably tied to a particular interpretation. To generate policy "inconsistencies" in all bombing proposals, and thereby discredit them, Clifford purposely misinterpreted Johnson's March 31 speech.

132 Ibid., p. 317.
IV. Frame Fixing Heuristics
(See The Third Column of Table 2, p. 185).

Up to this point we have covered two large families of heuristics -- the frame finding and frame altering ones. Frame finding heuristics provide the basic problem orientation; frame altering heuristics provide tactical moves once such an orientation is set. We now cover the last family of heuristics -- the frame fixing ones. Basically, these heuristics inhibit frame switching. They preserve old perspectives, deflect discordant information, and narrow one's focus.

Frame fixing heuristics have a shady reputation. When treated within the context of reasoning or problem-solving, their obstructive qualities are usually emphasized. For instance, a standard observation is that once we have arrived at a solution or belief, our psychological and perhaps material investment in this belief is often so great that we may prefer to distort reality to fit our beliefs rather than search anew. Frame fixing, it is argued, serves this dishonorable function of distorting reality.

While not denying the dangers of misperception, it is misleading to see frame fixing solely in this light. Fixing one's attention and ignoring distractions can produce important problem-solving benefits. Among these are:
i) Suspending judgment -- at the beginning of any new problem-solving enterprise, concepts and methods are apt to be vague. Almost by definition, to be new, really new, means to break with old perspectives and set up a new orientation that cannot be clearly understood within the confines of the old. Hence, this means allowing time for new approaches to prove themselves; it means avoiding premature judgment; it means protecting and nurturing one's ideas, like infants, until they are developed enough to stand alone; it means warding off attacks or difficulties from without. Frame fixing strategies are useful here.

ii) Focusing effort -- sometimes useful results are extracted from a given problem-solving scheme only after much developmental effort. In such cases, fixed boundaries, conventions, and restrictions of an empirical sort can serve to channel and discipline energies that might otherwise be dissipated before profitable results are produced. For example, in noting the paradoxical results that precise formulas have had on art (what he calls
"reasoned difficulties in the way of the artist's impulses"), Valery observes:

These formal rules offered a ... facility to those who wished to produce works. Very strict and even very severe conditions relieve the artist of a number of the most delicate decisions and of many responsibilities in the matter of form, while they sometimes excite him to discoveries to which complete freedom could never have led him. 133

Frame fixing strategies can promote this sort of creative concentration of effort.

iii) Promoting perseverance -- freedom from distracting alternatives can erase doubt and strengthen commitment. Heightened determination of this sort can be decisive in problem-solving, especially in bargaining contexts against a less confident opponent. The strategy of "chicken" whereby one locks oneself into an irreversible position to gain bargaining advantages is an extreme illustration.

Frame fixing strategies can promote such perseverance.

In these three ways, frame fixing heuristics can make

positive contributions to problem-solving attempts. With these qualifications in mind, we now consider two categories of frame fixing heuristics: 1) strategies for deflecting contradictions, and 2) strategies of frame reinforcement.
A. Strategies For Deflecting Contradictions
(Heuristics 1 - 4 in Table 2, p. 185).

Research on human reasoning had revealed the basic role consistency plays in problem-solving. The "meaningfulness" of information to people is closely linked to the consistency of that information with past experience. The ability and even willingness to solve problems is strongly influenced by this "consistency effect." These findings, in turn, suggest why contradictions can be so troubling in human thought; unexpected contradictions undermine our sense of the "meaningful."

In an earlier section we noted how contradictions (see the "contradiction" heuristic) warn the problem-solver of unpromising search paths or problem representations. But, sometimes we might wish to push a particular problem-solving approach despite visible inconsistencies. The "sunk costs" and past successes of an old approach, for instance, may convince us to perseverve in the face of contradictions.

134


For vivid examples showing how closely "meaningfulness" and consistency with past experiences are linked, see A.R. Luria, Cognitive Development: Its Cultural and Social Foundations (Cambridge, Massachusetts, Harvard University Press, 1976).
For example, the principle of the finite propagation of signals was accepted by physicists to make the theory of relativity consistent. But a number of experiences conducted in the 1970's (on the Bell inequalities) suggest instantaneous influences can exist under certain conditions. This contradiction with the theory of relativity, however, does not mean relativity will be abandoned. Its theoretical value is too great for such drastic measures. Instead, physicists are seeking ways of "managing" or sidestepping this contradiction by redefining the notion of a signal to include only those means of communication that transmit useful information. It is believed this redefinition would preserve the principle of the finite velocity of signals, and hence, move the theory of relativity from "harm's way."

This management of contradictions is the theme of this section. The heuristics below will suggest how inconsistencies can be deflected to preserve valued frames.

1) Resolution by frame embedding -- resolve a contradiction by: 1) containing it within a limited context, and 2) showing how the contradiction's force is nullified by considering larger contexts.

135
In order to understand this heuristic (and the following one), we must recall some frame terminology introduced in the first chapter. Frames are given definition by conceptual boundaries, termed frame brackets, that distinguish frame elements from "irrelevant," nonframe elements. Frame brackets can be the products of social conventions or theoretical design.

Further, frames can be embedded within other frames with the outermost sets of brackets enclosing other sets of brackets. It is this frame embedding property that concerns us here. In particular, an inconsistency within one framing context can sometimes be resolved by appealing to some "larger" framing context enclosing the initial frame.

One prominent application of the frame embedding heuristic involves blaming others of deceit to cover up one's own policy contradictions. In general, under deception, the victim assumes one framing context while the deceiver operates from a more extensive, more knowledgeable frame that "contains" the victim and his frame. Sometimes, however, a party might wish to falsely pose as a victim in order to explain away some policy inconsistency. This is the frame embedding heuristic in action. Under this ploy, the troubling contradiction within the original frame is passed off as the outcome of a larger frame connected with some conspiracy. The larger, alleged frame is, of course,
a fabrication to excuse past inconsistencies.

A concrete case of this ploy involves Mao Tse-tung's rapid switch from a seemingly pro-American stance in 1945 to an anti-American one by 1949. To explain away the inconsistency of Mao's earlier 1945 prices of the US with his later American "devil theory," the Chinese Communist Party pictured all previous, benevolent US actions as part of a plot to conquer China.

Because no standardized language exists for discussing this heuristic, sometimes notions of levels or hierarchies are used in other contexts, instead of embedded frames. In philosophy, for instance, the idea of language levels and "semantic ascent" from one level to another has played a crucial role in resolving semantic paradoxes. This important work is really the frame embedding approach in another metaphorical guise.

We now develop a final example of the frame embedding heuristic. The following discussion will be lengthy: but, I think, important for the following reasons: 1) it

136 Levi, Modern China's Foreign Policy, pp. 286-287.

137 An important paradox, philosophers have spent much time circumventing, is the Liar paradox (e.g., Consider a sentence that "says of itself" that it is false. Such a sentence is true if and only if it is false).

One famous approach for avoiding the paradox was proposed by Alfred Tarski. He showed formally that a language complex enough to discuss its own syntax and containing its own truth predicate will produce the Liar
illustrates the "semantic ascent" quality of the frame embedding heuristic as used in philosophy, and 2) it highlights important aspects of nuclear deterrence that will surface later in the next chapter.

The recent debate over SALT-II has underscored an ongoing paradox of the nuclear era: weapons of mass destruction are multiplied both in numbers and types to produce seemingly absurd levels of population overkill. It seems reasonable to stockpile conventional weapons to ensure target coverage. But why continue to amass an expensive nuclear overkill capability?

paradox. The he proposed a hierarchy of languages to sidestep this problem. The lowest level, formal language $L_0$, was constructed without containing its own truth predicate. Next, a metalanguage $L_1$ was constructed containing a truth predicate for $L_2$, but none for itself. The process of metalanguage construction was iterated producing a sequence $(L_0, L_1, L_2, \ldots)$ of languages, each with a truth predicate for the preceding one. In this manner, Tarski resolved the Liar paradox. See Alfred Tarski, "The Semantic Conception of Truth and the Foundations of Semantics," Phenomenology and Philosophical Research, Vol. 4 (1944).

138 This paradox was dramatically highlighted in a July 3, 1974 Moscow press conference given by Henry Kissinger following President Nixon's last summit session with Leonid Brezhnev. Kissinger argued then:

If we have not reached an agreement (on SALT--HYT) well before 1977, then I believe you will see an explosion of technology and explosion of numbers (of MIRV'ed missiles)
Proponents of increased strategic weapons spending have had to confront this paradox by "frame embedding." Perhaps the best exponent of this approach is Paul Nitze.

Essentially, Nitze argues a US-Soviet nuclear war should be seen as a series of embedded frames. The first frame (frame 1) is the weapons balance before a strike. The second frame, which contains frame 1, is the balance after the initial Soviet counterforce strike (i.e., a strike aimed at military targets only). The third frame, which contains frames 1 and 2, is the situation after the US

at the end of which we will be lucky if we have the present stability. Then it will be impossible to describe what strategic superiority means. And one of the questions which we have to ask ourselves as a country is what in the name of God is strategic superiority? What is the significance of it -- politically, militarily, operationally -- at these levels of numbers? What do you do with it?

(Correspondence, The New Republic, Nov. 17, 1979, p. 7)

We should also note that Kissinger later retracted his Moscow statement. In testimony before the Senate Foreign Relations Committee in July, 1979, he explained his Moscow declaration "reflected fatigue and exasperation, not analysis" and that he had "come to regret" it. The manner Kissinger used to resolve the "overkill" paradox implicit in his Moscow statement probably parallels the Nitze "frame embedding" interpretation of nuclear war described in the text below.

counter strike response. Although arms proponents carry this model no further, the process can be iterated, leading to a sequence of embedded frames defining various stages of a nuclear war as it unfolds.

The "overkill" paradox, argues Nitze, appears only in frame 1. As the war progresses and counterstrikes are exchanged, massive overkill capability disappears, and hence the paradox. Further, Nitze argues, "high quality deterrence" requires sufficient numbers and types of surviving weapons in each frame to ensure continued warwaging credibility. If the US, for example, following an initial Soviet attack on US strategic forces alone, had only enough forces for a small, retaliatory attack on Soviet cities while the Soviets retained a massive reserve force that could inflict wholly disproportionate destruction on US cities, then the US deterrent would be deterred. Rationally, the US should surrender to protect her cities rather than continue an unwinnable war. To avoid this fate and to retain our strike credibility in all frames, Nitze contends the US must continue to match Soviet strategic weapons spending.

In brief, this is a relatively sophisticated political example of frame embedding. Its sophistication is revealed not only by the way the "overkill" paradox is resolved, but, also by the side issues it implicitly raises. We
explore these briefly.

The embedded frame model of nuclear war reveals an interesting semantic ambiguity in the notion of deterrence. The claim that "one's force level deters" is ambiguous because it doesn't tell you up to which frame your force level will retain credible warwaging potential. For example, assume a war starts, and the US and Soviet Union exchange counterstrike blows while avoiding each other's cities. At the end of the counterstrike exchange in, say, the eighth frame one side may belatedly realize its warwaging credibility is gone. Hence, exactness would seem to require some sort of frame specification when speaking of deterrence, just as tire warranties require some mileage or time specification.

But current terminology contains just one word -- "deterrence" not a sequence of distinct subscripted phrases (deterrence$_n$), applying to frames at higher and higher levels. Hence, the idea of deterrence, under the embedded frame model of nuclear war, is inherently ambiguous -- its frame level is determined by situational context and the intentions of the speaker. So, for instance, when Paul Nitze calls for "high quality" deterrence, a reader has no way of knowing for certain what the appropriate frame level

is. Nitze might mean "forces to deter the Soviets from deterring our deterrent," or "forces to deter the Soviets from deterring our deterrent to their deterring our deterrent." If a reader is forced to assign a frame level to Nitze's phrase, "high quality deterrence" he may choose too low and, thus, underestimate both the sophistication and spending cost of Nitze's call.

One might wish to resolve this ambiguity by the sweeping assertion that "high quality deterrence" refers to warwaging credibility at all practical frame levels. Should, however, the Soviets seek deterrence of like "quality", the ambiguity returns since the frame level of "high quality deterrence" depends on the realities of Soviet behavior.

Finally, this ambiguity over deterrence frame levels raises an interesting theoretical question: how far can these frame levels practically extend? Clearly, this hierarchy of warwaging frames is finite. Further, as counterstrike exchanges mount, collateral damage to cities will also, even if both combatants take precautions. Hence, at some point, both sides will no longer have cities available to be held hostage, and the notion of deterrence will lose all meaning. Technically, this point might be called a "fixed point" -- i.e., the frame level at which counterstrike exchanges have eliminated all targets, both military and civil. Debate rages over where this fixed
point falls in reality. The lower the fixed point, the less useful theorizing about "nuclear warwaging" becomes. Indeed, this observation brings us back full circle to the original paradox (i.e., why continue to amass an expensive overkill capability?) that began this discussion on the embedded frame model of nuclear war. Prodefense proponents argue that: 1) overkill capability, and hence the paradox, disappears as counterstrikes are exchanged, and 2) strategic force disparaties can be great enough at later frame levels to persuade one side to surrender rather than "fight to the death." Their opponents reply that the fixed point for counterstrike exchanges is so low that very quickly strategic forces held in reserve will have nothing to target but rubble. Cities will not survive the counterforce dueling. All talk, they conclude, about preserving warwaging credibility at different stages of a war is irrelevant. For them, the "overkill" paradox and the waste it represents remain unresolved.

2) Evasion by shifting frame brackets -- avoid a contradiction by setting a frame's scope in a fashion that either excludes the contradiction or includes so much as to "dilute" the contradiction's force (e.g., by the addition or removal of constraints, variables, alternatives, rules, conventions, modes of interpretation, etc.).
Frames get their definition and scope from frame brackets — i.e., conceptual boundaries that separate frame elements from inappropriate, nonframe elements. Shifting these frame brackets either to encompass more or fewer elements can alter one's perspective significantly. In particular, contradictions might be resolved or avoided in this manner. Basically, such bracket shifts are changes in perceptual contexts. In this sense the "bracket shifting" heuristic is like the "frame embedding" one treated earlier. These two heuristics differ, however, with respect to the explicitness of the contextual change. With frame embedding, the contextual change is often emphasized -- to gain sympathy, a person pretending to be a victim wishes to emphasize the innocent outlook that led to his being deceived; to gain acceptance, a reformed sinner wishes to heighten the contrast between his "old, sinning ways" and his new "born-again" outlook; to gain analytical plausability, Nitze wishes to emphasize the "embedded frame" character of nuclear counterforce exchanges. In contrast, with "bracket shifting" the contextual change is deemphasized, subtle, perhaps even unnoticed by the user. Attention is diverted away from the bracket shifts. Contradictions are not really resolved explicitly, but instead are avoided implicitly. The following examples will illustrate this point.

One very common sort of "bracket shifting" involves
changing the temporal scope of one's frame. According to one's interests, appealing either to long-range or short-range perspectives can effectively mask troubling inconsistencies.

For instance, Marxian and New Left economists face an ideological quandary in that both simultaneously emphasize decentralization and central planning. This contradiction is made more acute because the abhored, "capitalist" market system is the only known mechanism that permits far-reaching decentralization in advanced industrial societies. The paradox is traditionally masked by short-run/long-run temporal shifts. Notes one observer:

> The classical way of escaping, rather than solving, this type of dilemma is presumably to argue that centralization is necessary in the short run but in the future society far-reaching decentralization will in fact be implemented -- and idea related to the Marxist notion of the "withering away" of the state in the long run. (Another parallel is the tendency for most new military dictatorships to assert that the extraordinary central powers taken today will, in fact, prepare the ground for democratic elections and decentralization in the future).141

Temporal shifting is also used to suspend criticisms of past policies. For example, when invited by a reporter to explain why Southeast Asia seemed far less important

---

strategically (in 1978) than was assumed earlier by the
Johnson administration, Johnson's National Security Adviser,
Walt Rostow, evaded the implied inconsistency by appealing
to the long view. Answered Rostow:

Well, to summarize my views, I would
say that I still hold a view that I formu-
lated in the 1950's looking very far back
and very far forward. Namely, the independ­
ence of the countries of Southeast Asia, of
any major power, is still a condition for the
stability of Asia ... I don't think we are
yet in a position to make a full assessment
of this historical episode. 142

When the errors of past policies are too stark to be
masked, policy-makers use temporal shifting to separate
themselves from these unpopular past policies. The line
goes something like: "I represent a new order, a new era,
a new frontier, a new Nixon, etc." In short, the leader
asks the public to frame current events in an ahistorical
fashion, where temporal brackets exclude the inconsistencies
of the past. "Wipe your mental slates clean so that I may
write anew," appeals the leader. Questioned about the 1975
suspension of democracy in India, Indira Gandhi blandly
replied, while electioneering in 1978, "All that is past
history." Upon his appointment as Carter's CIA director

142 "A Vietnam Perspective," The New York Times (May
21, 1978), Sec. 3, p. 11.

143 B.G. Verghese, "The Congress Party: Thirty Years
of Power," The Wilson Quarterly, Vol. 2, No. 4 (Autumn,
Stansfield Turner immediately began a series of public speeches to restore the CIA's public image, badly damaged by charges of domestic spying, abuse of power, and international debacles (Vietnam, Czechoslovakia, Chile, Angola, etc.). The message was the same: "I represent a new CIA; everything else is past history."

Finally, policy-makers can use temporal shifting to avoid trade-offs between values. Psychologically, trade-offs are disturbing because they violate the principle of cognitive consistency. Hence, the policy-maker has much incentive to deny trade-offs by ordering his frame so that values do not appear to conflict. One method of achieving this is by setting one's "forward time brackets" so far in the future that they encompass hypothetical elements that mask trade-offs, limit choices, and promote a deterministic outlook. One specific example is the "better war now than later" mindset. Expanding on this point in his essay on the Cuban missile crisis, Jack Snyder observes that:

...the decision maker will tend to sidestep the trade-off between war avoidance and, say prestige maintenance by conceptualizing his dilemma according to a "risk war now or incur destruction later" formula. The decision maker thereby allows himself to argue that only by running some risk of war over the immediate issue of contention can he demonstrate resolve to his adversaries and, thus, avoid an inevitable war in the future. This formulation makes the two values consonant and extricates the decision maker from the dissonance-producing trade-off. However, it is likely
to produce war if the adversary also adopts it. 144

The Japanese before Pearl Harbor and Hitler, to some extent before World War II, engaged in this sort of thinking. The "inevitability of war" mindset, in this regard, poses serious problems for deterrence strategies. It is difficult to deter someone who believes war is inevitable.

So far we have treated examples of "bracket shifting" related to temporal scope -- i.e., temporal shifting. Bracket shifting to evade contradictions can also be nontemporal in nature, as the following sample suggests. Note, in particular, the very subtle nature of the bracket shifting.

Consider the following hypothetical situation. A draft-age youth faces the following contradiction. On one hand he believes that if the country is endangered, private citizens should serve in the armed forces. On the other hand he does not wish to be drafted. How might he resolve this conflict when asked his opinion about the draft?

One possible argument, employing a subtle "frame bracket" shift, goes as follows: "If danger threatens, if

144


we really live in daily fear of foreign threats, then we should be willing to serve in the Army. But we don't live in such mortal fear, we are the strongest power in the world, so the draft is unnecessary."

The subtle "bracket" shifting in the argument above centers on the use of the pronoun "we." "We" can stand for individuals (e.g., you and I are going to class; we better get our books now and leave, or we'll be late). But, "we" can also stand for an abstract collectivity not reducible to individuals (e.g., "the nation," "the people," "the US," as in: Should we declare war?).

The "draft" argument above treats the two as identical. In so doing, the youth's dilemma is eased because the frame brackets marking individual concerns (represented by the individual "we") are unobtrusively expanded to encompass the nation as an abstraction (represented by the collective "we"). If the US government were suddenly dissolved tomorrow, the collective "we" would neither suffer fears nor feel pain. And our hypothetical youth might well pursue his daily activities unaware of the death of the collective "we" (as was true for many, for instance, following the end of the Roman Empire). Conversely, if I am taken hostage by terrorists and you are assaulted by KGB agents, the collective "we" remains unharmed. It possesses the serene invulnerability of all abstractions to fears, mortal harms, or
physical death. Bloodless abstractions have no blood to shed.

Of course, "bracket shifting" of this sort does not settle the policy question on the need for a draft. This heuristic, however, does relieve the personal dilemma of our hypothetical youth.

3) Containment by "residual categorization" -- placing contradictions in "residual categories" where they need not be addressed further.

To preserve a given frame from troubling inconsistencies, people sometimes resort to categorizing "tricks" -- what I call "containment by residual categorization." Just as an oyster forms a pearl to isolate a painful grain of sand, people establish categories to contain annoying inconsistencies. Notions like accident, fate, mistake, anomaly, God's will, eternal mystery, luck, etc. are examples of such special, residual categories. These categories let us come to terms with events or ideas that contradict some valued frame.

For example, just before the British sank the German battleship Bismark, the cruiser shadowing the fleeing battleship reported the Germans had altered course and were heading towards the pursuing British force. This report made no sense to the British admiral in charge; it was inconsistent with the military situation. So, he mentally
filed the cruiser's report in the residual category of "error." This resolved, at least momentarily, the inconsistency.

It is wrong to think that "residual categorization" is necessarily an unsound or unsophisticated way of handling contradictions. For example, a famous paradox in set theory, the Russell paradox, was in fact resolved using a "residual categorization" strategy. Further, science commonly classifies "inconsistencies" that seem beyond the scope of present knowledge as "issues to be deferred for later research." This is an acceptable mode of "residual categorization."

145 Jervis, Perception and Misperception In International Politics, p. 369.

146 The set-theoretic version of the Russell paradox goes: Let B be the set of all sets which are not members of themselves. Is B a member of itself? If B is a member of itself, then (by the way B was defined) it is not a member of itself. Conversely, if B is not a member of itself, then (again by the way B was defined) it is a member of itself. Hence, the paradox arises.

One way of taming this troublesome set B (Von Neumann-Bernays-Gödel set theory) is to distinguish two types of set-like collections — classes and proper classes. Classes are collections that are not necessarily able to be members of another class. Classes that can be members are sets. Those that can't are called proper classes. Using these distinctions, the Russell paradox disappears since B can be shown to be a proper class, i.e., B is not a set and, hence, cannot be the set of all sets. The notion of a proper class, plays in this context, the role of a "residual category." It checks mischievous terms like B that would otherwise embarrass set theory. See Ian Stewart, Concepts of Modern Mathematics (Harmondsworth, England, Penguin Books, 1975), pp. 286-291.
But, of course, the plausability of "residual categorization" can vary greatly. When, Alexander Haig, the White House chief-of-staff during the last days of the Nixon administration, suggested "some sinister force" as a residual category for handling the slippage between Nixon's proclaimed probity and an 18 1/2 minute erasure on a key Watergate tape, he was not noticeably convincing. Unfortunately, not all "pseudo categorizations" are so transparent.

Those situations we choose to label "nonproblems" can be unrecognized exercises in "residual categorization." For example, to resolve the tension between glaring racial injustices and American political ideals, one might residually categorize racism as a "nonproblem" and protestors who complain about racism as the "problem".

Another subtle way of escaping annoying inconsistencies is by residually categorizing a problem as a plight -- i.e., a problem that is without solution, a conundrum. In this manner, the problem can be ignored. Great Depression economists who fatalistically described depressions as "economic blizzards" fall into this category. So to, does

---

On December 6, 1973, while testifying in Judge Sirica's court, Haig suggested that "some sinister force" was responsible for the tape gap. He refused to speculate who or what this "sinister force" was. See Bob Woodward and Carl Bernstein, *The Final Days* (New York, Simon and Schuster, 1976), p. 96.
the spirit of the following Acheson quote on the inevitable Soviet need to exploit weakness:

...the existence in the non-Communist world of large areas of weakness, which by its very nature the Soviet system had to exploit... presented irresistible invitations to fish in troubled waters. To urge them not to fish, to try to agree not to fish, was as futile as talking to a force of nature. One cannot argue with a river; it is going to flow. One can dam it or deflect it, but not argue with it. 148

148 Acheson, Present At the Creation, p. 494.

In general, to get action on some issue, people must be convinced that useful results are possible. Hence, it is extremely difficult to organize movements against plights since plights, by definition, have no solution. One example is war, which many see as a plight.

An interesting attempt to convince people otherwise, through the use of analogy, is embodied in the following appeal for an "abolitionist movement against war":

In the early part of the Eighteenth century human slavery was an institution so well established, so widespread, and considered to be so in the nature of things that it was perceived by most people to be inevitable and immutable.

Nonetheless, over the next hundred years a small number of individuals and groups spoke out; they did not equivocate. They raised the consciousness of others who pressed their governments to end the slave trade and later the institution itself.

In our time, responsible individuals throughout the globe have come to recognize that technological developments have made it imperative to abolish organized warfare as an accepted institution.

...Our purpose is to bring about a new climate of informed public opinion which will stimulate national governments to dismantle the present war system and create instead a global society in which conflicts are resolved without the threat or use of military force.

(Institute For World Order brochure, 1979)
Labelling things "plights" is an important way of avoiding waste, and preserving scarce resources and precious time. But, it is an exercise to be indulged in sparingly. Plights breed paralysis, resignation, and poverty of imagination -- conditions that are extremely hazardous in politics.

4) Avoidance by cue saliency -- avoiding contradictions by avoiding any tasks that might bring them to one's attention. In particular, if a cue has led to some contradiction in the past, then lower the priority of any task involving that cue in the future.

Evading contradictions need not require subtle, tidy, or comprehensive frame changes like "frame embedding" or "bracket shifting." The "cue saliency" heuristic above is an illustration. It is a simple, piecemeal, evasion tactic. Simply avoid responding to cues associated with past task failure.

Such studied indifference produces an oversimplified outlook that can lead to simplemindedness. It can, however, also promote self-confidence and action. Francis Crick, the nobel laureate, characterized this as a valuable sort of boldness. In reminiscing about the adventuresome scientific giants who helped unravel DNA's structure, he observed:
Boldness? I would have to say that Lawrence Bragg and Linus Pauling were the people who most influenced me in these matters of style, and both have had that characteristic. Pauling to the point of rashness. I mean, one always knew about Linus that he would probably show an idea even if he realized -- even if he knew -- there was a good chance of being wrong. In fact, a lot of his ideas were wrong. But the ones that were right were important, and therefore he was forgiven for the fact that his structure of collagen was nonsense, for example, because the alpha helix and the pleated sheet were fine ... From Bragg and Pauling I learned how to see problems, how not to be confused by the details, and that is a sort of boldness. And how to make oversimple hypotheses -- you have to, you see; its the only way you can proceed...149

(Suspension in the original)

Suspending judgement and ignoring contradictions allow one to push speculation and imagination to the limits. But, as many would quickly point out, frame fixing of this sort can be extremely negative; it can inhibit reflection; it can preserve old ideas not worth preserving. Perhaps, this negative quality is more salient in politics than science.

One prominent example, among many in international politics, concerns the "Never Again Club" -- a group of US Army officers who, frustrated by the Korean conflict, opposed fighting wars on the Asian mainland without nuclear weapons. While the reasons for avoiding a ground war in Asia might be compelling, the "Never Again Club"

149

Judson, "Annuals of Science: DNA-I," p. 82.
in the 1950's dissuaded both military and civilian leaders from examining a fundamental contradiction in US foreign policy -- namely, US political commitments on the Asian mainland that might conceivably demand a major, conventional, military response. In particular, from a military perspective, the "Never Again Club" outlook inhibited questions about the missions the Army might have to meet in places like Indochina. When Vietnam forced itself on American consciousness in the early 1960's the Army had available only fuzzy doctrines on limited war and none on revolutionary guerrilla war. This unpreparedness ultimately contributed "to the advantage of the more militant men in the Pentagon who believed you had to use greater quantities of force, total force if necessary." It also contributed to the debacle that followed.

Unfortunately, the original contradiction in US foreign policy cited above is still with us today. In more general form it is the dilemma of having to motivate support for policies that, by their nature, do not inspire the kind of public commitment necessary for

150 For a description of an abortive, "colonels' revolt" in the fifties in favor of a reexamination of Army missions especially with respect to brushfire wars, see Halberstam, The Best and the Brightest, pp. 571-579.

151 Ibid., p. 565
success. How should the US protect those vital interests abroad that might require long, frustrating, messy, unsatisfactory, and unheroic military actions, while concurrently preserving national ideals and a sense of purpose without lies, deceptions, or illusions? This question provides a final example of the "avoidance" heuristic in action.

Following Vietnam little appetite existed for examining this policy contradiction between foreign interests and the motivation to protect them. Avoidance by cue saliency prevailed in the late seventies, perhaps best symbolized by the slogan "No More Vietnams." Anything that remotely resembled the beginnings of a Vietnam-type military commitment was shunned, perhaps in many cases with good reason. But, this sort of mentality also inhibited thought on the policy dilemma noted above. It still does so today, although the shock to US policy in Central Asia following the Shah's fall and the Soviet invasion of Afghanistan may change this.
B. Strategies Of Frame Reinforcement
(Heuristics 1 - 6 in Table 2, p. 185)

The last group of heuristics dealt with ways of evading or disarming contradictions that threatened a desired frame. In this section we shift our focus to methods of buttressing frames. In particular, we treat heuristics that strengthen the psychological appeal of a given frame in the face of hostile information, especially information that cannot be easily evaded.

1) The "no choice" ploy -- arguing no viable alternatives exist, or stressing the great risks of switching to another frame, if one exists.

Psychological studies on disruptive stress link it to cognitive rigidity. In general, high stress discourages complex thought. For example, international crisis research indicates that policy-makers perceive fewer alternatives in a crisis than in a noncrisis, and that they attribute greater freedom of action to their opponents than to themselves. Disruptive stress,

---

and the resulting cognitive rigidity, therefore promotes a "no choice" outlook.

The "no choice" heuristic, however, is not always a product of impaired mental functioning due to high stress. It sometimes marks a distinctive style of problem-solving. Japanese international negotiating behavior is one example.

Michael Blaker, in his study of Japanese negotiating, observed the "no choice" ploy satisfied at least three tasks. First, it promoted perseverance. In general, Japanese diplomats were given precious little bargaining room for offers and exchanges. Artificially inflated demands and officially authorized concessions were not stressed; opening Japanese bargaining positions were often close to actual minimums. This "no choice" procedure produced tenacious diplomats. Notes Blaker:

Self-commitment moves were at the heart of Japan's tactical style and a principal source of its bargaining strength. Its leaders and diplomats were adept at fastening themselves securely to a position through a variety of commitment devices, and then stubbornly refusing to let go. In fact, they were far more skillful at commitment than at persuasive techniques.153

Second, the "no choice" ploy provided Japanese negotiators with a convenient excuse for not making concessions.

153
Blaker, p. 189.
Japanese diplomats might agree on the need for give-and-take, but rationalize their lack of concessions by arguing that Japanese "public opinion" or the Navy or the Army, etc. would not permit it. Such supportive, "no choice" arguments appeared frequently in Japan's bargaining (e.g., 1921-1922 Washington Naval Conference, 1917 US-Japanese talks on China, 1930 London Naval Conference). It was a version of the "chicken game" -- a "you must give way because I can't" sort of exercise.

Finally, the "no choice" heuristic was an important "conscience-clearing" device for the Japanese. Blaker observes:

Phrases such as yamu o ezu (unavoidable), hoka wa nashi (nothing else but to ...), or yochi we nashi (no room but to ...), suggesting despair, fatalistic resignation, and even desperation, are scattered throughout closing Japanese bargaining statements. Whatever the substance of the final decision itself -- concession, threat, ultimatum, breakoff -- it was invariably frames as "bearing the unbearable." This was the product of a kind of situational determinism whereby ending moves were described so as to cast Japan as the helpless victim of circumstance (the commonest of many Japanese phrases expressing this idea is kyuchi ni ochiita or "we have fallen into a difficult spot"), buffeted about by forces beyond its control. 154

This "conscience-clearing" process was especially important because of the cultural significance of "saving

154 Ibid., pp. 191-192.
face" in Japan. "We had no choice" provided a way of softening embarrassment and lessening the stigma of bargaining failure should a Japanese diplomat return home "empty-handed."

These three uses of the "no choice" ploy, we should hasten to add, are not peculiar to the Japanese. Elements of these "commitment-deepening" processes, for instance, appeared in American planning in Vietnam (e.g., Ellsberg's "Desperate Proposal Pattern" described earlier with respect to the "saliency by extremes" heuristic).

Finally, we note that the "no choice" heuristic can be very closely related to two other heuristics covered above -- the "bracket shifting" and "residual categorization" ones. When "bracket shifting," for example, produces a "better war now than later" mindset, or when "residual categorization" transforms problems into plights, one is dealing with a "no choice" kind of fatalism. In such situations, the "bracket shifting" and "residual categorization" heuristics become special cases of the "no choice" heuristic.

2) Decontextualizing -- narrowing a frame's scope or denuding it of contextual elements so that cognitive freedom is constrained.

In general, the frame fixing heuristics promote "closed" systems of thought, in contrast to frame finding heuristics,
which encourage "open" thinking. Decontextualizing is somewhat paradoxical because it can serve both ends -- it can constrict as well as expand thought.

Decontextualizing is the foundation of abstract thought. It frees people from narrowly practical, discrete concerns, and encourages generalizing and theorizing. Indeed, the contrast between concrete and theoretical thought is so profound that words change functions when the mode of thinking changes. Empirical evidence suggests language, perception, and self-perception undergo basic restructuring when people change from a concrete, prescientific setting to a conceptual one.

Mathematics, perhaps, provides the best example of the analytical power conferred by decontextualizing. Separating form from content, transmuting these forms, and then reapplying them to specific cases have produced spectacular successes. But, decontextualizing leads to powerful, all-embracing abstractions only if one removes "irrelevant" details -- details that obscure basic structures, details whose removal clears the way for efficient, effective, and

155

In the early 1930's, A.R. Luria, a young Russian psychologist, studied cognitive changes (perception, abstraction, reasoning, and imagination) among remote groups of Uzbeks and Kinghiz as modernization took place. He found much evidence suggesting very basic changes were occurring in cognition and language usage. See A.M. Luria, Cognitive Development: Its Cultural and Social Foundations (Cambridge, Mass., Harvard University Press, 1976).
elegant symbol manipulation. But, herein lies the rub. How can one tell whether the details, the contextual elements being removed, are "irrelevant" to one's theoretical concerns? For example, both set theory and game theory are branches of mathematics that seek all-embracing formalisms. Yet, in some general sense, set theory seems consistent with open thinking while game theory is not. Decontextualizing is "nonrestrictive" in set theory; it is "restrictive" in game theory. It is in this sense that decontextualizing is "Janus-like", capable of serving both frame finding and frame fixing ends. In our treatment below we examine its frame fixing properties.


In general, Martin argues game theory is "selectively" useful because: 1) it can solve only certain types of problems, 2) it illuminates only certain problem features, 3) it can reach only certain types of conclusions, and 4) it cannot handle changes in institutions. After arguing that game theory is closely tied to a restrictive interpretation of the world, reflecting the mid-century economic concerns that gave it birth, Martin concludes:

By using the concepts of game theory to help oneself think about a situation, it is difficult indeed not to be led to think primarily in terms of those concepts, and unconsciously to incorporate their values. Indeed, one of the things that makes this analysis of game theory hard for one is the perpetual inclination to think in terms of a game theory formulation. (Martin, p. 104)

If Martin's conclusion is correct, then it is interesting to speculate if other branches of mathematics promote "closed" rather than "open" interpretations, and why this might be so.
Historical decontextualizing is a major frame fixing practice. In order to build legends, create heros, and foster myths, one must historically distort, deny, censor, recast, and embellish. This ultimately means the erasing of historical context — "decontextualizing." Only in this

There exists a tradition in mathematics, going back to antiquity, that assumes the symbols of mathematics stand for invisible, abstract things, which have an existence independent of how the symbols are used. Under this interpretation, mathematicians saw themselves working through symbolic devices to discover some non-material, eternal reality that stood behind those symbols. But, if Martin's argument about game theory is correct, that it reflects and is limited by the social and academic concerns of its time, then this suggests at least parts of mathematics are not attached to independent, eternal entities. It suggests that the symbolic devices of mathematics are not transparent, that they are not unproblematical, and that they color the nature of mathematical results. Under this alternate interpretation, mathematics is a human creation; we invent its constructive specifications (i.e., the purely mathematical structure necessary for analysis), and we determine their use. If this is so, then we must be very careful about their uses. We must use different branches of mathematics only where they are appropriate. Paraphrasing Wittgenstein and linguistic philosophers, understanding what mathematics means requires knowing how to use it correctly. To do otherwise is to commit a profound error. Unfortunately, the investigation of appropriate mathematical usage, akin to the enterprise of linguistic philosophy vis-à-vis natural language, has barely begun. Martin's concerns over the limitations of game theory are a step in this direction.

In particular, in some undefined sense, it seems the constructive specifications of game theory (and perhaps we might add here control theoretical treatments of arms races, and factor analytical approaches for modelling IR concerns) are too severe relative to the frame of applications it seeks to treat. How well the "problem-formulating and problem-solving freedoms" of a particular branch of mathematics match with the complexity of one's desired frame of applications is, in general, an unsolved problem that will grow more acute as mathematical treatments of politics spread.
fashion can history be denied and myths be preserved. In particular, historical decontextualizing preserves myths in at least four ways:

i) without contextual qualifications, the myth is easier to remember; it is simple, direct, and powerful; black-white conceptions of history emerge,

ii) without a context, a myth can be applied to any setting, it can be used to teach any desired lesson, it can take on any number of desired meanings, it can be continually updated to preserve its relevance and freshness; being so serviceable and adaptable a myth often is difficult to pin down and criticize,

iii) without a context, "counter-mythical" elements can be eliminated or reinterpreted; contrary figures and contradicting events are either dropped or altered to bring the past into line with the myth, and

iv) without a context, a myth seems set apart from history; it acquires a spontaneous character with a shrouded past that sets it
apart from the more mundane, transparent continuities of small happenings and common people.

National heros, cults of personality, or hallowed events (e.g., George Washington, Lincoln, Lenin, Mao, Hitler, the Alamo, the Long March, the storming of the Winter Palace, etc.) provide prominent examples of historical myths. The historian's often thankless task is to reverse this myth-making, decontextualizing process. But, mankind's insatiable hunger for inspiration and simple meanings guarantees the mythologizing of great achievements will continue. Mythless history, it seems, is too tart for most people's taste.

Decontextualizing is also an important ploy in negotiating. It is useful for focusing and fixing a particular agenda. A denuded context leaves the adversary with fewer opportunities to "switch frames," confuse issues, sidestep questions, or alter meanings. The Japanese, for example, with their traditional distaste for the unexpected or risky, usually seek narrow agendas. Typically, they carry "a very short shopping list, consisting mostly of staple items."

For similar reasons, President Kennedy, during the 1962 Cuban missile crisis, sought to decontextualize his

---

negotiations with the Soviets. Not wishing to be diplomatically diverted from the missile threat in Cuba, Kennedy refused to officially offer a Turkey-Cuba missile trade, and rejected the Stevenson negotiating plan to link the crisis with other disputes between the US and Soviet Union. "He wanted to concentrate on a single issue -- the enormity of the introduction of the missiles and the absolute necessity for their removal." Sharpening the focus of the dispute, Kennedy hoped, would discourage the Soviets from stalling.

3) Cognitive bolstering -- psychologically reinforce a favored frame by:
   i) exaggerating favorable consequences,
   ii) minimizing unfavorable consequences,
   iii) denying aversive feelings,
   iv) exaggerating the remoteness of costs,
   v) minimizing social surveillance,
   vi) minimizing personal responsibility, and
   vii) altering goals.

Social psychologists have spent much time investigating a type of defensive avoidance called "cognitive bolstering."

158
Typically, when faced with a difficult decision, a person faces stress, anticipatory fear, shame, guilt, and needs for cognitive consistency. Bolstering is one method of easing these tensions. Favored decisions are "bolstered" in attractiveness while unchosen alternatives are played down -- a cognitive pattern known as "spreading the alternatives." This process increases confidence, suppresses doubts, strengthens commitments, and fixes frames.

At least three preconditions for bolstering are required: 1) an occasion for decision involving risky options and no easy resolutions, 2) no hope of finding a better alternative because of time or information constraints, and 3) no hope of postponing the decision or shifting responsibility for it elsewhere.

Bolstering can take many specific forms. These forms depend upon personality predispositions and contextual factors. Moreover, in international politics, it is useful to remember that bolstering can build confidence in two different ways. It can promote self-confidence (e.g., the belief in one's defensive ability, if threatened), and it can promote mutual confidence (e.g., the belief that the other side does not wish to threaten). Hence, bolstering can be directed at oneself as well as projected on one's potential adversaries -- a distinction of some importance.
in the arms control and national security literature.

We now consider seven common bolstering tactics. Most of these come from the research of Irving Janis and Leon Mann.

i) Exaggerating favorable consequences -- one avoids indecision by playing up the benefits of a preferred alternative. Walt Rostow, President Johnson's national security advisor and a true believer in the Vietnam war, provides a vivid example by his bolstering of the war effort:

He would pore over the voluminous amount of incoming military information, make his selections, and come up with one or two positive pieces of news. Then he would call Rusk and McNamara, very cheerful. very upbeat: Have you seen the new captured documents? They're terrific! Have you seen the stuff about the battle at An Xuyen? Great victory. A civil guard company stood off a VC regiment. The body count in Chau Doc is marvelous!...It was always minuscule stuff in a broad vast war with hundreds of other items far more pessimistic, but it kept McNamara and Rusk busy wasting

---

159 See, for example, Jonathan Alford (ed.), "The Future of Arms Control: Part III, Confidence-Building Measures," Adelphi Papers No. 149 (Spring, 1979).

160 Janis and Mann, Decision-Making, pp. 91-95.
long hours culling the material themselves so they would be prepared for his calls. Thus valuable time was wasted and the great men of the government went through material checking out platoon ambushes lest they be ambushed themselves. And Lyndon Johnson, already isolated because of the war and because of his office, was kept even more remote. 161

ii) Minimizing unfavorable consequences -- one plays down the risks or costs of a preferred alternative, hence, making it more palatable. For policy choices, this might mean assuming one can undo a selected decision in case something goes wrong; it might mean playing down, in "sour grapes" fashion, the disadvantages of a policy that cannot be avoided; or it might mean protecting cherished beliefs by arguing how insignificant these disadvantages are from a practical standpoint.

As an example of the last frame-fixing intent, consider Dean Acheson's belief that the Soviets sought world domination in 1950. Later, in seeking to minimize the importance of this personae (and questionable) operating assumption on US foreign policy, Acheson reminisced:

161 Halberstam, The Best and the Brightest, pp. 775-776.
In the State Department itself (in 1950—HYT) we ran into a stultifying and, so I thought, sterile argument between the Planning Staff and the Soviet experts. The latter challenged the belief which I shared with the planners that the Kremlin gave top priority to world domination in their scheme of things. They contended that we attributed more of a Trotskyite than Leninist view to Stalin and that he placed the survival of the regime and "communism in one country" far ahead of world revolution. We did not dissent from this, but pointed out that, assuming the proper semantic adjustment, the effect of their point bore on the degree of risk of all-out war which the Soviet Government would run in probing a weak spot for concessions. Granted that they might not go as recklessly far as the Japanese had gone at Pearl Harbor ... the difference seemed to me more theoretical than real in devising courses necessary to eliminate the weak spots which so tempted Moscow to probe our resolution and that of our allies. 162

(emphasis added)

iii) Denying averse feelings -- one denies the aversive character of unfavorable consequences springing from a preferred alternative. When the costs of a policy, for example, are too great to be minimized, one might transform these costs into something attractive (e.g., viewing hardships as a challenge, an opportunity to prove oneself or build character).

162 Acheson, Present At the Creation, pp. 954-955, fn. 489.
One example of this comes from the pen of George Kennan, the "father" of the containment policy. In an essay written in 1947, Kennan carefully explained why the Soviet Union would create long-term hardships and hazards for US foreign policy.

Then, after this extended melancholy prediction, he ends on a curious "bolstering" note:

The issue of Soviet-American relations is in essence a test of the overall worth of the United States as a nation among nations. To avoid destruction the United States need only measure up to its own best traditions and prove itself worthy of preservation as a great nation.

Surely, there was never a fairer test of national quality than this. In the light of these circumstances, the thoughtful observer of Russian-American relations will find no cause for complaint in the Kremlin's challenge to American society. He will rather experience a certain gratitude to a Providence which, by providing the American people with this implacable challenge, has made their entire security as a nation dependent on their pulling themselves together and accepting the responsibilities of moral and political leadership that history plainly intended them to bear. 163

Exaggerating the remoteness of costs -- one plays down the costs of a choice by convincing oneself that these costs will come due in the remote future. Janis and Mann observe:

In Goethe's Faust, when the hero is tempted to sell his immortal soul in exchange for satisfying his present frustrated needs, he asks, "And what exact return am I to make?" Mephistopheles assures him, "That's so far off the thing may be dismissed." Facing more mundane decisions, any person can present to himself essentially the same Meshistophelian argument if he believes that there will be no costs or risks in the immediate future. 164

A concrete, Teutonic example of this sort of temporal "bolstering" comes from Germany's 1917 decision to begin unlimited submarine warfare. The German military, realizing such a campaign might push the US into the war against Germany, argued the war would be won before the US could mobilize. In short, the major political and military costs of the submarine campaign were seen as falling in the future, outside the context of the Continental war, and, hence, could be discounted. In postwar hearings, the German Secretary of State admitted that no one considered the possibility of extended fighting once unlimited U-boat warfare began.

Janis and Mann, Decision-Making, p. 92.
sort of temporal bolstering proved tenacious. Noted one writer:

Even after America had entered the war on April 6, and the unlimited submarine campaign had already lasted for three months, Ludendorf remained convinced that he need not worry about the American mobilization potential. Germany's ambassador to the United States, upon returning from Washington, warned Ludendorff how strong an army the United States could mobilize and send to France. Ludendorff replied that Germany would have plenty of time to terminate the war (with the United States) before that, because within three months the submarine campaign would force England to make peace. 165

v) Minimizing social surveillance -- one plays down the social or political costs of a choice by assuming it will all remain secret. If no one knows about one's choices, one escapes criticism and censure. Tourists often behave very differently abroad, for example, than at home because of this sense of security. The anonymity of the mob and secrecy in government produce similar effects. In general, as suggested by Watergate or by past FBI-CIA lawlessness, anything that weakens a sense of accountability encourages immoderate mindsets that, would be very difficult

to defend or hold under normal circumstances. Freedom from social surveillance means freedom from an important source of social constraints. Such freedom is a form of power, and, like all power, is subject to Lord Acton's famous dictum.

vi) Minimizing personal responsibility -- one makes the costs of a choice more acceptable by denying responsibility for the choice. The choice is attributed to external pressures and is not seen as a product of free will. The "Eichmann effect" as observed in Stanley Milgram's experiments is one example.

Another example is China's political reaction to the 1931 Japanese invasion of Manchuria. The whole responsibility for the situation was blamed on the foreign powers, who were accused of abandoning China. "This perpetual scapegoat policy relieved China of self-criticism and prevented improvements."

166 See Stanley Milgram, Obedience To Authority (New York, Harper and Row, 1974).

167 Levi, Modern China's Foreign Policy, p. 203.
"Blaming the victim" is still another way of minimizing personal responsibility. Its use to justify aggression goes back to antiquity (e.g., Thucydides' account of the destruction of Melos by the Athenians in his History of the Peloponnesian War). The reader is invited to insert his favorite examples here.

vii) Altering goals -- one preserves one's confidence in a situation that is changing unfavorably by altering one's goals, making them less ambitious, and, hence, easier to attain. In this manner, the basic nature of one's frame is preserved. One current example, is the relative decline of US strategic strength vis-à-vis the Soviet Union in the 1970's, and the resulting doctrinal alterations by the US to cope with this decline.

Argues one strategist:

As the Soviet Union has cancelled the more obvious US strategic nuclear advantages, and as the US continues to decline to seek to secure some measure of strategic superiority, so the attempt has been made to design "strategic offsets" for the adverse trend in the basic weapons balance. Very selective nuclear strike options, counter-economic recovery targeting, selective counter-military (and perhaps, in the 1980's, counter-political control) targeting, are all -- to some degree -- endeavors to effect an end run around the logical implications of an
Before closing this discussion on bolstering a few general observations on its advantages are offered. Bolstering can be maladaptive if it interferes with thorough search and appraisal efforts, if it leads one to ignore important warnings, or if it blinds one to moral considerations. But, bolstering need not always be bad. Assuming a wise decision has been made, bolstering can reinforce commitment to it. Bolstering can protect one from being demoralized by initial setbacks; it can protect one's preferred policy from challenge; it can ward off paralysis in decisional dilemmas when all one's options are bad. Confidence is often a necessary ingredient for problem-solving success. Bolstering is one way of buying confidence.

4) Concreteness -- using particularistic information explicitly received from external (and often functional and graphic) sources and only in the form in which it is received. Any additional information that might be inferred, abstracted, generalized, or transformed is either discounted or ignored.

---

In the search for general principles describing human information-processing, psychologists have hit upon the notion of concreteness. Basically, it is the belief that people try to use information provided by a stimulus with as little processing as possible. The more tangible and explicit the stimulus, the greater its posting impact. Judgments are based on explicit pieces of information. Implicit information often escapes detection (e.g., One old insurance ploy involves selling an inexpensive policy against something that almost never happens. During the Depression a popular, low-priced policy covered accidents like losing a leg while on a plane. In plane crashes, people rarely lose just a leg. The low premiums and high benefits are the explicit pieces of information in the sales pitch; the rarity of the event being insured against is the implicit part -- the part customers ignore or overlook). This process reduces the strain of inferring and integrating information.

The impact of concreteness on frames is not straightforward. Research suggests concreteness can play important roles both in frame finding and frame fixing processes. I have chosen to classify concreteness as a frame fixing heuristic; however, both its frame finding and frame fixing properties will be treated here.

---

The frame switching elements of concreteness reveal themselves in research on the acceptance of generalizations. In formal logic, quantifiers are treated with explicit care (e.g., all A's are B's, some A's are B's). But in everyday talk, quantifiers (e.g., all, most, some) are less precise and often implicit. For example, I may assert people in Columbus like OSU football even though I know some of my Columbus friends don’t. Quantifiers in ordinary language seem to be assigned on the basis of implicit assumptions that can shift depending on the nature of the relations and categories being discussed.

In general, the more universal the quantifiers implicitly assigned to a generalization, the more evidence is required before people will accept that generalization. Generalizations dealing with the concrete involve "lower order" quantifiers; hence, the evidence required for the acceptance of these concrete generalizations is less than for abstract generalizations. This observation, supported by experimental evidence, highlights the frame switching property of the concrete. Inductive appeals grounded in concrete terms, because less evidence is required for their acceptance, are more likely to persuade an audience than abstract appeals.

Research suggests less evidence is required to "sell" concrete, positive generalizations than abstract, positive ones. For example, given two possible lines of
reasoning below, people are more apt to accept the first rather than the second:

1) If urbanites destroy Reader's Digests, then they are likely to destroy magazines in general.

2) If urbanites hate Reader's Digests, then they are likely to hate magazines in general.

The reasons for the greater persuasiveness of the first generalization seem to be: 1) the greater concreteness of "destroy" as opposed to "hate," and 2) the "lower order" quantifier assigned to the first generalization in contrast to the more abstract, "higher order" quantifier of the second generalization. Concrete generalizations, because of their implied narrowness of scope, are easier "to sell." We note, also, that concreteness is not necessarily synonymous with persuasiveness in all cases. Abstract terminology appears to be more effective than concrete terms for selling negative generalizations.

The implications of the above research for inducement are significant. It suggests people can be influenced toward different conclusions depending on previously evoked concrete frames. For example, if one wanted to guide people to the conclusion that "urbanites hate magazines" using a survey, one should ask a prior question about whether urbanites destroy magazines. This prior question will evoke a concrete frame increasing the likelihood of the respondent's acceptance for the ultimate conclusion "urbanites hate magazines." This sort of manipulation via the "Socratic method" has been observed in empirical research on persuasion.

The frame fixing properties of concreteness appear when we consider that concrete generalizations usually enjoy limited scope and applicability. As we shall see, such limited scope is associated with frame rigidity and fixation. Moreover, such limited scope is often related to a persuasiveness that strengthens the frame fixing potential of the concrete. In particular, a tradeoff exists between a generalization's ease of establishment and its expanse. The easier it is to "sell" a generalization in concrete fashion, the smaller its domain of applicability is likely to be.

Perhaps, just as important from a frame fixing standpoint, is the salient quality of the concrete, a saliency that often reinforces and is reinforced by social norms and frames. We shall now consider these two points -- the persuasiveness/pertinence tradeoff and the saliency of concreteness -- in greater detail.

Concrete objects and their properties enjoy a primary claim to our sense of reality because of our physical modes of manipulating objects (we are, after all, physical beings) and the social contexts within which these manipulations take place. We assign certain perceptual and even value
qualities to our everyday activities, while ignoring other qualities, because these assignments have demonstrated a certain social usefulness and invariance. What is real is determined in large measure by our social contexts and purposes as revealed by these assigned qualities. We may choose our contexts and purposes; we cannot choose whether something will suit our chosen purposes. It is in this sense that the concrete and the real often assume a certain "objective" character, a certain primary claim to our attentions.

The close link between concrete expressions, value assumptions, and their corresponding evoked frames is suggested by the following observation made by Daniel Ellsberg. This quote is revealing in a double sense. It says much both about Pentagon frames as well as Ellsberg's own:

But neither had my year in the Pentagon taught me to read the "contingency plans" and proposals that had passed through my own hands with the same eyes that my wife and children brought to them six years later. Here is some of the language they read in the Pentagon papers about our bombing policy:

"We all accept the will of the DRV as the real target";
"Judging by experience during the last war, the resumption of bombing after a pause would be even more painful to the population of North Vietnam than a fairly steady rate of bombing";
"... 'water-drip' technique ...";
"It is important not to 'kill the hostage' by destroying the North Vietnamese assets inside the 'Hanoi donut';
"Fast/full squeeze..." option versus "Progressive squeeze-and-talk";
"... the 'hot-cold' treatment... the objective of 'persuading' Hanoi, which would dictate a program
This primacy of the concrete, because it is so useful in every day, social contexts, retains an enormous grip on our perceptions and thoughts. Herein lies the powerful, frame fixing nature of the concrete. Perhaps, the best example showing how the practicality of concreteness produces frame fixing is provided by A.R. Luria's work with the illiterate Uzbek and Kirghiz peasants of central Asia.

Briefly, Luria discovered these peasants were unaccustomed to abstract problem-solving. Concreteness was the dominant mode of thought. Moreover, concreteness continually reinforces the ordinary social frames of peasant life. Peasant thought could not move beyond fixating and reproducing practical activities; it could not cease being purely concrete and situational. Specific research findings that revealed the powerful, frame fixing potential of concreteness included:

- of painful surgical strikes separated by fairly long gaps "...
- "... our 'salami-slice' bombing program...";
- "... ratchet ...
- "... one more turn of the screw ...

These were phrases -- written by senior officials I worked with and respected -- that I had read and discussed in offices in the Pentagon and State, often in disapproval of their contents yet without even seeing or hearing them as my wife did when she characterized them, in horror, as "the language of torturers." (emphasis in the original)

Rigidity of classification -- peasants often sorted objects on the basis of frames drawn from life and reproduced from memory. For example, a table, a knife, a chain, meat, bread, and an apple might be grouped together because they all have some use in a "meal" frame. Objects, in short, were grouped not according to general abstractions (e.g., food, tools, etc.) but for situational or idiosyncratic reasons. Further, this concrete/situational style of reasoning was very rigid. Most peasants were unable to switch to other principles of classification. Only classifications based on "practical" frames struck them as "important" or "right".

The following, extended quote from Luria's psychological research is especially noteworthy because it highlights the strong, rigid frame fixing qualities of concreteness:

These subjects (central Asian peasants—HYT) performed operations that our experiment had not foreseen. Some of them classified objects by immediately appraising their practical value or "necessity." In doing so, they indicated the function each object performed but made no attempt to establish any closer connection between them. Others tried to think of a situation in which the objects would have some practical interrelation. Generally, such subjects reconstructed concrete situations from their daily experience. They had no hesitation grouping together a saw, an ox, and a log. As they put it, "You have to saw the log, then split it with the ax; all these things work together." Or they would remind us that "unless you have a log in the group there's no work for an ax and a
ii) Inability to solve hypothetical problems -- peasants could solve computational problems framed within practical, everyday contexts. When problems were removed from familiar frames and made more abstract, difficulties arose. Peasants either relied on guesswork or appealed to concrete personal experiences to solve the problems. When the conditions of the problems actually contradicted practical experience, the difficulties became insuperable. Describes Luria.

saw to do." They grouped a house, a bird, and a rosebush together because a "rosebush should be near a house, while a bird can sit on the bush and sing." Some subjects even insisted that the drawings of objects be placed closer together, noting that it would "take them a lot of time to collect all these things."

Every attempt to suggest the possibility of categorical grouping met with protest: "That's wrong. Some stupid fellow told you that, he doesn't understand anything." Even when we pointed out that "similar objects belonged in one category, these subjects were unconvinced; they interpreted the instruction to "group similar things" to mean select "necessary" or "suitable" objects. References to general terms (asbob -- tools; idish -- vessels) did not overcome their tendency to group objects in concretely effective ways. They either disregarded generic terms or considered them irrelevant, in no way essential to the business of classification.

Clearly, different psychological processes determined their manner of groupings which hinges on concrete, situational thinking rather than abstract operations which entail the generalizing function of language.

Upon hearing a condition that deviated from or contradicted their actual experience, the subjects usually refused flatly to try to solve the problem, declaring that the condition was wrong, that "it isn't like that," or that they couldn't solve such a problem. Even asking what it would be like if they were to solve it "on the basis of the interviewer's words" ... did not improve the situation, and the subjects continued to refuse. 173

iii) Difficulties formulating free questions -- when asked to pose any three questions to the experimenter, many peasants had extreme difficulties or refused. Even when specific topics were suggested, the peasants had problems. Reports Luria:

...within the experimental situation (no matter how natural we tried to make it and how much we prepared the questions by incorporating them into long, casual conversations), the subjects were unable to formulate questions independently, referring to their "lack of necessary knowledge" and remaining within a framework that reproduced their immediate practical experience. Keeping in mind all the stipulations that must be made, we see here pronounced difficulty in disengaging oneself from immediate experiences and formulating questions that go beyond it. 174

173 Ibid., p. 127.

174 Ibid., p. 139.
The few responses given by some, semi-literate peasants further emphasized the strong, frame-fixing quality of concreteness. Before formulating questions they "resorted to the curious procedure of creating an imaginary situation in which the formulation of questions seemed natural or,..., formulated questions within the framework of data that had just been communicated to them. The frames constructed by the peasants, whether imaginary or received from the experimenters, were situationally-based. Concreteness prevented the peasants from using frames other than those derived from their direct experiences.

While the tyranny of concreteness might not be surprising among peasants unaccustomed to abstract thought, the powerful sense of reality conveyed by the concrete is also very much evident in the highly abstract world of international politics. The numerous physical metaphors of statecraft suggest this. Diplomats speak of "corridors," "walls," "iron curtains," "power balancing," "bridge building," "nuclear umbrellas," "salami-slicing," "escalation ladders," and "domino theories." But, the importance

175 Ibid., p. 140.
of concreteness in international politics goes beyond metaphors.

We noted earlier that concreteness has both potential frame finding and frame fixing qualities. We also suggested a tradeoff existed between these frame finding and frame fixing potentials. The easier the task of establishing a frame by concrete processes (i.e., the frame finding potential), the more narrowly concrete the frame's domain of applicability. And as Luria's study suggests, the more narrowly concrete a frame's domain is, the more rigid and fixated it becomes (i.e., concreteness' frame fixing potential). This frame finding/frame fixing dichotomy arises often in international politics as suggested by the following examples, sometimes with troubling results.

Our first political example comes from Vietnam, during the period just before America's massive troop intervention there. It illustrates particularly well the

176

We should remember that concreteness' frame fixing potential is not necessarily bad. Everything depends on the applicability or usefulness of the frame being fixed. For example, consider the following, concrete, educational step recently proposed by two, well-known experts in

The United States might propose ... that the five permanent members of the Security Council (or perhaps France and China, who have not signed the Test Ban treaties) collaborate to arrange a joint demonstration of a one-time above-ground thermonuclear detonation over an uninhabited region, which leaders of all nations would be invited to witness personally. 'What
psychological saliency and selling power of the concrete. In late January, 1965, the situation in Vietnam was deteriorating rapidly. With the Johnson administration, a major escalatory shift from "tit-for-tat" reprisal air raids to an extended bombing campaign of North Vietnam was being considered. At this point, McGeorge Bundy, Johnson's national security adviser, flew to Vietnam on a fact-finding mission. In the history of the war, this trip was important for a number of reasons. First, Bundy, an influential power in the White House, had heretofore kept out of the debate on bombing and escalation. This trip would end his detachment. Second, Bundy's memo, resulting from the trip, would be particularly influential on 177 Johnson's decision to escalate.

has been powerfully sobering and self-deterring for the nuclear powers might usefully be experienced by all others as well. The moment is ripe today, when the world stands at the threshold of a jump in the number of nuclear-capable states, for such a shock. (emphasis in the original)


177 On the importance of Bundy's memo for US foreign policy, Halberstam observes:

There are, in the annals of Vietnam, thousands and thousands of memos and documents, as the Pentagon Papers would later show. But in an Administration where business was done by phone, they were at best small markers of a long and (sic) complicated and sad trail; very few of
On February 7, during Bundy's tour, the Vietcong hit the US barracks at Pleiku with a quick, accurate mortar attack. Its military intensity was nothing unusual for the time; but, its impact on Bundy was decisive. Notes Halberstam:

The next day Bundy left Saigon for Pleiku, where he visited the wounded; the scene made a strong impression on him. Those who worked for him and with him were surprised by the intensity of his feeling (as if he had blown his cool); since this sort of thing had been going on for some time, had not Washington realized that there would be killing? Why was he so surprised? It was and would continue to be a rare emotional response; for weeks after when someone questioned what they were doing with the bombing, the words would pour out, boys dying in their tents, we had to do something, we can't just sit by, we had to protect our boys. Even Johnson was fascinated by Bundy's emotional reaction; in the past Johnson had felt Bundy's doubts about Vietnam ... But after Pleiku it was, Johnson said, like talking to a man next door to a fire who's hollering for help. Later he told Bundy, "Well they made a believer out of you, didn't they. A little fire will do that." 178

This saliency of the concrete, with all its frame finding and frame fixing implications, is even more graphically illustrated by the 1968 Têt offensive. Prior to

them had any meaning themselves or were influential at the time they were written -- perhaps Nassam 288, which was the only statement of US purposes and objectives, perhaps the Taylor-Rostow report. And the McGeorge Bundy memo from Pleiku. It had effect, it moved people, it changed people at the time. (Halberstam, The Best and the Brightest, p. 635)

178

Ibid., p. 631
Tet most North Vietnamese and Viet Cong victories were never clear, their terrain was never held, their strength was never visible. Tet changed this. Instead of fading into the jungle, the Communists moved the war into the cities, making it visible to American TV audiences, making it concrete, making it clear, and in so doing, making a mockery of easy US optimism about the war's progress.

The extent and depth of Tet's frame shifting impact was immense. Newsmen in Vietnam and Washington, resentful and embarrassed at having swallowed the optimistic, pre-Tet progress reports from the Johnson administration, shifted to more critical and pessimistic reporting of the war effort. This sharpened and prolonged the shock of Tet on the American public.

Even administration officials who had access to confidential, upbeat Saigon cables were shaken by Tet's concrete impact. Harry McPherson, a Presidential speech writer and special counsel, recalled:

I felt we were being put to it as hard as we ever had, and I was extremely disturbed. I would go in two or three mornings a week and study the cable book and talk to Rostow and ask him what had happened he day before, and would get from him what almost seemed hallucinatory from the point of view of what I had seen on network television the night

before... Well, I must say that I mistrusted what he said, although I don't say with any confidence that I was right to mistrust him, because, like millions of other people who had been looking at television the night before, I had the feeling that the country had just about had it, that they would simply not take any more ... I suppose, from a social scientist point of view, it is particularly interesting that people like me -- people who had some responsibility for expressing the presidential point of view -- could be so affected by the media as everyone else was, while downstairs, within fifty yards of my desk, was that enormous panoply of intelligence-gathering devices -- tickers, radios, messages coming in from the field.180

In both the Pleiku and Tet examples, one is struck by the persuasive immediacy of the concrete. Equally noteworthy, this persuasive immediacy is not positively tied to applicability or validity. For example, the Johnson administration, while perhaps persuaded by the Pleiku attack to begin its bombing campaign, found that justifying its bombing policy on the basis of Pleiku was both awkward and unconvincing. In the case of Tet also, a discrepancy existed between the persuasive impact of the event and the validity of the "message" many observers were persuaded to accept.

180
Schandler, The Unmaking of a President, pp. 81-82.

181
For a discussion on the unconvincing nature of the Pleiku justification for the escalation in bombing, see Halberstam, pp. 630-641.
For a detailed treatment on the slippage between the persuasive impact of Tet and the validity of its military/political "message" regarding the progress of the war, see Braestrup's Big Story.
This slippage between persuasiveness and validity is also evident in our next example — cliency in the foreign service. Cliency, the inclination by a diplomat to acquiesce or defend the policies of his host government, is a major occupational hazard of diplomacy. The British foreign office attributed this disease to being "too long in the East," the Japanese often referred to the effects of cliency as dokudan senkō ("arbitrary action"), the State Department desk officers call it "localities."

Whatever the terminology or effects, it appears the persuasive power of the concrete is an important, underlying factor here. Working in the field, often isolated in obscure places, and engaged in tedious work, a diplomat becomes susceptible to concrete pressures. He begins to empathize with and adopt the frame of his host state. Close working relationships with foreign officials, vested interests in maintaining friendly ties with the foreign regime, and responsibilities for successfully coordinating diplomatic activities (e.g., negotiations, aid, arms sales, trade, etc.) further reinforces this trend. In comparison, one's home state metamorphasizes into something distant,

---

182 One scholar noted that dokudan senkō was so widespread in Japanese diplomacy as "to seem the norm rather than the exception." For many interesting examples and reasons for this practice, see Blaker, Japanese International Negotiating Style, pp. 113-130.
ignorant, fickle, and abstract. In extreme cases, representatives, like T.E. Lawrence or many Peace Corps volunteers, "go native," developing cultural loyalties toward their host nations superceding those to their own.

The practical effects of clientism can be very serious. For example, the US embassy in Lagos, during the 1967-1969 Nigerian Civil War, continually hampered relief efforts to Biafra because of the embassy's loyalties to its Nigerian clients. Clientism of a similar sort paralyzed the US embassy in Burundi during the 1972 massacre of the Hutu tribe by the Tutsi-dominated government.

Again, we note that the "selling" power of the concrete is not always in accord with the suitability of the frame sold. This frequent tension between the persuasiveness of the concrete and its pertinence remains a serious problem in international relations.

We must therefore end on a cautionary note. The effects of the concrete are "Janus-like." On one hand, when used to guide and illuminate abstractions, concreteness can be of considerable practical value (see, for instance, the earlier section on generating examples). It can clarify, suggest, and test hypotheses. But, as

183

suggested by Luria's research, for those unaccustomed to abstractions, concreteness can hobble and constrict. Even for those experienced in abstract thought such as diplomats, concreteness can bend and distort, so powerful is its sway on our sense of the "real."

5) Causation and correlation -- tying elements of a frame by some causal or correlational nexus to promote a sense of coherence and consistency.

In an earlier chapter on frame orientation, we noted that frames composed of tightly interrelated and consistent elements were often difficult to change. The strong bonds between frame elements discouraged small changes. If changes were necessary, they often assumed the proportions of major upheavals, requiring much cognitive effort.

We further noted a type of frame fixing strategy using "ad hoc constructions." Basically, this involved limited frame extensions to remove anomalies introduced by new information. We shall now reexamine these two themes in greater detail, with the following discussion on the "causation/correlation" heuristic.

The notions of causation and correlation are basic tools for promoting human understanding. By linking

The notion of causality is extremely complicated. Many philosophical and semantic distinctions concerning causality exist; but, these will not be raised here. I admit some of these distinctions probably have important
events and beliefs, they allow us to organize, predict, and act. But this linking quality also provides powerful frame fixing potential. Causal approaches allow us to connect events and actions even when little or no evidence of a causal nature exists. The frame fixing implications, both in terms of reinforcing a given frame and deflecting contradicting information, are enormous.

First, the sheer importance of causal-correlational notions in promoting understanding and forming beliefs offers, by itself, great fixing power. In periods of confusion, vagueness, and puzzlement people usually assign an unusual degree of importance and validity to the first understandable perspective or pieces of evidence. Moreover, implications for the frame fixing power of causality. For example:

1) counterfactual interpretations of causal assertions,
2) generic, "law-like" causal assertions,
3) specific, "concrete" causal assertions,
4) causal assertions dealing with moral concerns (e.g., permission, obligations, promises), and
5) causal assertions dealing with goals and intentions.

Basically, I see causality as an organizing principle. It imposes patterns of meaning and categorization on other concepts (e.g., causality is a useful organizing device for determining temporal orderings of events). Given its complex, subtle nature, causality clearly can be used for many other things besides frame fixing.
once such a perspective is offered, most people learn to see what they expect to see even if it does not exist.

By allowing us to relate events and ideas in almost countless ways, the causation-correlation heuristic provides a quick way of constructing "explanatory" frames of great selling and enduring power. Confused people are quite willing to embrace the first apparently reliable explanation of things to relieve their confusion. In fact, a form of hypnotherapy called the "confusion technique," uses this principle. Confusion is induced by hypnosis as a first step towards changing a patient's view of reality.

Second, the causation-correlation heuristic can promote saliency that encourages frame fixing. Causal chains that tie events or ideas together in multiple ways are usually accorded high saliency; disconnected events or ideas are likely to be forgotten (many memory-improvement techniques rely on this principle). Moreover, the formation of causal chains can sometimes increase people's probability estimates of the likelihood of events found in those chains. These considerations can promote frame

---

185

One example is "illusory correlation," the mistaken perception, caused by prior expectation, of a correlation between two variables that does not really exist. See Slovic, "From Shakespeare To Simon," pp. 6-7.

186

fixing.

Third, the causation-correlation heuristic can encourage frame fixing by its very large "connecting potential." In the discussion on ad hoc constructions, introduced in a previous chapter, we noted that frames of very broad scope ("monopolistic" frames) were difficult to contradict because they encompassed "everything" (e.g., ideologies, religious cults). The causation-correlation heuristic provides a way of constructing such monopolistic frames. Causal-correlational arguments can link very large numbers of frame elements, thus promoting a heightened sense of stability, regularity, consistency, and internal cohesion. Further, research suggests that such elaborate frames tend to be more persuasive to people than simple ones.

Finally, the causation-correlation heuristic offers a splendid method of "explaining away" unexpected, discrepant information. Once a frame is established, this heuristic can arrange new, contradictory information so that it produces not corrections but elaborations of the original frame. The frame then becomes fixed and self-sealing. If, for example, someone harbors a "devil-theory" view of an enemy, and then, quite unexpectedly, that enemy behaves in a friendly way, causal attribution can be used to preserve

187

the original "devil" perspective. The friendly behavior can be seen as temporary, caused by unforeseen contextual elements that can be included in the old, "devil" frame. In this fashion, the enemy's imputed hostility and untrustworthiness remain fixed; his friendly behavior is seen as reactive; and he is not credited with a changed character. The enemy is being nice because he is forced to be by external factors, not because he wishes to be.

In a famous case study of John Foster Dulles, Ole Holsti showed Dulles' view of the Soviet Union paralleled the frame fixing pattern outlined here. Decreasing Soviet hostility, Dulles always believed, was due to necessity (e.g., economic weakness) and not to any genuine changes of character. Accordingly, his beliefs were highly resistant to change, changes in Soviet policy notwithstanding.

6) Inoculation -- exposure to preparatory information and reassurances designed to increase tolerance for setbacks and stress after some decision has been made.

Inoculation is a method of psychological preparation against becoming demoralized when the costs of a chosen course of action emerge. Before making a decision one

---

explores all threats and costs that might arise. Emotionally, this can increase tolerance for postdecisional stress by encouraging the development of coping mechanisms. One thereby avoids surprise, improvision, and the attendant stresses they produce. Psychologists call this process "emotional inoculation" because it resembles the protective nature of vaccinations. In the words of one prominent researcher:

The goal of emotional inoculation is to make the person aware of an impending crisis or disaster well in advance of the full confrontation. That way he has an opportunity to anticipate the loss, to start working through his anxiety and grief, and to make plans that might enable him to cope more effectively with the subsequent crisis ...

Conceivably, the amount of time and effort required for effective emotional inoculation might be reduced by the judicious use of films, recorded lectures, and pamphlets that are specially prepared to convey the essential preparatory information. The United States Peace Corps, for example, has developed a set of such communications for use in conjunction with group discussions. They are intended to provide emotional inoculation for volunteers who are about to leave for an arduous assignment overseas, where they will be separated from family and friends, subjected to cultural shock in an underdeveloped country, and probably exposed to a series of failures and other stresses that could make them feel depressed or demoralized. 189

Basically, inoculation has three stages: 1) identifying impending losses and risks, 2) emphasizing reassuring facts to promote confidence in long-term success, and 3) providing ways of meeting temporary setbacks. This process

189 Janis and Mann, Decision Making, pp. 389-390.
discourages unrealistic optimism, hopes, and expectations; it encourages the growth of realistic, supportive beliefs and patience. Instead of the fragile "nothing bad will happen" attitude, the decision-maker adopts the more robust view that "some bad things might happen but if I persevere, success is assured."

The effectiveness of inoculation has been documented in such diverse things as undergoing surgery, giving birth, tooth extracting, career searching, getting married, choosing a college, and surviving community disasters. In all cases, inoculation reduced fear, acute feelings of helplessness, and overreaction.

Inoculation, as a means of strengthening resolve and belief, is also common in affairs of state. A military commander, for example, will frequently tell his troops not to underestimate the enemy's abilities while, at the same time, reassuring them of ultimate victory. Churchill's dramatic promise of "blood, toil, tears, and sweat" is a more colorful example of this same theme.

In contrast, we might note one example of an important, political failure to inoculate. By December, 1967, US intelligence had alerted President Johnson about an upcoming Communist winter-spring offensive. But, noted one observer:

190 _Ibid._, pp. 388-394.
...little effort was made to alert the American public to the probability of such attacks, and the public consequently was ill-prepared for the trauma of Tet. In what he later admitted to be a mistake, Johnson had excised a long section dealing with Vietnam from his State of the Union message. In that speech, the president merely emphasized again the progress that had been made in Vietnam during the past year and indicated the attempts currently being pursued to establish peace talks with North Vietnam. 191

Hence, when the January, 1968 Tet offensive erupted, the public's sense of surprise and disaster was complete. Administration attempts to contain the damage by emphasizing the positive, military consequences of Tet failed. Public shock was too great; public confidence was permanently undermined. Failure to inoculate, failure to forewarn the American people of the coming offensive, contributed mightily to Tet's political decisiveness.

191 Schandler, The Unmaking of a President, p. 80.
I. A Backward Glance

At the outset of this study, I set forth three goals for myself. First, to develop some conceptual devices for talking about context and how they shape political perspectives, policy, and meaning. Second, to discuss different problem types that might arise in political settings — all this as a prelude to describing how context, problem type, and heuristics relate to each other. And third, to exhibit examples of heuristics arranged within a classification based upon their contextual functions. I shall now briefly summarize my findings and arguments for satisfying each of these aims.

First, with regard to the conceptual treatment of context. Before it is possible to talk sensibly about problem-solving heuristics, I argued that some sort of general, theoretical perspective was necessary. This perspective would provide the vocabulary for talking about contexts, how they changed, how different problem types were related to context, and how heuristics operated on contexts to "solve" problems. To develop this theoretical perspective, I used the notion of a frame. Frames, briefly, are schemata of interpretation that are required to locate,
order, and incorporate new information.¹

In order to cope with the details, changes, and demands of life, frames must be "managed" in at least three basic ways. These three transformation requirements can be conveniently summarized with the words "finding, altering, and fixing." First, in order to make sense of external complexities, a suitable frame for guiding interpretation must be found or constructed; this is the "finding" task. Second, once a frame is found, it must often be modified as information is either learned or forgotten; this is the "altering" task. And third, an established frame must possess a minimum amount of consistency and coherence if it is to guide and interpret actions. A frame that lacks such stability can lead to hesitation, drift, paralysis, and mental fatigue. Providing this stability is the "fixing" task.

Further, these three, "finding, altering, and fixing" tasks provide a natural typology for grouping heuristics. "Frame finding" heuristics are those designed primarily for retrieving frames from memory; "frame altering" heuristics are those designed primarily for modifying frames; and "frame fixing" heuristics are those designed primarily for preserving frames.

¹My interest in frames was first aroused by Erving Goffman's imaginative book Frame Analysis (New York, Harper and Row, 1974).
Additionally, for purposes of convenience and precision of exposition, two uses of frames were distinguished—orientation and problem-solving. Orientation referred to the processes of "locating" oneself within some spacial temporal or conceptual context. Orientation (which can involve selecting, dismissing, organizing, and integrating information) does not presume strong desires to resolve pointed, problematical predicaments. But, the other frame use—problem-solving—does. In particular, while orientation and problem-solving processes share many common traits, I argued that, in general, problem-solving made greater cognitive demands and embraced all those heuristics required for orientation plus, additional, more specialized ones. After a brief, survey of frame orienting heuristics, the rest of this study concentrated on problem-solving.

Next, to provide more background for tackling problem-solving heuristics, the second goal of my study was addressed—namely, a discussion of different categories of problems. I now briefly describe my conclusions.

Problems differ in the amount and appropriateness of the structure they possess. Such differences determine how they can be best approached (e.g., algorithmically or heuristically), or whether they can be solved at all. For this reason, an examination of problem types and their structural differences was important. It was necessary,
Well-defined problems have "complete" frames — that is, frames containing all those elements necessary for reaching a solution (a solution, in this case, being defined with respect to that frame). Algorithms thrive here because of the abundant frame structure; they are less useful outside this "well-defined" domain.

Ill-defined problems, in contrast, have "incomplete" frames — frames that lack all those elements necessary for realizing or recognizing solutions in unambiguous fashion. Accordingly, algorithms are of little use here; heuristics offer the best hope. Most international political problems fall within this category.

With regard to problem-formulation, research suggested open, "discovered problem" approaches were most likely to produce creative solutions. Heuristics are indispensable here.

Having related contextual concerns and problem types via the notion of frames, and having discussed the function of heuristics with respect to each of these problem types and to problem-formulating, I then offered detailed descriptions and examples of numerous, political, problem-solving heuristics. As noted earlier, these heuristics were grouped by function — frame finding, frame altering, and frame fixing. Each of these categories were further subdivided for convenience of exposition as indicated below.
in particular, to understand why many problems are not open to algorithmic treatment, to identify those problem types that lend themselves to heuristic approaches, and to examine the role of heuristics in problem-formulation.

I treated four problem types -- paradoxes, plights, well-defined problems, and ill-defined problems. Paradoxes referred to confusions over conceptual meanings and word usage that were unresolvable by purely empirical means; plights were conundrums -- that is, unsolvable problems; well-defined problems were problems enjoying precise representations, ample background information, and "solution-identifying" criteria; and ill-defined problems were problems lacking one or more of those structural elements enjoyed by well-defined ones.

In framing terms, paradoxes imply a uniting of inconsistent frame elements. Conclusions reached from one direction clash with conclusions reached from another direction. The sense of the paradox arises because both the inconsistent results and their deductive procedures coexist uncomfortably within a single frame. Heuristics, through their frame-manipulating actions, are often useful for resolving such paradoxes.

Plights are situations that lack suitable frames for realizing solutions. Heuristics are useful here only indirectly, when they shift from the plight to secondary, "solvable" concerns.
Frame finding heuristics were divided into two subgroups — strategies using cues for starting problem-solving procedures, and strategies for assigning saliency to a concept. Both classes of heuristics are needed to initiate problem-solving.

Frame altering heuristics were divided into five subgroups — strategies for generating examples, strategies for modifying problem-formulations, strategies for estimating values of various sorts, strategies for selecting between alternatives, and strategies for diagnosing unpromising searches. All these heuristics modify frame elements once a frame is established.

Frame fixing heuristics were divided into two subgroups — strategies for deflecting contradictions and strategies for reinforcing frames. These heuristics preserve frame integrity in the face of new, incoming information, or information loss.

This arrangement of heuristics is not necessarily representative of people's problem-solving talents. Compared to the practices and possibilities of policymakers, this collection represents a very tiny sample indeed. Yet, the richness and diversity revealed here suggests that heuristic studies can handle well the descriptive intricacies and subtleties of applied, strategic thought.
This general conclusion about the descriptive power of heuristics is very important and worth stressing. Heuristics are useful for systematically capturing and describing many elusive, neglected, but important elements of strategic behavior. No other current approach surpasses heuristics in this regard (and many methods, such as the algorithmic variety, are distinctly inferior).

We now briefly consider some potential extensions of this heuristic approach to international, political concerns.

II. A Look Ahead

The long-term research possibilities involving political heuristics are many. First, heuristics offer a way of significantly upgrading computer simulations of governmental and leadership behavior. Starting with heuristics carefully collected from observed political activities, one might convert these heuristics into algorithmic form in a manner similar to the "time heuristic" search routine covered in the introduction (p.). Such efforts have already been undertaken in other disciplines with promising results. For example, in the mid-1970s, a program called MYCIN was developed, using 450 heuristics collected from medical journals and Stanford hospital case studies. MYCIN could provide accurate diagnoses and treatment plans under experimental conditions. Heuristic-based programs
have been developed for helping chemists interpret nuclear magnetic resonance patterns. No theoretical obstacles prevent similar efforts from being undertaken in political science.

Second, very important classes of political heuristics have yet to be systematically collected and described. Some classes include: heuristics on deception, heuristics on time manipulation, and heuristics on inducement. Such efforts would be valuable contributions to the strategic studies and negotiating literature.

---

2As an example, consider the following, frame analysis of an inducement heuristic, which I call the "feinting ploy." This trick can best be illustrated with a simple, bargaining setup. A buyer asks the price of two, different items. He then asks for the price of one of the items alone, suggesting his interest in it. The seller is usually tempted to quote a high bargaining price for it. The buyer then switches his bargaining efforts to the other item, based on the lower, residual price. For instance, if an arms dealer wants $100 million for two, different versions of a coastal patrolboat, and wants $60 million for one only, the buyer begins negotiating at $40 million for the second.

This deceptively simple, bargaining ploy actually depends on a number of orienting and problem-solving frame processes for its effectiveness. First, it invites the seller to adopt initial, orienting postures that are disadvantageous to him. These orienting postures deal with the frame altering and fixing tasks. When the buyer and seller open negotiations, each understands the basic, bargaining context; hence, the frame finding tasks are, for our purposes, given as settled. When the buyer asks for the price total and the price of a single item, the
Third, the link between heuristic effect and language usage is well worth investigating. The subtle manipulation of language in a number of the heuristics described in chapter 4 (e.g., evasion by shifting frame brackets, decontextualizing, concreteness) suggests rich theories of political semantics and pragmatics remain to be constructed. Heuristics provide valuable leads for such theorizing.

Finally, the relation between heuristic styles on the one hand, and situational, organizational, or cultural conditions on the other, may produce interesting patterns. Are certain heuristic repertoires, for example, more or less likely during a crisis than during noncrisis conditions?

Seller performs certain frame altering tasks, in preparation for the hard bargaining to follow. In particular, the seller is invited to draw certain hunches about the buyer's interest in the particular items selected for pricing. The seller, then "anchors" an asking price for the item at a level high enough to allow himself bargaining room in the dealing to come. In this process, the buyer is strategically manipulating the seller's anchoring and adjustment heuristic.

In particular, the buyer decomposes the merchandise into suitable units for pricing (in contrast to the simple arms example above, more than two items may be involved in the bargaining), considers the best means of extracting a "package" commitment from the seller, and determines the best order for asking pricing questions. The aim of all this activity is to fool the seller into focusing his anchoring and adjustment techniques on the wrong item having lured the seller into setting a high bargaining price for the first item, the buyer then unexpectedly switches the bargaining to the second item. The seller is then faced with the problem of maintaining consistency, together with a favorable bargaining position, using ad_hoc constructions. Such constructions in bargaining are
tions? Are certain organizational setups or cultures predisposed towards particular heuristic repertoires? If interesting and consistent heuristic patterns do emerge, might not the elusive notion of cognitive style be characterized heuristically?

These proposals do not begin to exhaust the research possibilities offered by heuristic approaches. That heuristics seem to be potentially relevant for the investigation of so many other important research activities—from simulations to strategic thought to pragmatics to organizational behavior—provides further evidence for the claim made at the outset of this study—that heuristics occupy a fundamental position in human problem-solving processes.

awkward affairs and often leave openings for the buyer to continue his bargaining pressure. At the very least, this "feinting ploy" places the seller immediately on the defensive.

The use of feints to force an opponent into some premature commitment and then striking his weak points, is perhaps more familiar in war than diplomacy. Generals, for example, always try to disguise their geographical objectives by using axes of advance that allow them to attack multiple targets. Consider B.H. Liddell Hart's famous description of Sherman's "march to the sea" through Georgia:

In the Atlanta campaign he (Sherman) had been handicapped, as he realized, by having a single geographical objective, thus simplifying the opponent's task in trying to parry his thrusts. This limitation Sherman now ingeniously planned to avoid by placing the opponent repeatedly "on the horns of a dilemma" — the phrase he used to express his aim. He took a
line of advance which kept the Confederates in doubt, first, whether Macon or Augusta, and then whether Augusta or Savannah was his objective. And while Sherman had his preference, he was ready to take the alternative objective if conditions favoured the change.

And in his ensuing Carolinas campaign, Sherman repeated the strategy:

...his opponents could not decide whether to cover Augusta or Charleston, and their forces became divided. Then, after he had ignored both points and swept between them to gain Columbia -- the capital of South Carolina and the centre of Lee's best source of supply -- the Confederates were kept in uncertainty as to whether Sherman was aiming for Charlotte or Fayetteville. And when in turn he advanced from Fayetteville they could not tell whether Raleigh or Goldsborough was his next, and final, objective. He himself had not been certain whether it would be Goldsborough or Wilmington. (B.H. Liddell Hart, Strategy (New York, Frederick Praeger, 1960), pp. 151-152.)

All this is basically the "feinting ploy" transferred to the military sphere.


118. Levi, Werner, Modern China's Foreign Policy, Minneapolis, University of Minnesota Press, 1953.


177. Riding, Alan, "Central American 'Dominos' Are Upset," The New York Times, April 1, 1979, Sec. 4, p. 3.


216. and Tamashiro, H., "Program Evaluation in Foreign Policy and International Politics," Dept. of Political Science, Ohio State University, 1976, mimeo.


