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**Publication Date**

1995

A1458  
no. 95-5

5/24/95

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**Working Paper 95-5**

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Human institutions... are artificial, conceived in the ingenious brain and wrought with mental skill born of inventive genius. The passion for their improvement is of a piece with the impulse to improve the plow or the steam engine. Government is one of these artificial products of man's devising...

-- Lester Frank Ward, The Psychic Factors of Civilization

The formulation [of a problem] is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.

-- Albert Einstein and Leopold Infeld, The Evolution of Physics: The Growth of Ideas from Early Concepts to Relativity and Quanta

In a day and age when our public institutions -- particularly our large scale formal organizations -- are almost daily pressed to take on additional burdens and at the same time called to account for their perceived inadequacies, inefficiencies, and failures, there may be no more important questions for social science than those concerning the content and form of those institutions and the processes by which they came to be.\* Our large scale formal organizations are many things -- constellations of political power, reducers of transaction costs, open systems, closed systems, technologically driven, rulebound and inflexible, informal configurations of overlapping groups, oppressive to the individual spirit and venues for individual achievement -- but most fundamentally they are the greatest manifestation of the human genius for adapting to an uncertain and ever-changing environment. Surely the ascent of the human race from mere subsistence to its complex and multi-textured existence today may be understood as the successive invention of increasingly effective and efficient tools, from levers to wheels to plows to railroads to personal computers. Just as surely, few such inventions would have been possible or susceptible of exploitation without corresponding advances in our institutional forms. The Industrial Revolution was, for most, defined by the substitution of mechanical for human energy, but it was also an elemental transformation of the institutions that organize human endeavor. The information revolution which now confronts us is accompanied by no less an upheaval in organizational forms.

It is the thesis of this essay that the self-same human problem-solving behaviors that led to the invention of steam engines and screw propulsion, counter sorters and super computers, vaccines and magnetic resonance imaging, power looms and polypropylene, also provide the most satisfactory accounting of our institutions. Our institutions, in particular, large scale formal organizations, are the highest expression of human artifice. The structures, rules, and procedures of such organizations are inventions made in response to important problems that require some sort of cooperative endeavor for their effective solution. It may safely be said that no public policy becomes reality without a formal organization -- whether it take the form of administrative agency, regulatory commission, government corporation, or some hybrid -- to execute it.

If we are to understand such institutions as artifices we must first grasp the *reasons* that spur their invention. But reasons alone do not suffice for explanation. We must also comprehend the *processes* by which they are created. Processes of problem-solving encompass much more than making choices from among some set of alternative problem solutions. In fact, such choices come only at the *end* of efforts -- frequently quite extensive -- to identify and structure problems -- which often remain only incompletely understood -- and to generate alternative solutions for those problems. Consequently, any study of problem-solving endeavors, including those aimed at creating institutions, must attend closely to those behaviors which led, ultimately, to choices from among alternative solutions.

## THE MATTER OF INSTITUTIONS

For the most part, scholars do not adopt a common definition of "institution" of which their specific preoccupations become exemplars. Rather, they tend to define "institution" in terms of the specific questions and empirical phenomena they are most interested in comprehending.<sup>1</sup> Here, I understand "institution" to refer to "organized, established, procedures," often presented as the "constituent rules of society." More specifically, I use the term institution to signify a "social order or pattern that has attained a certain state or property," order or pattern being defined as "standardized interaction sequences." In turn, variances from these patterns are counterbalanced in a "regulated fashion" by socially constructed controls that are more or

less "self-activating" processes of reward and sanction. Thus, institutions have consequences for the behavior of humans who exist within them or proximate to them. Although the new institutionalism in political science has tended to focus on the consequences of institutions, almost exclusively formal organizations -- principally legislatures, but also bureaucracies -- a wide variety of common social, economic, and political phenomena also qualify as institutions, including, for example, marriage, insurance, wage labor, the vacation, academic tenure, and elections.<sup>2</sup>

However, I focus here on the bureaucratic type of large scale formal organization, further defined as a stable set of social relations that are "*deliberately created, with the explicit intention of continuously accomplishing some specific goals or purposes*. These goals or purposes are generally performed for some larger structure." (Stinchcombe 1965, 142, emphasis added). From this perspective, what distinguishes large scale formal organizations among the panoply of institutions considered in the social sciences, is their *intentionality* and *instrumentality* -- and thereon hangs the tale. Since Adam Smith's *Wealth of Nations*, numerous and varied models from sundry disciplines have been employed in efforts to comprehend large scale formal organizations. Although these theories have varied in their empirical locus, all have recognized that the character of large scale formal organizations is fundamentally artificial (Scott 1981).

Consistent with Lester Frank Ward's formulation, "artificial" is understood here as "Made by or resulting from art or artifice; contrived, compassed, or brought about by constructive skill, and not spontaneously; not natural." (*Oxford English Dictionary*) Thompson (1974, 1976) distinguished "artificial" from "natural" system, on the basis of the former's status as a tool, whose sole reason for existence is to achieve certain stated ends under a given set of conditions. It is an instrument whose meaning is established in terms of its utility for achieving those ends. Once a goal has been set, a system for implementing it must be designed -- an administrative system, typically a bureaucratic form of large scale formal organization. The purpose remains primarily external to, or given to, that system.<sup>3</sup> Early theories of organization implicitly recognized the artificial character of organizations by treating them as machine-like entities. As machines, organizations might be designed and new components invented to make them work better. While in no wise do I treat organizations as machines here, I focus primarily (though not exclusively) on their artificial or formal aspects -- their structures, rules, and procedures. This formulation encompasses the legal charters of organizations, their formal structures, their internal maintenance arrangements such as accounting and

personnel processes, the rules and procedures by which their subunits actually administer policies, etc. I largely ignore the role of natural (or informal) system aspects in the solution of problems because the principal aim is to understand the artificial aspects of large scale formal organizations and the processes by which they were brought about.<sup>4</sup>

*The New Institutionalism.* How, then, should we think about institutions? By what processes do they come into existence and acquire some forms and not others? Which theoretical tools in the social science inventory are most effective in explaining *both* processes and outcomes? These days the social sciences abound with discussions of institutions. Institutions, it is supposed, are factors that serve to constrain behavior and affect outcomes; at the same time they constitute important phenomena to be explained in their own right. Contemporary interest in institutions crosses disciplinary boundaries including economics, political science, and sociology.<sup>5</sup>

The new institutional economics adds realism to microeconomic theory's usual assumptions regarding the behavior of individuals. Using the transaction as the basic unit of analysis, economists argue that institutions decrease the costs of transactions by reducing uncertainty and introducing stability (DiMaggio and Powell 1991; Williamson 1975, 1981; North 1986, 1990; Posner 1981; Schotter 1981; Nelson and Winter 1982). Some believe that considerable forethought goes into the shaping of economic institutions; others are less sanguine, arguing instead that historical circumstances and random occurrences play considerably greater roles in institutional formation and retention than individual calculations.

In political science, positive theorists have produced an extensive literature concerned with the effects of legislative structures and procedures -- particularly those concerned with committee jurisdictions and agenda formation -- on policy outcomes, including pioneering work by Shepsle, Weingast, and Riker, among others. This corpus responds to the perceived failings of rational choice theories who did not include the contexts in which individuals pursue their interests. It emphasizes the importance of legislative rules for providing the stability inherently missing in pure majority vote structures. Among the conclusions reached is that institutions reflect the power and preferences of the individuals or units which comprise them, and that battles over rules and procedures reflect a recognition on the part of rational actors that shaping them in specific directions will bias outcomes in one direction or another. As time has passed, the new institutionalism has become more subtle and discerning, e.g., Moe (1987) has criticized the early institutional

researches for restricting their study to the formal rules and procedures at the expense of ignoring more informal but significant determinants of behavior.

From this vantage point, institutions are to be understood primarily as "the mobilization of bias," a concept developed long ago by Schattschneider (1960). Actors engage in the rational calculation of gain in substantive policy conflicts and seek their own advantage in the design and functioning of social institutions. This in turn influences the outcomes of specific policy conflicts. Presumably, once the interests of actors have been clarified, we may predict the institutional arrangements they should prefer and seek. The "new economics" of institutions is characterized by three elements: "a contractual perspective on organizational relationships, a theoretical focus on hierarchical control, and formal analysis via principal agent theories" (Moe, 1984, 739).

Skowronek's study of the creation of national administrative capacity in the United States provides another variant of the new institutionalism. From this perspective, the rapid development of particular kinds of institutions at particular points in time is explained by a conscious and systematic response to the existence of certain conditions: "domestic or international crises, class conflicts, and the evolving complexity of routine social interactions" between 1873 and 1920. These new institutions moved power away from the states and toward the national government, yet existing political institutions constrained that transformation (Skowronek 1982).<sup>6</sup>

There are also studies by Skocpol (1979) of the role of the state in political life; by Krasner (1988), Kratochwil and Ruggie (1986), and Keohane (1984) of international regimes; by Hanf and Scharpf (1978), as well as by Bendor (1985), Chisholm (1989), and Desveaux (1995) of the effects of organizational structure on the implementation of public policy. Some (e.g., Skocpol and Skowronek) assume that institutions do not simply reflect preferences of relevant actors, but act independently behalf of their own agendas and constrain their components' freedom of action in significant ways.

The new institutionalism takes a different tack in sociology, evincing a skepticism toward rational-actor models and views institutionalization as a state-dependent process that makes organizations less instrumentally rational by limiting the options they can pursue. It focuses on constraints imposed by, and irrationality located in, the formal structure itself rather than in informal, interest-oriented "political tradeoffs and alliances" (DiMaggio and Powell 1991, 12). Sociological variants of institutionalism take a less optimistic



view of the possibility of shaping and molding institutions to one's interests than do their counterparts in economics and political science. Where public choice theorists and economists tend to see institutions as temporary resting places on the path to efficient equilibrium solutions, sociologists find that institutionalized behaviors and structures are typically more resistant to change than those that are not. (DiMaggio and Powell 1991).

The new institutionalism thus represents rather less a unified approach to the study of human behavior than an amorphous set of assumptions, hypotheses, and empirical studies revolving around the general notion that the way life is organized affects behavior and outcomes in significant ways. Organization matters.<sup>7</sup> From the economic perspective some argue that institutions reflect the pursuit of preferences by actors (whether individual or corporate), while others understand them as outcomes that cannot be explained in terms of summed individual preferences. Some find institutions readily malleable; others, stubbornly resistant to alteration once in place. Some treat preferences as exogenously derived, determining the character of institutions; others believe that institutions shape those preferences. Thus, although no single research agenda or method describes the new institutionalism, in economics and the positive theory of institutions in political science all seek to understand how institutions come into existence, given certain basic assumptions about rational choice in human behavior that would lead us to think otherwise. At the same time, with the exceptions noted above, there is a common view that at a macro level institutions are subject to historical efficiency, in which an efficient equilibrium is ultimately reached through processes of evolutionary selection, thereby explaining the existence of organizations with broadly shared characteristics at particular points in history.

A positive theorist taking up the problem addressed here might focus on the connection between the reduction of transaction costs and the creation of particular institutional forms, or on the different interests relevant to a given issue area, identifying the alternative institutional arrangements optimal for advancing each of those interests, and then examining conflicts over alternative arrangements. Changes in institutional arrangements would be explained by the emergence of new interests in interaction with whatever existing institutions affected the course of those conflicts. Over time, the institutional arrangements would find an equilibrium state in which no set of interests had sufficient power to alter those arrangements any further.

Were Skowronek's strategy followed, institutional development would be interpreted as an instance of the process of state-building, an outcome of struggles ensuing among officials attempting to acquire or maintain political power and institutional position when existing structures were questioned (Skowronek 1982, 4-5). Institutional development or changes would be interpreted as a self-conscious endeavor. This, because "external events had made existing institutional arrangements obsolete in some significant way. Conflict would result because the established state organization ultimately [would have] to be thrown into internal disarray. Members of a given bureaucracy would consequently seek their own advantage. The outcome would be increased centralization and consolidation of national power" (Skowronek 1982, 9).

*Institutionalism, Neither New nor Old.* Present interest in institutions is not particularly novel. Other fields have longstanding interest in the transformation of institutions, the conditions that make possible or shape such transformations, and their consequences for political, social, and economic life. These offer other valuable avenues for comprehending the development and transformation of modern institutions -- such as large scale formal organizations. Administrative histories have given us valuable insights into the idiosyncracies and peculiarities of particular organizations during specific historical periods. Historical sociology provides a theoretical framework for understanding changes from one dominant form of institution to another over long periods. Development administration has maintained a normative interest in the transformation of institutions from traditional to modern. Theories of institutionalization and professionalization also offer useful lessons for understanding the roads taken by modern institutions.

Administrative histories of individual agencies -- especially those which investigate long periods of time -- tell us much of value about particular organizational transformations (Paullin, 1968). And yet, despite the richness of detail they contain, the lack of uniformity in the specific empirical phenomena they address renders it difficult to make comparisons across these organizations. Taken together, Leonard White's four histories remedy this deficiency by providing a comprehensive picture of the development of the administrative apparatus of the U.S. national government, from the early days of the Constitution to the close of the 19th century (1951, 1954, 1956, 1958). Their great virtue lies in White's analysis of virtually every important federal administrative body extant during each of the periods he addressed, affording the opportunity to compare different organizations at similar points in history. They still fall short, however, for

the purposes of this essay because they do not -- except through processes inference by the individual reader -- embody any broader theory of institutional formation and development.

Although absent the rich detail of White's research, Weber's historical analysis of broad trends in institutions over extended periods constitutes a general theory of institutional forms, particularly as they manifest the rise of rationalism. His concept of bureaucracy works as a macro-historical benchmark and the process of bureaucratization is useful for characterizing a significant pattern of social change (Bendix 1971). In similar manner Stinchcombe (1965) addressed the general question of the relationship of the society outside organizations to their internal life in historical sweep similar to that of Weber. He focused especially on the transition from traditional to modern societies -- where the latter were understood to be characterized by special-purpose organizations -- and concluded that the organizational inventions that could be made at a given point depended on the social technology available at the time. Because these forms functioned effectively and became institutionalized, their basic structure tended to remain fairly stable.

A Weberian interpretation of modern institutions would place them within broad historical trends that describe the processes of bureaucratization. Timing of those changes would be explained by the presence or absence of conditions identified as vital for the development of bureaucratic forms that rest on rational-legal legitimacy. It would permit analysis that explained why bureaucratization occurred at one time in one setting and not in another. In corresponding manner, an approach based on Stinchcombe's viewpoint would examine the particular form that a large scale formal organization took at any given time in reference to extant social conditions and in comparison to prevailing types of institutions in the broader system of which it was a part. Historical sociology thus tells us much about the factors conditioning the appearance and survival of certain forms of institutions at particular points in history. It tells us little about the mundane processes by which such institutional transformations actually take place, nor does it allow us to make very precise predictions about those processes. Contemplating this problem, Stinchcombe (1978) asked: "How can historical research bear on the question of whether a particular reduced form of a system of equations contains all the relevant information?" He answered that it could not remain at the level of epochal facts, it had to be founded in more detailed studies of particular historical sequences. This suggests that general theories cannot provide much of value absent the kind of close empirical work performed by White.<sup>8</sup>

Post-World War II U.S. foreign aid, the rise of the United Nations, the World Bank, and other international agencies dedicated to bringing former colonies and other less developed areas into the "modern" world spurred interest in the practical problem of "building institutions." Naively optimistic early efforts, largely simple transfers of technology and wealth, gave way to a recognition of the fundamental importance of those social, political, and economic institutions that make possible the use of modern technologies and the creation of wealth beyond mere subsistence. Practical problems of "institution building" or building "institutional capacity" proved more complicated and less amenable to solution than development "experts" had anticipated, causing a close reexamination of exactly which patterns of modernization development administration was supposed to emulate.

Landau (1971) explained the failure of Western development efforts in underdeveloped nations by the differences between traditional and modern societies in their decision rules and communal cognitive representations of the existential world which serve to establish legitimate grounds for decisions.<sup>9</sup> He argued that the grounds on which decisions were made and legitimated would first have to be altered to make development possible. From this perspective, organizations can exist only insofar as their distinguishing characteristics are distributed through the larger society of which they are a part. Landau assumed that "when stable intermediate entities are the basis of complex organization, they provide protection against disintegration" (1971, 407). The fundamental development problem was therefore to create those stable intermediate forms that would allow of the transition between traditional and modern society.<sup>10</sup>

Development administration thus informs us about long-term, global processes of consciously creating modern institutions. It alerts us to general stages of development and therefore suggests where to look when analyzing any given empirical case. An analysis of a large scale formal organization would, from this perspective, be attentive to external conditions, especially broader societal decision rules and shared cognitive maps that constrain the types of organization possible. However, it also rests on the assumption that *institutions may be fabricated by humans acting to connect means with ends*; they do not simply "happen." It therefore leads the researcher to look for a series of stable intermediate institutional forms along the path of transformation trod by a given society (or organization) that enabled it to make the move from simple to complex forms.

The idea of a generalized process of "institutionalization," one that leads to fully developed and articulated institutions is both relevant and congenial to the perspectives of both historical sociology and development administration. Polsby's (1968) historical analysis of the U.S. House of Representatives is one of its most important expressions in political science.<sup>11</sup> Concerned with the creation and development of specialized organizations for "authoritative resource allocation, problem solving, conflict settlement," and "institutionalizing representativeness," he examined the evolution of the internal structure, rules, and procedures of the House. He concluded with two remarks that are cogent here. First, the institutionalization process might be reversed because institutions always remain subject to environmental influences and their ability to alter and direct such influences is less than perfect. Second, a "big-bang" or "take-off" theory of institutionalization appeared to have some warrant; for the House, at least, universalistic criteria, boundedness, and differentiation developed at an accelerating pace in the 1890-1910 period.

Polsby's approach leads us to look for evidence of the increased presence of universalism, complexity as manifested by increasingly specialized functions, and boundedness, expressed primarily as carefully controlled and qualified entry into the organization. Empirical indicators of decline in particularism, of differentiated structure, and efforts to insulate the organization from larger environment influences, or at least to make membership more difficult to attain, would be important. It would lead us to look closely at the post-Civil War to World War I period as key to an organization's institutionalization.

Lastly, studies of professions and of the processes of professionalization are pertinent to understanding the development of institutions. This approach considers the processes by which some groups and activities in society acquired certain characteristics which then affected their ways of conducting business and, in turn, their status within the larger social, economic, and political structure (Dewey 1927; Parsons 1954; Cogan 1953; Greenwood 1957; Wilensky 1964; Wiebe 1968).<sup>12</sup> Wilensky, for example, argued that a profession is characterized by a technical basis for the occupation, combined with norms to which those in the occupation adhere. An occupation must "assert an exclusive jurisdiction, link both skill and jurisdiction to standards of training, and convince the public that its services are uniquely trustworthy" (1964, 137-138). Occupations which have achieved professional status share common traits: they start to do things full-time, establish some sort of training school or program, combine to form a professional association, persist in political activism to gain legal protection of the job territory and its ethical code, and develop rules to

eliminate the unqualified and dishonest, to reduce internal competition, and to protect clients, all embodied in a formal ethical code (Wilensky 1964). Thus, there are empirically researchable indicators of professionalization processes.

This approach seeks to understand whether and how an institution's personnel professionalized, or achieved these characteristics. It directs attention to the establishment of schools or programs for professional education and training; the content of their respective curricula; the creation of professional associations; shifts from particularistic to universalistic criteria, etc. Common barriers to professionalization might explain the timing and pace of the process for any given institution. This approach gives more specific content to the concept of institution and processes of institutionalization. Particular contours of an institution might be explained via efforts of some its members to professionalize their occupation under particular historical conditions. One important consequence of professionalization would be increased independence and power for an institution's personnel, both within their own organization, and from control by the President and Congress, e.g., successful resistance to political penetration in matters of promotion, retirement, and assignment to positions.

### WHITHER SHALL WE GO?

Administrative histories, historical sociology, development administration, institutionalization, and professionalization all offer useful insights into the creation and transformation of modern institutions. Each -- excepting administrative histories -- deals directly with change, defines an end state, suggests a natural history that describes movement toward that end state, implies that "progress" intrinsic is to those processes, and uses a lengthy time perspective. They focus primarily on the late nineteenth and early twentieth centuries, times of great ferment in the organizational domain. As theoretical structures, they all -- again excepting administrative histories -- simplify by providing more or less rules by which aspects of the complex empirical phenomena of interest may be omitted. None, however, gets at the questions posed here: *What are the processes by which such institutional transformations are actually accomplished, especially, how are organizational structures, rules, procedures related to perceived problems and where do alternative solutions come*

from? Neither do they provide great leverage for comparing the unfolding of specific organizations.

Nonetheless, these approaches inform us about what kinds of macro, long-range substantive trends that we may expect to see, the forms of organizations we may anticipate at different historical times and in disparate cultural settings and thereby enable us to locate any given organization of interest in a larger context.

What is wanted, then, is a theory that allows of comprehending the processes by which organizations are created and that licenses meaningful, systematic comparison across such organizations. The new institutionalism comes closer to the mark than these approaches do, perhaps, in its vision of the content of institutions resulting from the rational pursuit of self-interest. Still, it does not satisfy. We need somehow to salvage a rational perspective on the creation of those institutions called large scale formal organizations, but one which does not limit the focus to utility-maximizing behavior. Positive theories of institutions, even after accommodations to the cost of search and information, cognitive limitations, the inability to predict outcomes with any objective certainty, and the instability of preferences, remain focused on issues surrounding maximizing, that is, making the optimal choice from among some array of alternatives. They do not inform us as to where those alternatives came from, nor, in general, about the number of alternatives we may expect decision makers to consider in real world decision making.

Moreover, positive theories of institutions in political science originated in and have been most fully articulated in studies of legislatures. In this empirical context, emphasis on connecting actors' interests to structures, procedures, and outcomes is but natural. Legislatures are, after all, intended to accommodate and facilitate the articulation of interests. Large scale formal organizations, such as administrative agencies, although susceptible of interpretation in a similar way, exist largely to provide goods or services for constituencies, thereby typically making practical issues of how to deliver them effectively of greater moment than politics in determining their internal structures and procedures.<sup>13</sup> Similarly, work on international regimes has centered on how such institutions may arise at all and then be maintained in the face of scarcity and conflicting interests. Positive theory might be used to explain why a formal organization came into existence and then persisted, but it goes only part way toward helping us to comprehend the processes of internal differentiation, specialization, and elaboration undergone by large scale formal organizations over time.

*The Old Institutionalism.* Thus it is that the approach to institutions advanced here does not derive from the rational pursuit of self-interest embedded in positive theory. Nor does it place itself in the administrative histories, historical sociology, development administration, institutionalization, or professionalization. It is nevertheless founded on institutionalism, but lies rather closer to the variant embraced by the social sciences of the latter nineteenth century, the "old institutionalism," built on the philosophical and methodological foundations of pragmatism, than to more recent work. Watershed changes in the social, political, and economic life of the United States of that time -- particularly the increasing difficulties associated with a *laissez faire* economic system coupled with burgeoning industrial capitalism, urbanization, and immigration -- had far outstripped the predictive and explanatory capacity of eighteenth century analytic schemes. At the same time, intense interest in reform demanded an empirical underpinning from which to work real alterations in the organization of political, social, and economic life.

Simultaneously, the ineluctable and random change of Darwin's theory of evolution had supplanted the ordered world of Newton's mechanics, and rendered obligatory some new approach to understanding social phenomena, including institutions. Newtonian rationalists saw the world as a closed, unilinear, finished system; a world that was holistic, unified, and finished, with a given predetermined character. By contrast, Darwinian empiricists saw the world as an open system, one in which chance and spontaneity were real, and were in fact the most important elements. Where the rationalist began with a fundamental principle and then proceeded to consider particulars, the empiricist saw the universe as an agglomeration of things known individually through sense impressions. Where the rationalist knew fact from principle, the empiricist induced principle from fact (Hartshorne and Weiss 1934; Dewey 1920; White 1949; Commager 1950; Landau 1979). Where the Newtonians understood progress in terms of bringing human political, economic, and social institutions into closer attendance to the natural laws and overall plan of the "Almighty Architect," Henry James's meliorism and John Dewey's pragmatism made possible a concept of progress in which "men stood, or floated, in a broad sea of contingencies and options, and how and where they steered was largely up to them" (Marcell 1974, 189). Because humans could affect the course of history, the burden of progress was placed squarely on their shoulders. The resulting "liberal ideology" was "anti-formalist, evolutionary, historically oriented; it was deeply concerned with the economic aspects of society" (White 1949, 107).<sup>14</sup>



Consequently, Lester Frank Ward, Woodrow Wilson, Oliver Wendell Holmes, Jr., Charles Beard, Richard T. Ely, John R. Commons, Thorstein Veblen, and Wesley C. Mitchell, notable among many others of the time, all sought to depart from formal, legalistic studies of politics, society, and economics toward empirically-based analyses, including the behavior and consequences of key institutions. Ward asserted that the act of invention extended well beyond machinery and might be appropriately and effectively applied to government institutions. He believed, further, that the

constant tendency [of man] is to render everything more and more artificial, which means more and more perfect. Human institutions are not exempt from this all-pervading spirit of improvement. They, too, are artificial, conceived in the ingenious brain and wrought with mental skill born of creative genius.... Government is one of those artificial products of man's devising, and his right to change it is the same as his right to create it (1897, 286-287).

Wilson (1887) sought to redirect attention from constitution-making and abstract discussions of the "good state" to empirical research into the actual workings and behaviors of governmental institutions. He believed that the lessons of other nations' administrative institutions could be applied to the American context. His pathbreaking *Congressional Government* (1883) demonstrated that the Constitution's system of checks and balances had gone awry in the post-Civil War period and proposed practical institutional solutions to the problems created thereby -- many of which were ultimately embodied in the Budget Reform Act of 1921. Both Wilson and Ward sought to recast institutions so that they might contend more effectively with the increasingly complex problems of industrial and urban civilization. The transformation was to be accomplished by means of human intellect and creativity. The challenge was to generate new organizational forms that might be more effective than existing ones.

For his part, Holmes concluded that the law could not be analyzed as if it contained only the axioms and corollaries of a book of mathematics because the law comprised and contained the history of a nation (White 1949). His empirical focus thus led him to an interest in history. Similarly, Beard's dissatisfaction with constitutionalism and Hegelian idealism -- which "saw the state working out its abstract destiny in the 'laws of freedom' in history" -- led him to believe that the best way to understand any institution, especially that of property, was to study its evolution (Lerner 1954, 29-30).

The whole focus in the economics of the time pivoted on the bearing of Ely's work. He was the most influential of the "new school" of economics in the United States (and founded the American Economic Association). Very much an advocate of social reform, he insisted that the

old economists were English, hypothetical, and deductive. The new economists were German, realistic, and inductive. Old economists believed in a priori laws which could not be changed, no matter who suffered, while

new economists recognized what everyone of ordinary sense could see -- that economic policies changed with the times (Furner 1975, 60).

From the contemplation of economic laws, the next generation of economists turned to analyzing institutions. Commons coined the term "institutional economics" and ultimately wrote a book of the same name (1934) to refer to the broader base of economic investigation that he advocated.<sup>15</sup> For Commons, the acquisition of economic knowledge was practical in purpose: it was to be used for solving economic problems. Veblen rejected classical political economy as too abstract and offered a theory of economic development framed in terms of two fundamental institutions: the engineers and the price system (White 1949; Veblen 1919). Mitchell -- who was Veblen's student -- argued that deductive classical economics were inadequate for explaining observed behavior: "the more perfectly the old hedonistic preconceptions are worked out in economics the less does the theory have to do with the facts" -- and labelled the assumption that man is "a reasonable being who always intelligently seeks his own good or is guided in all his activities by enlightened self-interest" as the "intellectualist fallacy" (1910, 197, 207). He pointed to the importance of understanding the role of social institutions in economic behavior.

Fundamental affinities shared by these variants of late-nineteenth century institutionalism included the beliefs that (1) institutions were important determinants of social, political, and economic outcomes; (2) existing institutions had become outmoded and ineffective in the face of new conditions; (3) institutions could not be comprehended by logic alone and so empirical study, especially historical method, was essential for understanding; (4) institutions were subject to conscious human modification and manipulation through the creation of alternative forms and might be perfected; and (5) the social sciences could be best employed toward practical reforms of institutions. The problem solving approach taken by this essay is rooted in these beliefs about institutions and how we may most effectively comprehend large scale formal organizations -- except that it makes no assumption that they are perfectible.

## THE PROBLEM-SOLVING APPROACH

The structure, rules, and procedures of large scale formal organizations result from day-to-day efforts of individuals acting in their professional capacities and official roles to solve problems that impinge

upon their ability to get on with their business. It does not assume nor does it rely on any larger vision of any given such institution and its development or transformation -- rather, institutions are cumulative consequences of the actions of many different people over time. Nonetheless, it does contend that of the great panoply of political, social, and economic institutions, large scale formal organizations, at least, result from rational human behavior. This approach contemplates humans as goal-directed actors who apply factual and procedural knowledge in determining how to achieve their objectives (Smith 1988): *humans are problem solvers*. While this perspective shares with economics the assumption that institutions result from rationally-directed behavior, the similarity between the two ends there. Where economics has been concerned largely with *what* decisions are made, problem solving has focused on the process (Simon 1978). This is no trivial difference. Long before the advent of the "new institutionalism," Cyert, Simon, and Trow described the rational choice model embraced by economics as follows:

1. An individual is confronted with a number of different, specified alternative courses of action.
2. To each of these alternatives is attached a set of consequences that will ensue if that alternative is chosen.
3. The individual has a system of preferences or "utilities" that permit him to rank all sets of consequences according to preference and to choose that alternative that has the preferred consequences (1956, 237).

This model neglects several critical elements of the process of decision, most significantly the necessity for decision makers to look for significant problems to which their attention should be addressed; the need to generate alternatives, which are not typically given to the decision maker; and, because they are seldom a given, the need to search out the consequences of those alternatives.

These elements are integral to the problem-solving approach to decision. It is nothing very new. Like the institutionalism of the 19th century, it originated with Peirce (Hartshorne and Weiss 1934), gestated in the meliorism of James, and was first systematically explicated in Dewey's 1910 *How We Think*. It has developed further in the fields of cognitive psychology, cognitive science, and artificial intelligence. It is embedded in Simon's theories of bounded, or procedural, rationality and satisficing, in Newell, Shaw, and Simon's information processing theory of cognition (1958), and in Lindblom's (1959) theory of incrementalism. It is congenial to March and Olsen's notion of "experiential learning" (1984). Thompson and Tuden's work (1959) on decision-making and organization structure and processes relies on the problem-solving approach. The organizational analyses of Landau (1969, 1973); Landau and Chisholm (1995); Landau and Stout (1978); Chisholm (1987, 1989), and Wildavsky (1972) are also located within the problem solving paradigm. Voss and his colleagues have used a problem solving approach to analyze foreign policy decision

making (Voss, Wolfe, Lawrence, and Engle 1991; Voss and Post 1988; Voss, Greene, Post, and Penner 1983). It also is common to operations research, management science, and strategic decision making, which fields' concerns are primarily prescriptive: how to design better problem solving processes (Luckman 1967; Lang, Dittrich, and White 1978; Lyles 1981, 1987; Lyles and Mitroff 1980; and Lyles and Thomas 1988). It is the approach taken in the political science of Merriam (1924) and the policy sciences of Lasswell (1950), along with many contemporary public policy analysis techniques.

More generally, knowledge and "its representation, memory storage and retrieval, inferential processes, perception, and the nature of intelligent performance in humans and machines" are prominent among the research problems addressed in the problem solving literature (Smith 1988, 1490). As such, the problem solving approach makes much of the empirical study of behavior. Fundamental to these endeavors is the belief that the characteristics of both problem *and* problem solvers must be considered, including the latter's values, but especially their professional backgrounds, knowledge, and abilities. So too, is the organizational context for problem solving considered important.

Dewey argued that reflective thinking -- problem solving -- is not a "case of spontaneous combustion; it does not occur just on 'general principles'." Rather, its origin is in "some perplexity, confusion, or doubt"; "there is something specific that occasions or provokes it." This, because problem solving is painful, hard work, and people will refrain from engaging in it unless they confront some difficulty that demands it. Dewey went on to identify five logically distinct steps to problem solving: (1) a felt difficulty; (2) its location and definition; (3) suggestion of possible solution; (4) development by reasoning of the bearings of the suggestion; and (5) further observation and experiment leading to its acceptance or rejection.<sup>16</sup> Because Dewey distinguished such stages logically, however, is not to say that they manifest themselves in that manner in every instance of problem solving. Dewey himself observed that the "process of problem exploration is not self-sealed and wholly autonomous: it is tied into the structure of interaction and proceeds through the use of interruptions, overlaps and insertion sequences, the proffering of corrections and clarifications, cycling and recycling of questions, answers, requests, and responses" (Dewey 1910, 72; Anderson, Hughes, and Sharrock, 1987, 146). Nonetheless, these steps allow us to distinguish important constituent activities of problem solving.

Similarly, Simon conceptualized decision making in terms of three activities or phases: Intelligence -- finding occasions for making a decision; Design -- finding possible courses of action; and Choice -- choosing among courses of action. It is vital to note that managers do not devote equal amounts of time to each of these endeavors. The fractions obviously vary over time and from organization to organization, but the largest proportions of decision making efforts are spent in figuring out what the problems are and then generating through search or invention possible alternative ways of dealing with them. The smallest proportion is spent actually selecting from among alternatives once they have been generated (Simon 1960). Others find "logic in delineating distinct phases of the strategic decision process, but not in postulating a simple sequential relationship between them. Our central framework resembles the Simon trichotomy, although we define the phases differently, using the terms identification, development, and selection" (Mintzberg, Raisinghani, and Theoret 1976, 252).

Other scholars have recently elaborated on these basic conceptualizations of the problem-solving process, principally attempting to differentiate further its various stages, and to talk in greater detail about the character of the activities at each stage. However, none contravene the fundamentals of the problem-solving approach as espoused by Dewey and by Simon. Although the language used by different scholars varies substantially -- the range of terms for the same concepts and phenomena is truly mindboggling -- the concepts remain comparable.<sup>17</sup>

*Problem Identification.* Decision makers must first "find" or "identify" problems to be solved. Problem identification is a creative act, a precursor to solving a clearly posed problem (Dillon 1982).<sup>18</sup> In a world where decision makers of limited abilities are besieged by many different matters, problem identification is a process of organizing attention. Problems embody some disparity between what decision makers expect to see or desire to see and what they actually experience. First must come conditions where potential exists for being interpreted as a problem (Pounds 1969, 5; Mintzberg, Raisinghani, and Theoret 1976, 253; Cowan 1986, 766). Asserting the existence of a problem follows an evaluation of the situation in which one finds something about it that is "undesirable." Situations and objects not only negatively affect self or group interest, but affect adversely beliefs or expectations, and may point out gaps in one's understanding or knowledge, or are undesirable in some other way. "Undesirable" means that a problem can be altered

only by an act that completes the situation in a way which is implied in how the problem is framed (Agre 1982; Berry and Seavey 1984).<sup>19</sup>

The precise moment at which resources will be mobilized to solve a problem may be viewed as a function of the relation between the cumulative stimuli and an action threshold.... the greater the frequency, clarity, or consistency of stimuli, the more consequential their perceived combined amplitude (Mintzberg, Raisinghani, and Theoret 1976, 253).<sup>20</sup> Not just any undesirable situation is to be labelled "problem," however, it must also have something about it that is believed to be difficult, which signifies that the "level of effort needed to complete the activity must be judged to be above the level required to carry out adequately what are viewed as one's regular, routine tasks" (Agre 1982, 130).

Decision makers carry with them a wide variety of usually implicit, sometimes explicit, models of outcomes they expect to occur when all is right with the world. Because decision makers live in a complex and dynamic world, discrepancies frequently arise between the predictions of their models and what actually happens. Each decision maker sorts acknowledged stimuli by comparing a perceived outcome to a norm for that outcome (Nutt 1979, 203). Such models enable decision makers to decide which phenomena constitute problems. They are predicated on recent past experience, which is assumed to be an effective guide to the short term future, and are also founded on the assumption of historical continuity. What is judged undesirable varies among individuals, depending upon their models of expected outcomes, which in turn depend upon both the value premises important to each and the expertise each possesses. This reminds us that problems are "conceptual entities that don't exist in the world, but rather involve a relationship of disharmony between reality and one's preferences. While they involve external reality, problems are partially but intrinsically subjective: each person has his own beliefs, preferences, and capabilities" (Smith 1989, 965-966). At the same time, decision makers must also believe that the problem is solvable, or at least that it resembles problems that have been solved before. Situations that are perceived as *not* susceptible of solution do not qualify as problems (Agre 1982). Therefore, the time necessary to recognize a problem's existence may range from nearly instantaneous with its existence to some number of years; sometimes it will be automatic, at others it will require considerable effort. Here I assume that problem identification occurs amidst various ongoing endeavors, not as a discrete event.

*Problem Representation.* Once recognized, discovered, or identified, and given some working designation, problems must then be understood. The task is to grasp the character of the gap between expectations and state, and to represent the problem so that its essential cause and effect elements are included, and irrelevant factors omitted. This is accomplished by means of constructing a "problem representation," an internal model of what the decision maker thinks is going on "out there." There is some debate over how gaps are delineated: by specifying ultimate goals or by some more operational approach. The former tactic often proves difficult, because goals have a way of evolving -- we find out what is that we value during the process of making decisions. Moreover, for some problems, decision makers will not have a clear idea of their value premises. Whether one or the other process occurs remains therefore an empirical question.

Problem representations result from the interplay of the decision maker's "cognitive map" -- alternatively, "knowledge base", "frame of reference," "operational code," "decision frame," or "cognitive framework" -- with the real world situation.<sup>21</sup> As Einstein and Infeld expressed the matter in their domain, "Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world" (1942, 33). Cognitive maps constitute necessary simplifications by decision makers of a complicated environment and reside in long-term memory. Cognitive maps are usually understood to comprise concepts and the causal links between those concepts, or, cause-effect relationships. Concepts represent variables which can assume different values, and enable people to categorize and aggregate data. Cause-effect relationships link together concepts and show the direction of their linkages (Dutton, Fahey, and Narayaman 1983, 311).<sup>22</sup>

For any given problem, cognitive maps held by different decision makers are likely to diverge in significant ways, affected by the value premises they hold and the expertise possessed. Thus, cognitive maps influence the decision-maker's understanding of any given problem while value premises determine the degree of interest in the process (Dutton, Fahey, and Narayaman 1983, 311). Where goals and level of expertise covary, conflicts among decision makers are intensified. At the same time, cognitive maps may be revised and restructured in the face of new information as new problems arise. "Problem representation" is used here to denote a problem-specific cognitive map generated in response to a specific problem. However, problem representations may be incorporated into long-term memory in consequence of their utility for

solving a problem. Should the same problem, or a comparable one, occur later, that stored problem representation may serve to expedite identification of the problem and improve the likelihood of accurate representation.<sup>23</sup>

The *process* of producing a problem representation has been labelled variously as representing, comprehending, framing, naming, diagnosing, and defining. At root, it involves a process of information search and acquisition in order to comprehend in some useful way the problem being faced, especially to enable the decision maker to categorize the problem and to formulate some understanding of the workings of cause and effect in the problem space. That process consists of focusing and filtering information, organizing it into meaningful concepts, and ordering those concepts into cause-effect relations. It includes both deductive *and* inductive modes of thinking (Dutton, Fahey, and Narayanan 1983, 313). Put differently, representation is achieved by two processes: analogical reasoning and utilizing inadequate solutions. The latter involves using previous "inadequate proposed solutions as vehicles for the reidentification of the problem. By seeing which features of the proposed solution are progressive and which are obstructing or irrelevant, the problem solver produces a new account of what properties of the goal are necessary to satisfy the existing needs" (Klein and Weitzenfeld 1978, 36). Both processes lead to some improved understanding of the problem and generate a problem representation. The point of problem representation is to provide some basis for generating for alternative solutions and for selecting from among them. Some argue that although problem representation is a convenient conceptualization for organizing research, it is not something that decision makers do, at least not in terms of a structured problem solving process. It remains an empirical question.<sup>24</sup>

*Generating Alternatives.* How distinct the act of generating alternatives is from representing problems remains unclear. The two endeavors appear to be intertwined in practice. Nonetheless, understanding the generation of alternatives is vital to comprehending decision outcomes. Studies on agenda setting have shown us that controlling the issues that come up for consideration goes a long ways towards shaping outcomes. (Baumgartner and Jones 1993) In analogous manner, the type, number, and variety of alternative solutions available for any given problem significantly constrains outcomes. Finding alternative solutions is no simple puzzle to solve. Some scholars have recognized the importance of this phase of the problem-solving process, but research into the search for, discovery of, or generation of, alternative solutions



is not well developed, especially outside of experimental settings. Riker spoke of these endeavors in terms of "artistry within the rational choice context," but Simon countered that the "generation of alternatives is much more than that: it is an integral component of any veridical account of human decision making, or of human bounded rationality generally. The theory of the generation of alternatives deserves and requires, a treatment that is just as definitive and thorough as the treatment we give to the theory of choice among prespecified alternatives" (1985, 303). Moreover, unlike problems posed under experimental conditions, solutions for real-world problems must frequently be invented as opposed to merely "found."

The general process of generating alternatives may be considered in terms of three related questions: (1) What does the decision maker think should happen? This is a function of problem representation. (2) By what mechanism is search for alternative problem solutions conducted? In order for any search to be more than a matter of blind luck, the decision maker need have some heuristic by which that inquiry may be directed toward the places where useful alternatives are more likely to be found -- to narrow the search space. In organizations, practically speaking, search is likely begin among existing customs or informal mechanisms for handling a given problem, among historical efforts to solve the same or similar problem, or among solutions employed by analogous organizations for what seem to be comparable problems. Most problem solving can be represented as a search through a large space of possibilities. Unfortunately, for "real-world problems, the spaces are not merely large, but immense, and there is not the slightest chance for either man or computer to search them exhaustively for the solution that is absolutely best" (Simon 1975b, 1-2). (3) How does the decision maker know when to stop searching for alternative solutions? Since search is expensive and the probability is nil that a decision maker will discover all possible solutions to his problem, the key is how that decision maker figures out how to terminate the search so that it may be conducted at an acceptable cost and completed in a timely manner. I assume with Simon (1975b) that decision makers terminate their search when they reach an apparently acceptable alternative solution. They are not likely to find, invent, or generate very many alternative solutions, most likely only a single one that appears to satisfy the problem's constraints.

Some contend that value premises -- defined in terms of operators, i.e., solutions to the problem -- are built into problem representations. However, this essay does not assume that decisions makers as individuals maintain clearly defined value premises or that such premises are organized in some meaningful

and stable rank preference orderings or that organizations manage to establish and maintain stable, meaningful joint preference orderings. Instead, it is assumed that decisions

must satisfy a whole set of requirements or constraints. Sometimes one of these requirements is singled out and referred to as the goal of the action. But the choice of one of the constraints, from many, is to a large extent arbitrary. For many purposes it is more meaningful to refer to the whole set of requirements as the (complex) goal of the action.... In the process of searching for a satisfactory solution, the goals of the action -- that is, the constraints that must be satisfied by the solution -- may play a guiding role in two ways. First, the goals may be used directly to synthesize proposed solutions (alternative generation). Second, the goals may be used to test the satisfactoriness of a proposed solution (alternative testing) (Simon 1963, 7).

Thus, in a multi-person situation, one individual's goals may be another's constraints. This permits us to proceed with having to posit any rank-ordering of values and at the same time to understand how it is that a given objective situation may be considered a problem by one actor and not by another.

Cause-effect beliefs built into the problem representations provide criteria by which the acceptability of proposed alternatives may be judged (Smith 1990, 627-628). Other things being equal, the more developed the problem representation, the fewer alternatives will be judged acceptable. Greater discrimination becomes possible with well articulated representations. Thus, the content and quality of the problem representation profoundly affects the generation of alternatives. Some problem representations may provide very little guidance by way of a "stopping" rule which defines what an acceptable alternative solution might look like. The characteristics of the alternative generation process that obtains for any given problem, then, are not susceptible of deduction and must be investigated by means of empirical research.

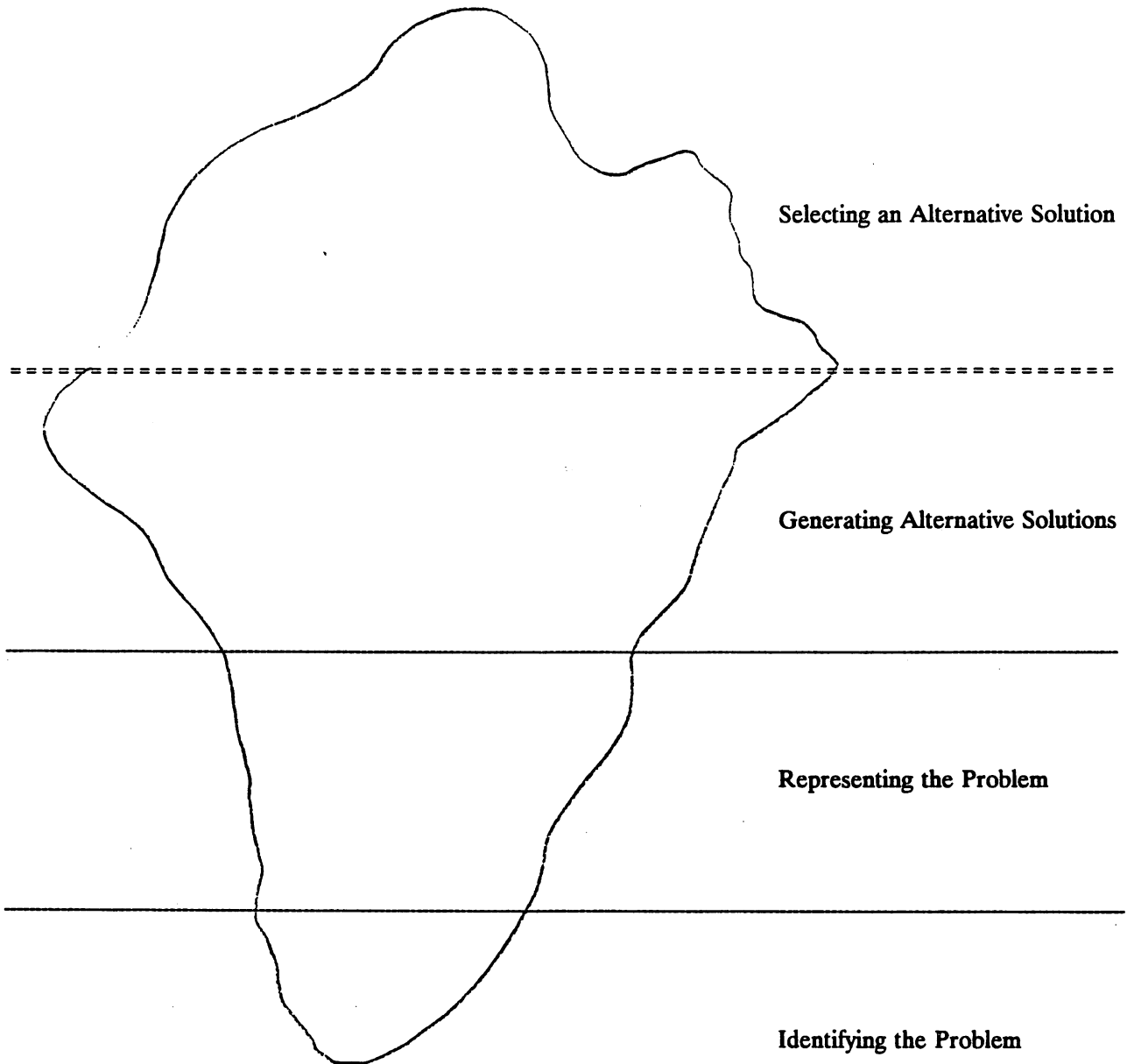
It is the structures, rules, and procedures of large scale formal organizations that constitute the solutions to the problems they are intended to address. These structures, rules, and procedures are designed to solve the problems as the cause and effect relations of those problems are represented and structured. Akin to Dewey's conception of public policies as hypotheses to be tested for their empirical warrant against experience, large scale formal organizations are also to be treated as hypothetical in character (Landau 1973). To the extent to which any given problem has been made well structured, the resulting organizational structures, rules, and procedures become more likely to actually solve that problem effectively, other things being equal. To the extent that the problem remains ill structured, alternative rules, structures, and procedures are probably going to be ineffective as solutions, and will have to be discarded or substantially modified. Put differently, when perchance a problem is become well structured, its representation provides a nearly complete and accurate picture of its cause and effect structure, making it possible (but not necessary) to devise a solution that addresses the problem's effective cause. Consequently, the structures, rules, and

procedures of organizational solutions may nearly match the structure of the problem they are intended to solve. At such times, the organization may approach the status of a programmed system (Simon 1960; Thompson and Tuden 1959).<sup>25</sup>

*Selecting a Solution.* The final phase of problem solving is to choose from among alternative solutions. From the cognitive standpoint, this may be the simplest of the lot -- given the relationship between problem representation and the number and range of alternative solutions generated. Where more than one decision maker is involved, and decision making is a socio-political process, of course, this may be the stage of greatest conflict. It is the phase for which positive theory is most powerful as an explanatory tool. In the 19th century American context, solutions for institutional problems were often worked out by members of the institutions themselves, and after having been worked over by relevant House and Senate Committees, reached the House and Senate floors. Frequently, they occasioned great opposition from members who held somewhat different value premises as constraints and who possessed much less expertise and factual knowledge than those more intimately involved. This meant that their sense of what constituted a problem differed, their problem representation differed in both substance and degree of complexity, which ensured that their preferred course of action would differ as well.<sup>26</sup>

*The Tip of the Iceberg.* If the distinction between the problem-solving approach and positive theory remains at all murky, Figure One should provide the requisite clarity. As well-used as the iceberg metaphor may be, none other makes the point better. Aside from the profound differences between satisficing and optimizing models of decision making, between procedural and substantive models, the problem-solving approach differs from the decision theoretic approach rooted in economics by virtue of its attention to *all* of the cognitive activities that take place *prior* to the act of selecting from among alternative solutions. Positive theory focuses on that aspect of decision that lies principally above the water line, and does so with great power. It is precisely this peculiarity that forms the foundation for this essay: positive theory's restriction of the concept of decision to choice from among some assumed predetermined or provided array of alternatives leaves out the entire set of behaviors that create and shape those alternatives. Much of vital importance in decisions goes on well before the process "breaks the surface" and becomes one of choice among alternatives. In cases where decision makers are unable to come up with more than one alternative problem solution, the choice presented becomes one of accepting the *status quo* or the alternative generated (or some modification

FIGURE ONE  
THE DECISION AS ICEBERG



of it) rather than one of a choice from among an array of alternatives.<sup>27</sup> In such situations, the processes of problem representation and alternative generation are particularly important to investigate: the search may itself determine the choice.

## TYPES OF PROBLEMS

Having described the problem solving process, it is imperative to recognize that not all problems are created equal. Problem-solving approaches effective for one sort of problem are not likely to work effectively for other kinds. The task is to devise a typology that connects problems with processes. Fortunately, much work has been done on this issue. Weaver (1948) distinguished problems of "organized complexity" from those of "disorganized complexity" and from "simple problems." Each requires a different solution strategy. Minsky (1961) identified ill-defined problems. Reitman (1964) developed that concept further while Simon (1973) differentiated ill structured and well structured problems, and linked problem type to appropriate solution strategy. Variation in problems suggests that, at a minimum, we should expect different problem solving processes to be associated with different types of problems. Understanding the design of any given institution requires that we locate it in terms of problem type and address the processes by which that type of problem may be transformed into another to make it more readily solvable.

Weaver noted that prior to 1900 physics concerned itself principally with "two-variable problems of simplicity." In the period immediately following, some physicists went to the other extreme, and developed powerful techniques of probability theory and of statistical mechanics to deal with problems of "disorganized complexity," which have a very large number of variables, each of them with a behavior which is individually erratic or totally unknown, but in which the system as a whole possesses certain orderly and analyzable average properties. These techniques, however, left untouched an entire body of other problems which display the essential feature of "organized complexity": those comprised of a sizable number of factors "interrelated into an organized whole." These problems did not yield to techniques effective for problems of simplicity or for those of disorganized complexity (Weaver 1948). New analytic tools had to be found.

Simon further described the underlying architecture of organized complexity: roughly, "one made up of a large number of parts that interact in a nonsimple way," so that the whole is greater than the sum of the parts in the "important pragmatic sense that, given the properties of the parts and the laws of their interaction, it is not a trivial matter to infer the properties of the whole" (Simon 1962, 468). This concept, modified to "organized social complexity," applies to social systems, including large scale formal organizations such as administrative agencies (LaPorte 1975).<sup>28</sup>

*Ill Defined Problems.* Many, if not most, political, social, and economic problems, are characterized by organized complexity and are more difficult to fathom than problems of simplicity. As Rittel and Webber (1973) have pointed out, the problems we ask our public agencies to take on have become increasingly difficult, what they refer to as "wicked problems" not susceptible of solution in the same manner as earlier, simpler problems.<sup>29</sup> This suggests that problems may be arrayed on a continuum that reflects the degree of understanding any given actor possesses of those problems -- the difficulty of which is positive correlated with the degree of organized complexity. Minsky provided a conceptual basis for such a continuum, describing problems that were "initially well-defined," meaning that with each such problem we are given some "systematic way to decide when a proposed solution is acceptable." Such problems include, for example, games with precise rules for play and scoring, and theorem proving. He pointed out that ultimately such problems are trivial. If a solution to such a problem exists, it eventually can be found by "any blind exhaustive process which searches through all possibilities." It is not terribly difficult to program such a search" (Minsky 1961, 9).

If there are well-defined problems, by implication other problems are less well-defined or "ill-defined." Problems of organized complexity -- or "wicked problems -- are more likely than simple problems to be ill-defined. Reitman contended that most human energies are devoted to problems that fail to meet Minsky's criterion for well-defined (1964, 282). He sought to comprehend the problem-solving processes appropriate to "ill-defined" problems, where problem solving is understood as the "*transformation or creation* of states, objects, or collections of objects." Key to defining problems are their attributes, which "may be viewed as *constraints on the problem solution* and therefore, indirectly, on the problem-solving process" (Reitman 1964, 291). Ill-defined problems are distinguished by "open" constraints, those whose definition "includes one or more parameters the values of which are left unspecified as the problem is given to the

problem-solving system from outside or transmitted within the system over time." Open constraints are "ubiquitous," although problems may be ill-defined in some places and well-defined in others (Reitman 1964, 292-293).<sup>30</sup>

Problems described by open constraints are not subject to solution by means of an algorithm, because unless "strict isomorphism of relevant corresponding information structures from one individual to another is assumed, it may well turn out that settings of these open constraints acceptable to one individual are not acceptable to the other. Consequently, solutions involving these settings also may not be acceptable." In a stable environment, the development of social conventions concerning "acceptable values and operational definitions of variables" may go some distance toward promoting agreement on problem definition and solutions. Still, ill-defined problems are much less likely to be handled by consensus -- even of experts in the field -- than are well-defined problems.

*Problem Type and the Generation of Alternative Solutions.* This brings us full circle, to connect ill-defined problems to the task of generating alternative solutions. Some problems are identified automatically, largely as the result of prior experience; others require that more information be sought and evaluated before the problem can be defined. The "prior experiences of a decision maker result in learned responses which predispose him to apply previously successful solutions to any future problems he perceives as identical" (Taylor 1975). Problems not previously encountered by a given decision maker or organization, that is, ill-defined problems, are likely to be more difficult to sense, identify, and then to represent than problems which are confronted regularly. Moreover, solutions to such problems are unlikely to be close to hand. Thus,

if we restrict ourselves to ill-defined problems, the proposition that "alternatives are not given but must be sought" is not merely an assertion about the human situation but instead becomes a theorem which may be derived quite directly from the basic definition of an ill-defined problem. For the concept of an ill-defined problem rests on the concept of an open attribute, that is, an attribute "whose definition includes one or more parameters, the values of which are left unspecified as the problem is given to the problem-solving system from outside or transmitted within the system over time" (Reitman 1964, 314).

To solve an ill-defined problem, the problem solver must actively seek out or generate whatever solutions required to solve it.

*Ill Structured Problems, Decomposition, and Sequence.* Simon distinguished "ill structured" from "well structured" problems, equivalent, roughly to ill-defined and well-defined problems. However, Simon's nomenclature was intended to convey the idea that the quality of a problem's structure is a function of the

characteristics of the problem solver, *not* the problem itself. To be classified as well structured a problem must satisfy several requirements:

1. There is a definite criterion for testing any proposed solution, and a mechanizable process for applying the criterion.
2. There is at least one problem space in which can be represented the initial problem state, the goal state, and all other states that may be reached.
3. Attainable state changes (legal moves) can be represented in a problem space, as transitions from given states to the states directly attainable from them. But considerable moves, whether legal or not, can also be represented - that is, all transitions from one considerable state to another.
4. Any knowledge that the problem solver can acquire about the problem can be represented in one or more problem spaces.
5. If the actual problem involves acting upon the external world, then the definition of state changes and of the effects upon the state of applying any operator reflect with complete accuracy in one or more problem spaces the laws (laws of nature) that govern the external world.
6. All of these conditions hold in the strong sense that the basic processes postulated require only practicable amounts of computation, and the information is effectively available to the processes -- i.e., available with the help of only practicable amounts of search (Simon 1973, 183).

Ill structured problems are not susceptible of the same sorts of calculated choice as well structured problems.

It is not that the problem itself is ill structured, it is that the actor's representation of it does not encompass all of the variables and their cause and effect relationships. A problem might be ill structured for one actor and quite well structured for another, or it might be ill structured across all relevant actors. The process of representing a problem is really about assigning to it a cause and effect structure, or *structuring the problem*. To the extent that the representation remains incomplete or inaccurate, the problem is to be considered ill structured. To the extent that the problem representation closely accords with the existential problem, it is become well structured. At the same time, when the problem solving techniques available at any given time and place are more powerful, the more definiteness can be assigned to the structure of any given problem.

Reitman proposed that any "sequence of problem transformations... be thought of as a chain or path through a hypothetical problem space, with an initial problem as origin and the current problem as temporary terminus." Partial solutions at one stage of the transformation of a problem create additional constraints, open or closed, on partial solutions at later stages, because problem solving involves

increasing particularization, with individual subcomponents mutually adapted to one another in more and more detail. Consequently, modification of a component or subcomponent out of context or with suppressed detail and subsequent reintroduction of the subcomponent into the antecedent vector may be expected to result in complications to the extent that the modified subcomponent will possess attributes that differ from those to which the related subcomponents are adapted (Reitman 1964, 307).

This suggests that the sequence of solutions to parts of any problem matters in the determination of the larger outcome. Sequence is not something that can with any confidence be predicted ahead of time and points therefore to the importance of empirical studies of problem solving processes.



The tactic of partial solutions rests on Simon's concept of an "architecture of complexity." Problems of organized complexity share a common underlying general structure that approximates a taxonomic hierarchy: each system is comprised of sub-systems, each of those sub-systems is comprised of sub-systems, and so on, until the most basic component is reached. This facilitates understanding each particular problem, because it can be simplified by breaking it down into its various sub-systems. Variables within each sub-system are more closely related to each other than they are to variables within other sub-systems. This is what defines a sub-system. Thus, the short-term behavior of any given sub-system does not depend on the behavior of other sub-systems, and its long-term behavior depends only in an aggregate way on the behavior of others (Simon 1962). He states this as the "empty world hypothesis": most things are only weakly related to most other things. This fundamental property permits us to decompose problems of organized complexity into their constituent parts, so that we might deal with them more or less independently of one another. Problems of organized complexity are therefore "nearly decomposable." Thus, even though problems of organized complexity are difficult to understand, decomposition makes them more comprehensible, adapting to our limited cognitive abilities.<sup>31</sup>

Given that ill-structured problems tend to be ones of organized complexity, we are likely to attempt to decompose them into sub-problems. In part, this is due to the need to disaggregate complex problems into smaller, digestible pieces, which can be then treated as well structured problems, and solved in serial fashion. However, attempts to solve any given sub-problem may have significant unanticipated effects on other sub-problems, which effects we may or may not be aware of at the time. We may not even be aware that there are other sub-problems to be affected by solutions for the sub-problems of which we are aware, or, if we are, the specific forms they take.

Even though interrelations among the various subproblems are "likely to be neglected or underemphasized," and, over time, "solutions to particular subproblems are apt to be disturbed or undone at a later stage when new aspects are attended to, and the considerations leading to the original solutions forgotten or not noticed," *some disaggregations are likely to be more effective, to do "less violence to those interactions than other ways of dividing the larger problem.* A good procedure will divide the problem "into components that are as nearly 'self-contained' as possible" (Simon 1973, 191).<sup>32</sup> A major challenge in any problem solving process is, therefore, to figure out how effectively to disaggregate the larger problem, making

it "well structured in the small" although it might remain ill structured in the large (Chisholm 1987). The particular method of disaggregation to be used in any given case and its relative effectiveness are, of course, empirical matters.

In similar manner, the sequence in which sub-problems are taken up for solution is very likely to influence the contours of the final product. That is, once a larger problem has been broken down into sub-problems, selection of which sub-problems to begin with, by virtue of posing constraints for those sub-problems to be solved later, alters the character of the larger problem and its solution. Thus, for any disaggregated problem, the final design for its solution may take any one of several forms, depending on the manner in which it was disaggregated and the sequence in which the sub-problems were solved (Simon 1975b). Two organizations facing precisely the same existential problem and holding the same value premises, might, by virtue of differences in their respective decomposition processes and sequences of solution end up with very different overall solutions. There is no reason to suppose that in the matter of institutional design that functionally comparable institutions operating in similar environments must follow the same paths of problem solution in order to persist and maintain their effectiveness. This suggests that workable solutions are neither unique nor are they strictly a function of the problem solver's value premises or representation of the problem (Simon 1975b; Murray, 1923).

Although people vary in the ways in which they experience information and perceive the environment, ill structured problems are more likely than their well structured counterparts to evoke a range of different solutions when faced by different problem solvers. Thus, in

the solving of well-structured problems, which generally have agreed upon solutions, the solution process would be expected to vary only slightly among solvers experienced in the particular problem area, thereby exposing only relatively small differences in the problem-related memory contents of the respective individuals. However, when individuals are solving ill-structured problems, many more differences in the memory structures of respective solvers are likely to become exposed, regardless of level of expertise (Voss and Post 1988, 264-265).

Evidence also exists that "experts and novices begin their problem representations with specifiably different problem categories, and completion of the representations depends on the knowledge associated with the categories. For, the experts initially abstract physics principles to approach and solve a problem representation, whereas novices base their representation and approaches on the problem's literal features" (Chi, Feltovich, and Glaser 1981, 121). Similarly, Lawrence (1988) found that Australian magistrates, when asked to address actual legal cases, were very skillful in defining a problem space, setting limits on what it

contained, and focusing their attention on its features. These skills are especially important in ill-structured problems.

At the same time, the solution of subproblems, through the information generated thereby may provide opportunities for problem solvers to improve their understanding of the problem and to modify their problem representation -- assuming that problem solvers have some mechanism by which that information may be assimilated and integrated. In part, this will be a function of the problem solver's ability to integrate information from long-term memory with information from the external environment. There is no reason to suppose that institutions will have perfect long term memory, perfect information from the environment, or comparable abilities to assimilate that information. It is a question to be addressed empirically.

Over time, as the problem space is reduced or the open constraints closed by the problem solver, an ill structured problem is transformed into a well structured one. This is not to suggest that the problem itself has changed in any way -- although it may have. Rather, it means that the problem solver has reached a better understanding of the problem. Again, problem structure applies not to the problem itself, but to the actor's comprehension of the problem:

*It is important to distinguish between definition as a representation and definition as an attribute of problems. Many theorists follow Reitman (1964) in differentiating between well and ill defined problems. This distinction relates to the nature or characteristics of the problems, and only derivatively to possible representations. Owing to their unclear boundaries and lack of deep structure (Smith 1988), it may be more difficult, if not impossible, to adequately represent ill-defined problems. But such problems are necessarily represented, if only implicitly, and this can be done more or less successfully (Smith 1989, 966).*

Actors who hold the same value premises may possess widely disparate understandings of what all of them construe to be a problem; they structure the problem differently. At the same time, the degree of structure given to a problem is partly a matter of consensus among the actors relevant to that problem.

Simultaneous to moving from ill to well structured problem is the continuing potential for existential circumstances to change quite independently of the actors' ability to control them. Events in the environment may fundamentally alter the problem's contours even as the previous incarnation of the problem is at last comprehended. Problem representations may quickly become obsolete and once-effective solutions rendered may be impotent. It is improbable that such changes will be noticed promptly, and even if noticed unlikely that they will be understood in very short order. Thus, I do not assume that even if institutional memory is preserved, even if progress is made in moving from ill to well structured in the near term, that any sort of long-term linear advance in understanding takes place. That is an empirical question.

## IMPLICATIONS FOR RESEARCH

Aaron Wildavsky once silenced a roomful of candidates for the Nobel Prize for Economics by asking simply, "Where do values come from?" (Rose 1993). Although economics has taken the sources of values as external to its theoretical concerns, focusing instead on how maximize values when confronted with some array of alternatives from which to choose, the origins of those values do matter. In fact, Wildavsky later argued that theories of self-interest and rational choice are only sensible in a social context (1994). In like manner, so too do the origins of alternative solutions to problems matter: *where alternatives come from and the processes of their generation significantly affect problem-solving outcomes*. These also have remained exogenous to economic decision theory, and yet, for comprehending the processes by which institutions are created, they are absolutely essential. The most important premises of any theory that aims to explain the actual phenomena of politics are empirical assumptions about goals and, more importantly, about the ways in which people characterize the choice situations that face them. Goals and characterizations rest not on unchanging principles, but are a matter of time and place that can only be ascertained by empirical inquiry (Simon 1985).

The representation of problems and the generation of alternatives are empirical matters that can only be understood through careful attention to the actual behaviors of decision makers. This is a concept, however, to which many researchers have proven immune. Because a shift in scientific style, from an emphasis on deductive reasoning within a tight system of axioms (substantive rationality) to an emphasis on detailed empirical exploration of complex algorithms of thought (procedural rationality) is required, many scholars have effectively avoided the consideration of these questions (Simon 1976, 147). Making this shift is especially relevant for understanding the means by which decision makers, in addressing the problems of organized complexity that are deemed to require institutional solutions close the open constraints that characterize ill structured problems and the processes which lead to well structured problems. Thus, studies that employ a problem-solving model of decision, grounded in procedural rationality, must of necessity take an empirical bent.

*Contingency, Sequence, and Narrative Structure.* Research on such problems sometimes takes a certain institutional outcome as a given and works backward to uncover the chain of events that led to that

result. This approach implicitly assigns a linear character to historical processes that smacks of teleology. But real-world outcomes are, as Gould (1989) has pointed out, contingent facts of history. Things do not *have* to turn out a particular way, they just happen to do so. To understand the processes that led up to a given outcome whose character we know, it is necessary also to include those courses -- whether problem representations or alternative solutions -- that were considered but not chosen. Decisions made at a unique point in time in response to a particular configuration of problems, with a particular set of value premises as constraints, structure future possibilities for choice in ways that scarcely could have predicted by either the decision makers or researchers investigating them. Sequence and the connection of one component of the problem with another at any given time are assumed to thus important parts in developing problem representations and in the process of generating and selecting alternatives. The sequence in which the open constraints in ill structured problems are closed will, in and of itself, significantly affect both the representation of the problem and the alternative solutions generated and selected. Conversely, without concrete evidence, it is dangerous and misleading to impute to historical actors the same value premises and perspectives brought by contemporary actors to comparable problems today.

The perceived structure of a problem at any given point is therefore consequent upon its previous structure, changes since that time, and previous efforts to solve it. There is no ineluctable process tending by a particular path toward some specifiable end state for any given institution. The idea of "reversibility" is singularly important here, for implicitly it means that there is no inevitable process driving the transformation of institutions. There is no historical imperative which demands that institutions move in only one direction, in some universal manner. Thus, as a systems theorist might say, the process of creating institutions is one of "equifinality." According to this principle, a system can reach the same state from differing initial conditions and by a variety of paths. At the same time, from an initial starting point systems may follow different paths to different points (Katz and Kahn 1966). Moreover, there is no reason to suppose that problem-solving efforts tend toward any sort of equilibrium.

Thus, there is no necessity for any institution to turn out as it did, even assuming rationality on the part of its constructors. Rather, it is largely a matter of happenstance that a particular problem confronted a given set of actors at any one point in time. Following Gould, who observes that because there might be different paths by which life might have evolved, the

consequent differences in outcome do not imply that evolution is senseless, and without meaningful pattern; the divergent route of the replay would be just as interpretable, just as explainable after the fact, as the actual road. But the diversity of possible itineraries does demonstrate that eventual results cannot be predicted at the outset. Each step proceeds for cause, but no finale can be specified at the start, and none would ever occur a second time in the same way, because any pathway proceeds through thousands of improbable stages. After any early event, ever so slight and without apparent importance at the time, and evolution cascades into a radically different channel (1989, 51).

Although the creation of institutions differs from the concerns of evolutionary biology in significant ways -- i.e., a far shorter time period and far fewer permutations -- Gould's point is well taken.

On the other hand, while the problem solving perspective does not endeavor to interpret complex events by "reducing them to simple consequences of natural law," neither does it consider them as willy-nilly random occurrences (Stinchcombe 1978, 13-14). Theoretical structure is given to actors' behavior by means of the problem solving approach, not by positing a theory of any underlying directed process of institutional change -- although the language used here might appear to suggest otherwise. While it is hypothesized that over the course of any institution's design, decision makers will gradually, in fits and starts, move problems from ill structured to well structured, there is no assumption, explicit or implicit, that the design, creation, development, or evolution of an institution can be represented as any type of linear "progress" toward some better, desired end state. The tendencies suggested by theories of bureaucratization, institutionalization, or professionalization offer guidance for empirical focus, but no more than that.

Moreover, existential problems are not assumed to stand still, patiently awaiting accurate structuring by decision makers. Rather it is assumed that their structures do change, even as decision makers struggle to comprehend their earlier forms and attempt to solve that incarnation. In part these changes result from exogenous environmental factors beyond decision makers' control, but they also follow from intermediate solutions to parts of the larger problems. The problem solving approach assumes the decision maker to be afloat in a sea of contingencies: satisfactory, workable solutions to problems are non-unique, perhaps even considerable in number. To understand that development requires close attention to history, to the empirical processes by which that system was created. Thus, attention is focused on the process by which decisions were made. Serial observation sensitizes to the sequential aspects of change. "An observation 'this time' is embedded in a sequence of 'other times.' Much of what is important about time and change can be captured in the study of sequences. Some observed sequences exhibit regularities; they seem to have a causal logic to them. They are the most easily and advantageously studied. But random sequences can be observed and studied, too" (Fenno 1986, 5).

Understanding the problem of institutional development is thus one that requires an extended time perspective. Not only does it take a long time to accomplish, designing institutions involves a protracted series of problem solving efforts -- any one of which may be properly understood only in terms of its placement in the larger sequence of such efforts. Attempted solutions for a problem at one time, irrespective of their effectiveness, become part of the problem to be solved in the next round of efforts. Alternative solutions not selected at one time may be chosen at a later time. Choices at one time may be reversed at later times. Some alternative solutions may never be chosen at all but by virtue of having been considered significantly affected outcomes. This essay therefore considers the roads *not* travelled to be as important as the highways actually taken. Understanding their origins demands attention to the longer sequence of problem-solving efforts. It is also true that there is no necessary retention by organizations of problem structuring or solutions from past efforts, which makes the presence and content of institutional memory an empirical question.

*Verbal Protocols.* How then can we get at the problem representations and the generation of alternative solutions by the relevant actors? The "verbal protocol," developed by Newell, Shaw, and Simon, and others, as a method for studying real human problem solving behavior, provides the basic foundation for the narrative structure suggested here. The verbal protocol consists of the articulation of their thoughts by subjects asked in experimental situations to solve some problem presented to them by the researcher, e.g., the Towers of Hanoi or scheduling errands under time and space constraints (Newell, Simon, and Shaw 1958; Simon, 1978b; Hayes-Roth and Hayes-Roth, 1979). The aim has been to model those thinking processes in such a way that they can effectively be reproduced in computer programs -- cognitive simulation (Simon 1978a). The verbal protocol aims not only to develop workable problem solving programs, but to do so constrained by attention to behavioral processes: matters such as attention allocation, problem representation, search, pattern recognition, and the like. Verbal protocols may be disaggregated into various segments according to the cognitive tasks being performed in each one. No assumption is made, however, that there exists a single, generalized problem-solving process. Rather, even in relatively simple task environments, humans will exhibit diverse problem-solving behaviors. Greater variety is likely to be found in the face of ill structured problems than for problems with fewer open constraints. Several different problem-solving strategies may work with comparable effectiveness for the same problem (Simon 1975a).

The verbal protocol is to be distinguished from retrospective reconstructions by decision-makers of their thoughts and actions, say, in research interviews or memoirs, a technique subject to faulty recollection, distortion, and the occasional dishonesty. The verbal protocol relies on the subjects to order the process of problem solving. This includes false starts, errors, and redirection of attention during the process. Protocol analysis is thus employed as a real-time method. This is especially important for studies that focus on process and are concerned with ideas tried and discarded, alternatives considered and rejected before any formal problem solution is proposed.

Although most thoroughly developed in experimental research into standardized problems, there is precedent for its use and evidence of its usefulness in problems more closely approximating those actually confronted by actors attempting to design institution. Forty years ago, Cyert, Simon, and Trow (1956) studied a decision by a business firm about a complex problem that illustrated the differences between classical theories of decision, which were applicable only to well structured problems, and their revised theory, which accounted for the search procedures and other information processes indicative of decision-making about ill structured problems. They focused on the cognitive processes of the firm's managers as they tried to make sense of the problem they faced (develop problem representations), generate alternative solutions, and choose an alternative that would meet the constraints of several value premises. More recently, Isenberg (1986) used verbal protocols to study the efforts of general managers from U.S. corporations to solve ill structured problems presented to them, while Lawrence (1988) presented active Australian magistrates with file data from actual cases and asked them work through their decisions.<sup>33</sup>

For some institutions, the key events surrounding their development are long past and the relevant actors long deceased. On first reflection, this might suggest that verbal protocol analysis is not a workable method for getting at the processes by which older institutions were established and elaborated. However, memoirs and other forms of recollection can provide starting points, but remain inadequate narratives and are often self-serving fictions. Secondary sources such as newspaper accounts or histories -- even written relatively near the events at issue -- are not much more, and perhaps less, reliable windows into the thinking of the actors than their memoirs. At best, they can suggest where research might begin. However, verbatim transcripts of deliberations by and debates among the relevant actors, in combination with a succession of written reports on and proposed solutions to problems can serve the same purposes as verbal protocols.



They must be sufficiently detailed to allow close examination of differences in thinking among actors at any given point in time, changes in thinking of particular actors over time, and changes in thinking as the actors themselves changed. They must allow the identification of the effects of different problem representations on solutions proposed. Fortunately, such sources are often available in great detail and plentitude. As such, documents can afford a level of detail in the analysis of the problem-solving processes that very closely approaches that furnished by verbal protocols, albeit with an increased probability that the process will be structured by the researcher, rather than by the subjects. This suggests that the narrative structure for any such studies must be built upon the sequencing present in actors' behavior, however, messy or disorganized that might be.

*The Problem of Presentation.* There is also the matter of how problem representations of the relevant actors may be effectively conveyed. It should be a consistent presentation so that problem representations may be compared over time for the same actor and across different actors in order to see what effects they have on both alternative generation and selection. It should be capable of incorporating each actor's principal value *and* factual premises about the structure of the problem. At the same time, the presentation should be clear and accessible to the reader. One approach would be to use a graphic of a causal model *a la* multiple regression analysis. Cognitive mapping -- a method, based in graph theory, of representing an individual's assertions about some limited domain (i.e., a policy problem) -- is another. Scholars of foreign policy making have long utilized methods of cognitive mapping to analyze decision makers' cognitions about the consequences of complex policy alternatives (Axelrod 1976; Goodman 1968). Procedures for coding text into cognitive maps closely resemble those associated with content analysis and coding open-ended question survey responses. The general utility of such a device is clear and documentary coding is sufficiently reliable but its application to problem solving processes for institutions is difficult, given the complexity of those problems, the length of time involved, and the large number of actors typically involved. Using cognitive mapping can, paradoxically, become too burdensome and tend to obscure more than it reveals. In part, this is because existing graphic techniques have an exponential tendency toward a noisome busyness that renders the resulting cognitive maps difficult to penetrate as soon as more than a very few concepts and causal linkages among them are present. Additionally, using cognitive maps, by their very form, can convey a greater precision than the data and analysis warrant. This suggests that the simpler

device of summarizing verbally the actors' representations be employed. This less elaborate approach permits consistent presentation over time and across actors, works well with available data, and is more accessible to the reader.

## CONCLUSION

This essay has addressed the issues of the creation and transformation of institutions, and, in particular, those variants of institution known as large scale formal organizations, such as administrative agencies. It has asserted that institutions matter: different institutional arrangements lead to identifiably different substantive outcomes. It seeks to explain the changes wrought in modern institutions as a process of design, one in which formal structures, rules, and procedures are established and elaborated as responses to problems. Institutional design is to be understood as a process of problem solving comprised of the day-to-day, often myopic, efforts of many individual decision makers to come to terms with and work out the difficulties that stand between them and the completion of their tasks. This approach is more closely related to the institutionalism of the late nineteenth century than to contemporary incarnations of institutionalism. It is founded in the pragmatism of Peirce, James, and Dewey and is informed by developments in cognitive psychology, cognitive science, operations research, and management science. Although this perspective shares, generally, with positive theories of decision the belief that institutions result from the rational pursuit of self-interest, in contrast with the attention of those theories to the calculation of optimal choices from among a given or non-problematic array of alternatives, it focuses on the processes of problem identification, problem representation, and the generation of alternatives as the most powerful explanators of institutional forms. Efforts to understand problems and generate solutions for them more powerfully affect institutional forms than conflicts over value premises.

This approach asserts that decision makers may not understand that they face a problem at all, or that it may take them some time to identify the existence of a problem. Institutional design is treated as a problem of organized complexity, comprised of a great many components which interact in systematic, non-simple ways. The structure of problems -- their components and their interrelationships -- for which formal

institutions are believed to be appropriate solutions, are rarely understood only completely and even then rather inaccurately. They typically remain poorly defined and ill structured. Thus, much of the problem solving effort involves developing more complete and accurate representations of those structures -- moving from an ill structured problem to a well structured problem. This process entails decomposing the larger problem into smaller, more manageable sub-problems, closing open constraints, and balancing competing value premises. Even where value premises are largely in agreement, differing problem representations lead to the generation and selection of different alternative solutions. Similar variation results from the manner in which the problem is decomposed, and the sequence in which solutions for sub-problems are generated and selected.

Creating solutions to institutional problems is a matter of artifice fundamentally no different than the invention of mechanical devices. The presence of alternative institutional forms from which to choose a solution cannot be assumed. Institutional forms must be invented or borrowed from elsewhere. Those available are constrained by historical circumstance and knowledge of them by decision makers of them at any given point in time. The presence of that knowledge is an empirical question. Representation of the problem conditions both the process of generating alternative solutions and selecting them. Search for existing solutions elsewhere or the invention of new ones is asserted to be an expensive, difficult enterprise. It is therefore also assumed that for any given problem at any one time decision makers are unlikely to generate very many alternatives. In fact, when it comes time to choose an alternative solution, it is apt to be a matter of accepting, rejecting, or modifying a single such solution, rather than selecting from among several competing solutions. In any case, the number of alternative solutions generated for any given problem is an empirical question.

Because the exigencies of getting on with business require decisions about solutions before problems have become well structured, errors are frequently made, the constituent sub-problems are often only partially solved at best, the solutions may not solve the problems at all, and almost always carry with them unanticipated consequences, some of which are likely to affect other sub-problems quite negatively. The presence of perfect or near-perfect information about present problems and past efforts to solve them is itself problematic. Because the development of institutions occurs over decades or even centuries, many generations of decision makers will have had their hand at attempting to solve the problems. Institutional

memory and continuity of effort are therefore empirical questions. The matter is further complicated by an uncertain and ever-changing environment. Problem structures are periodically altered in unpredictable and uncontrollable ways even before its earlier structure has been represented, let alone solved.

The problem solving approach to understanding institutional development is more complex than one which assumes that institutions are simple manifestations of the rational pursuit of self-interest by some set of actors. At the same time, it posits no particular direction or speed to institutional development as do theories of institutionalization, bureaucratization, professionalization, or state-building. Consequently, it depends very much for its power and success on careful, sustained empirical research that addresses the actual behaviors of many decision makers over extended periods of time. It is therefore more difficult to execute and less parsimonious than these other approaches, but compensates for those weaknesses by its greater ability to explain important outcomes in real institutions through the analysis of the problem solving processes by which they came to be.

In closing, let me note that I do not think that we have in the social sciences currently anything resembling what might be called a general theory of human political, social, and economic behavior nor does it seem very likely that we will ever have such a one; this, notwithstanding the fond hopes of so many of our colleagues for a "unified field theory" and their fervent belief that such is possible. It seems rather more probable that we will continue a pluralist theoretical tradition, but increasingly one that offers not so much competition among theories for explaining and predicting the same phenomena, but supports a variety of theories for explaining different behaviors or different aspects of any given behavior. From this perspective, one selects from among the theories in one's toolbox on the basis of the problem that one wishes to understand. A theory appropriate and powerful for one problem may prove entirely inappropriate and inadequate for another.<sup>34</sup>

The argument advanced in this essay rests on that foundation. Consequently, I do not propose here that the problem solving approach supplant positive theories of institutions, nor that we cast aside substantive theories of bureaucratization, institutionalization, professionalization, or state-building when we seek to comprehend institutions.<sup>35</sup> If one wishes to understand which alternative institutional form an actor is likely to prefer under norms of rationality, the appropriate strategies for gaining acceptance of that form in the face of different preferences held by other relevant actors, and the probable *substantive outcomes* in the resulting

games, there may be no more powerful tool available than positive theory. If, however, one's great passion fixes instead on understanding the *processes* by which actors come to believe that they confront a situation that requires some sort of institutional response, how they come to comprehend that situation, how they generate alternative institutional forms, and the effects of these processes on choice from among alternatives, then the problem solving approach, with its long tradition in cognitive psychology and wide application in cognitive science, operations research and management, provides a powerful device for making considerable advance in our knowledge. It is moreover, an approach with broad applicability across disparate domains of interest; it can tell us much about the behavioral processes that comprise larger trends such as bureaucratization, institutionalization, professionalization, and state-building. As such, like positive theory, it offers great potential for useful comparisons among seemingly unlike substantive realms and for thereby informing us about basic similarities in behavior in different times and places.

## NOTES

\*. The author wishes to thank Joel Aberbach, Frank Baumgartner, James Desveaux, William Gormley, Martin Landau, and Graham Wilson for their most helpful comments on earlier drafts of this paper.

1. For example, as DiMaggio and Powell have pointed out, political scientists in

the rational-choice/game-theoretic tradition view institutions as temporarily "congealed tastes" (Riker 1980), frameworks "of rules, procedures, and arrangements" (Shepsle 1986), or "prescriptions about which actions are required, prohibited, or permitted" (Ostrom 1986). The new institutional economics, particularly the branch located in economic history, contends that "institutions are regularities in repetitive interactions, ... customs and rules that provide a set of incentives and disincentives for individuals" (North 1986:231). The economics of organization conceives of institutions as governance structures, social arrangements geared to minimize transaction costs (Williamson 1985).

In the international relations literature, regimes are defined as "sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations" (Krasner 1983:2).

(1991, 7-8).

2. This definition of "institution" follows that used by Jepperson (1991, 53-54, 143-145). Jepperson's definitions follow and accord with the analyses of institutions by Parsons (1954), Stinchcombe (1965), March and Olsen (1989), and others in the social sciences.

3. Notwithstanding the hopes of Wilson (1887) and Goodnow (1900) large scale formal organizations such as administrative agencies obviously do participate in the interpretation of the goals assigned to them and in the formation of new goals. However, the rationale for their existence remains their instrumentality for achieving those goals.

4. For a detailed definition of artificial system, see Thompson (1976 15-16). See also Chisholm (1989) for a discussion of the differences between formal and informal organization. The terms equate, roughly, with artificial system and natural system, respectively. This is not to suggest that organizations do not also have consequential "natural" components, or that natural systems do not serve external, instrumental purposes. Clearly, they do. See, for example, Lansing's (1987) analysis of the system of water temples, rice planting calendars, and irrigation canals on the island of Bali. Lansing found that over several centuries a very effective system for managing water and timing the planting of rice crops, embedded in the island's religious institutions, had evolved. Western aid agencies managed to disrupt the delicate balance achieved by this system over hundreds of years, which then had to be reconstructed.

5. Such interest in institutions is a response to the increasing importance of large scale formal organizations in modern social, economic, and political life: our theories and studies tend to focus on problems prevailing at any historical moment. These stimuli produce this effect in combination with perceptions of the inadequacy of theories and research that study individual behavior (both in domestic politics and in international relations) as though it existed quite apart from the context in which it occurs, or if not apart from, to treat institutions "simply as arenas within which... behavior, driven by more fundamental factors, occurs" March and Olson (1984, 734). March and Olsen identify five attributes of the "basic vision that has characterized theories of politics since about 1950":

(a) contextual, inclined to see politics as an integral party of society, less inclined to differentiate the polity from the rest of society; (b) reductionist, inclined to see political phenomena as the aggregate consequences of individual behavior, less inclined to ascribe the outcomes of politics to organizational structures and rules of appropriate behavior; (c) utilitarian, inclined to see action as the product of calculated self-interest, less inclined to see political actors as responding to obligations and duties; (d) functionalist, inclined to see history as an efficient mechanism for reaching uniquely appropriate equilibria, less concerned with the possibilities of maladaptation and non-uniqueness in historical development; and (e) instrumentalist, inclined to define decision making and the allocation of resources as the central concerns of political life, less attentive to the ways in which political life is organized around the development of meaning through symbols, rituals, and ceremonies.

(1984, 735). The new institutionalism responds to the perceived inadequacies of this basic vision. I do not here attempt anything approaching a comprehensive review of the development of the new institutionalism either in political science or in the other social sciences. March and Olsen (1984) and DiMaggio and Powell (1991, 1-40) have accomplished that task. I wish only to show the wide distribution of interest in institutions within political science and elsewhere, and the variety of interesting findings it has led to as well as the important questions it has led researchers to ask. Moreover, as March and Olsen frame the matter: "The new institutionalism is an empirically-based prejudice, an assertion that what we observe in the world is inconsistent with the ways in which contemporary theories ask us to talk." (1984, 747)

#### 6. Skowronek argues that

State building is usually associated with the development of new governmental institutions; that is, individual institutional innovations, in themselves, may be considered evidence of state building. This study presents a slightly different view. It looks at American state building as the systemic transformation of an entire mode of governmental operations that had to be negotiated in the process of establishing new institutions. (1982, 10)

Similarly, Knott and Miller address the "common origins of administrative reform principles as they were manifested in police reform, educational reform, regulatory reform, and elsewhere." They wished to understand why people seemed to choose the same institutional model over and over again. They specifically noted the consistency of their approach with "neo-institutionalism," but rejected the

strict notion of "intellectual determinism." ...we are not arguing that the orthodox ideas about administrative reforms "caused" all administrative reform in the United States. Rather, we argue that the orthodox "rules" about how to organize a bureaucracy constitute a recognizable "institution" and that this "institution" was chosen at various times and places because a decisive coalition of involved individuals could reach agreement on that particular institution (1987, 7).

They believe that the "rules can be said to determine the outcome as much as the individual attitudes." So it was that they examined the "expectations the key political actors had about the effect of those rule changes on the values that were important to them" (1987, 8-9).

#### 7. Scharpf (1977) asked the question, "Does Organization Matter?" Wilson (1989) answered in the affirmative. March and Olsen are also cogent here:

This new institutionalism can be presented and discussed as an epistemological perspective of profound importance to understanding social science, [but] it is more useful to define it in terms of a narrow collection of challenges to contemporary theoretical thinking in political science, a small set of relatively technical ideas of primary interest to professional students of political life. The ideas deemphasize the dependence of the polity on society in favor of an interdependence between relatively autonomous social and political institutions; they deemphasize the simple primacy of micro processes and efficient histories in favor of relatively complex processes and historical inefficiency; they deemphasize metaphors of choice and allocative outcomes in favor of other logics of action and the centrality of meaning and symbolic action. The ideas are not all mutually consistent (1989, 738).

Ironically, the "old" institutionalism was criticized for neglecting the same micro processes that the "new" institutionalism is to supplant, e.g., Wallas was driven to comment that "nearly all students of politics analyse institutions and avoid the analysis of man. The study of human nature by the psychologists, has, it is true, advanced enormously since the discovery of human evolution, but it has advanced without affecting or being affected by the study of politics" (1905, 14).

8. Stinchcombe argues that it is from "more detailed studies of particular historical sequences that evidence comes for deciding among epochal theories. As methods for summarizing the long sweep of history, then, epochal theories have merely literary functions. They are produced for the textbook function of historical writing, that of giving a specious sense that we understand the nature of the society we live in by providing a myth of how it came about -- a myth illustrated with historical events.... But such a narrative structure for the long sweep can provide concepts for more detailed studies." (1978, 10).

9. There is, of course, an extensive research literature in modernization and development. That literature is not summarized here. Landau's approach and set of concerns are discussed as emblematic of a significant portion of that literature and whose features are particularly relevant to the problems raised in this study. See LaPalombara (1963), Apter (1968), or Welch (1967) for additional examples of such approaches to institutions

during the 1960's. See also Esman (1972). For a more extensive summary of the development administration literature, see Weidner (1967). For examples of development administration studies, see Siffin (1966) and Riggs (1966).

10. Contrasting the intermediate organization with the "formal-complex" organization, Landau observed that

- (1) It is by design (intention) nondeterministic in structure.
- (2) It is, therefore, much less differentiated structurally, and its degree of specialization is less pronounced. Assignment to roles is less dependent on merit criteria, and ascription operates with greater force and visibility.
- (3) Its ethos is more reflective of *gemeinschaft* than *gesellschaft*. Primary group involvements are high, and "informal" groupings are not treated as residual.
- (4) To these characteristics, we can also add that intermediates are smaller in size, operate in terms of lesser magnitudes, and permit a larger social space to their members.

...an organization of this sort is much closer to the "probability texture" of the task environment of the undeveloped scene than is the complex formal entity (1971, 413).

11. See also Polsby, Gallaher, and Rundquist (1969).

12. For studies of professionalization as it manifested itself in specific domains, see Fleming (1954), Starr (1982), Furner (1975), Haskell (1977), Janowitz (1960), McKee (1991), and Karsten (1972).

13. As Moe puts the matter:

Political institutions serve two very different purposes. On the one hand, they help mitigate collective-action problems, particularly the commitment and enforcement problems so debilitating to political exchange, and thus allow the various actors to cooperate in the realization of gains from trade. On the other hand, political institutions are also weapons of coercion and redistribution. They are the structural means by which winners pursue their own interest, often at the great expense of political losers (1990, 213).

He goes on to observe that the "core technology" of social choice had encouraged certain lines of inquiry and discouraged others, in particular, disinterest in bureaucracy: "The institutions on which they focus their attention - legislatures -- are bound up with (and bolster) the analytic technology that points so compellingly to the first story [mitigating collective-action problems]" (1990, 214). Moe is right on target as far as he goes, but he neglects that aspect of bureaucratic institutions which provides their reason for existence -- instrumentality in implementing public policies.

14. Although a Newtonian, James Madison may also be reasonably considered as an institutionalist given his strong interest in the consequences for behavior and policy outcomes of different institutional arrangements, as evidenced in his essays in *The Federalist Papers*, especially numbers 10 and 51.

15. Commons defined institution as "collective action in control, liberation, and expansion of individual action" (Harter 1962, 205).

16. Decision makers frequently treat alternatives, once generated, as hypothetical, whose truth value is yet to be established. This conception was first formally stated by Dewey, who proposed that "policies and proposals for social action be treated as working hypotheses, not as programs to be rigidly adhered to and executed. They will be experimental in the sense that they will be entertained subject to constant and well-equipped observation of the consequences they entail when acted upon, and subject to ready and flexible revision in the light of observed consequences" (1927, 202-203).

17. Luckman identified three stages: analysis, synthesis, and evaluation (1967, 345-346). Klein and Weitzenfeld conceptualized problem solving in terms of several steps: recognizing that a problem exists, identifying the problem that exists, reidentifying the problem that exists, searching for a solution, evaluating potential solutions (1978, 38-40). Schwenk and Thomas offered a four-phase framework: gap identification/problem recognition, problem diagnosis/formulation, alternatives generation, and alternatives selection (1983, 242). "D'Zurilla and Goldfried (1971) proposed a model for training in "real-life" problem solving that involves the following five components: (1) problem orientation, (2) problem definition and orientation, (3) generation of alternatives, (4)



decision making, and (5) verification" (D'Zurilla and Nezu 1980, 67). Smith discussed three stages of problem solving: identification, definition, and solution (1990, 627). He observed that the "process by which one becomes aware of a problem is variously termed problem 'finding,' 'sensing,' 'recognition,' and 'identification'" (1992, 30). Or, Smith again: "Problem definition... is equivalent to 'problem setting'... framing and naming... locating the problem" (1989, 965). Smith provides a "reconstruction" of research into problem solving. See especially his discussion of the decomposition of "problem formulation," which he notes is more an "organizing construct than a research target" (Smith, 1989). See also Wagner (1991).

18. Although Dillon (1982) conflated the acts of discovering, formulating, and posing problems as a single act, here they are treated as separate, if interdependent, enterprises.

19. Berry and Seavey understand problem definition as "a deliberate and conscious acknowledgement of an undesirable situation. Undesirable conditions may exist but are not considered to be problems until labelled as such. Perception of a problem qua problem becomes central to problem-solving. In an abstract sense, non-perceived problems -- rather than an incorrect solution to a perceived problem -- may be the major cause of organizational failure" (1984, 59).

20. The political science literature on agenda-setting is largely about how out of the welter of potential issues some subset come to be identified and judged worthy of attention by decision makers, but focuses on the processes through which political support for considering them is mobilized. See Baumgartner and Jones (1993) and Kingdon (1984). This essay focuses on the cognitive components of the problem-solving process.

21. Hayes-Roth and Hayes-Roth use the term "knowledge base" to denote "observations and computations regarding relationships in the world that might bear on the planning process" (1979, 287). Lawrence utilizes the term "frame of reference" to designate how judges "define a problem space, set limits on what it contains, and focus attention on its features. The concept picks up the way shared values and outlooks place certain constructions on reality for professional and cultural groups" (1988, 231). For George, an individual actor's "operational code beliefs are not a fortuitous, unconnected collection of beliefs. Rather, they comprise a 'belief system' in the sense described by Converse (1964): 'a configuration of ideas and attitudes in which the elements are bound together by some form of constraint or functional interdependence.'" He contends that operational codes influence information processing by decision makers (1970, 100). Tversky and Kahneman employ the similar term, "decision frame," in reference to the "decision maker's conception of the acts, outcomes, and contingencies associated with a particular choice. The frame that a decision maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker" (1981, 453-454). They note that decisions may often be framed in more than one way, with significant consequences for choice. Cowan prefers "cognitive framework," defined as "the networks of concepts and ideas that people possess mentally when confronting the world. These mental representations of the world are constructed from past experiences and provide a general basis for perceiving, remembering, inferring, and evaluating" (1986, 766).

22. Graph theory is often used to depict cognitive maps, with concepts represented as points and the causal connections between them represented by arrows. See Axelrod (1976) for a discussion of methods for ascertaining cognitive maps and a series of applications of cognitive mapping techniques to a broad range of decision making domains.

23. Simon notes that a basic component of understanding problems is no more than pattern recognition. Problem solvers search their long-term memories for patterns that resemble the problem they currently confront. Research on chess players indicates that "a body of knowledge stored in long-term memory (LTM) compensates in large measure for the slowness of search. The human expert does not so much *search out* the correct move as *recognize it*" (1978, 503). Chess masters have in their memory tens of thousands of patterns to which they compare the situation on the board at any given time in order to work out a viable series of moves. Such an accumulation of experience permits people to behave in very nearly optimal ways in situations to which their experience is pertinent, but is of small moment when new and unique situations are presented (Simon 1978, 503). Memory has to be constructed, which explains, in part, differences in problem solving successes between experts and novices. See also Simon and Hayes (1976) and Simon (1975).

24. Weick "argues that managerial thinking is situated in action, interwoven with the many interpersonal activities dominating managerial time, rather than the reflective "sit-down" contemplation familiar to academics." (Smith 1989, 967). While Weick may be correct for some organizations, this essay argues that the presence of such reflective problem solving processes is an empirical question and probably occurs more often than Weick suggests.

25. This is not, however, to suggest that any given problem is susceptible of an optimal, that is to say -- unique and maximally efficient -- solution. Quite the opposite is assumed here: for any given problem there are likely to be multiple acceptable solutions with more or less comparable effectiveness for solving the problem.

26. Consider this example of the close relationship between problem representation, alternative generation, and alternative selection in the contemporary setting: In the U.S. Navy are found two groups in opposition over the appropriate design for fighter aircraft. Both sides agree that the goal for these fighters is to shoot down as many enemy aircraft as possible. The "quantity school" believes that "kill rate" is a function (e.g., represents the problem as one) of obtaining the first sighting, outnumbering the enemy in the air, outmaneuvering to gain firing position, and achieving split second kills. Conversely, the "quality school" considers that U.S. aircraft can never outnumber enemy aircraft and enemy aircraft can be shot down by means of "beyond visual range" weapons systems. The "quantity school" therefore advocates large numbers of relatively inexpensive, lightweight, single-purpose "dogfighter" aircraft that have stealth (are difficult to detect), relatively simple avionics, high cockpit visibility, relatively low wing loading, good thrust to weight ratios, moderate radius of action, weapons "optimized for effectiveness within 3,000 feet slant range during rear hemisphere attacks" and that are "low enough in cost to permit much training and high expenditure of rounds," high maintainability, and a crew of one. Conversely, the "quality school" champions fewer, sophisticated, heavier fighters that can "dogfight," provide close air support, deep strike interdiction, and operate in all weather conditions. These aircraft therefore are to have highly sophisticated avionics, long range, high speed, missiles instead of guns, often two-person crews, lower visibility cockpits, greater weight, and larger radar cross sections. The differences in policy preferences between the two groups stem almost exclusively from their opposite cause-effect beliefs about the nature of air combat, the effectiveness and reliability of sophisticated weapons systems, and the capacity of existing and potential enemy aircraft. Their respective problem representations explain the differences in their proposed alternatives and selection than their value premises, which are largely congruent. See Stevenson (1993).

27. The "garbage-can model" of March and his colleagues argues that, at least for organized anarchies such as universities, solutions abound, perhaps in surfeit, and in fact chase problems to which they may be applied (Cohen, March, and Olsen 19 ; March and Olsen 1979). While their assertion on this point may hold true for statistically anomalous large scale formal organizations such as universities and for political systems viewed from a macro perspective, it is this essay's position that in the matter of institutional design, at least, effective alternative solutions are rare and expensive to generate. In any event, it remains an empirical question as to whether alternative solutions are readily to hand for any given problem; their availability cannot be assumed.

28. LaPorte attempted a more formal definition of complexity than Simon. The degree of organized complexity (Q) is a "function of the number of system components ( $C_i$ ), the relative differentiation or variety of these components ( $D_j$ ), and the degree of interdependence among these components ( $I_k$ ). Then by definition, the greater  $C_i$ ,  $D_j$ , and  $I_k$ , the greater the complexity of the organized system (Q)" (1975, 6). He treated the key terms component, differentiation, and interdependence as follows:

A component of an organized social system is defined as a person or group occupying a position within the system and evincing these characteristics: (1) sufficient mutual agreement or consensus about this position so that he or she or it is the object of expectations and actions from other members and (2) recognition on the part of the person or group of the legitimacy of the others' expectations and positive response to those expectations, at least to the degree required for maintaining membership in and avoiding expulsion from the system. pp. 6-7

Differentiation of components is defined as the number of different social roles or positions within the system, based on the degree of mutual exclusiveness of the activities distributed among the roles in an organization. p. 7.

The most difficult element of our definition is the interdependence of components. It is by far the most important and the least developed. Interdependence among persons or groups assumes varying degrees of reciprocal relationships between them. Interdependence means an exchange relationship of at least one resource between at least two persons (1975, 7).

29. Rittel and Webber (1973) observed that once upon a time planners worked on relatively easy "tame" problems that were "definable, understandable, and consensual," -- building and paving roads, designing and building housing, eradicating dread diseases, providing clean water and sanitary sewers, etc., susceptible of solution by fairly simple processes. For "tame" or "benign" problems, the mission is clear and so also do we know when we have solved them. In the contemporary setting, however, we confront "wicked problems," which are never really solved, merely "re-solved -- over and over again." They argued that the characteristics of wicked problems render the idealized planning system, predicated on the "classical paradigm of science and engineering" inappropriate for virtually all planning problems. Their understanding of "wicked" problem is essentially the same as Minsky's conception of "ill defined" problem.

30. Precisely what constitutes an open constraint is, to a great extent, a social artifact. Thus, what emerges is

a concept of a continuum which ranges from well-defined formal problems on the one hand to such ill-defined problems as composing a fugue on the other. This continuum is closely related to the idea of ambiguity as, for example, it appears in discussions of stimulus ambiguity in projective tests. In other words, to the extent that a problem situation evokes a high level of agreement over a specified community of problem solvers regarding the referents of the attributes in which it is given, the operations that are permitted, and the consequences of those operations, it may be termed unambiguous with respect to that community. On the other hand, to the extent that a problem evokes a highly variable set of responses concerning referents of attributes, permissible operations, and their consequences, it may be considered ill defined or ambiguous with respect to that community.... it is the open constraints that are the locus and source of this ambiguity, interindividual variability, and problem ill definedness.

(Reitman 1964, 301).

31. This idea should be familiar to any academic. The fundamental concept of *ceteris paribus* in science relies upon the assumption of decomposability: "While the assumption of complete decomposability (or *ceteris paribus*) is often convenient to make, it is seldom likely to be fully satisfied in practice." For systems that are not completely decomposable, but are still nearly decomposable, "the Simon-Ando Theorem asserts the following: carry out the analysis of the system on the assumption that it really is completely decomposable (i.e., ignore inter-set dependencies altogether). Provided that inter-set dependencies are sufficiently weak relative to intra-set ones, *in the short run* that analysis will remain approximately valid in all respects -- that is, the system will behave almost as if it *were* completely decomposable" (Fisher and Ando 1962, 109).

32. On this point, Berry and Seavey argued that "One definition of the problem is not more correct than the other; however, one definition may be more important than the other for the organization" (1984, 60). However, Ramaprasad and Mitroff attached more dire consequences to error in problem formulation. They argued that "a strategic problem does not have a unique, universal formulation.... formulating a strategic problem in different ways can result in different solutions to the same problem.... an error in formulating a strategic problem can result in solving the wrong problem.... an error in formulating a strategic problem can compound the problem" (1984, 597). I am inclined toward the position that given a particular array of value premises, some problem definitions or representations are going to be more useful in producing effective problem solutions than others.

33. Isenberg was particularly interested in the means by which managers impose meaning on the stimuli they encounter -- what in this study is called problem representation. Lawrence proceeded by asking each magistrate for his

general approach and frames of reference for the particular offense, with clinically probed questions about his view of its seriousness and implications, and his objectives when sentencing offenders. He then worked on the case as he would normally, or in the novice's case as he expected he would, while thinking out loud. Subjects dictated the order for tendering file data. They were asked to explain what they would do with any information they requested that was not on file, and then to work with the information that was available (1988, 235-236).

She analyzed audio tapes of the verbal protocols by propositions in which pieces of data were verbalized, for all information mentioned and all inferences made about a case, and reduced information points and inferences to their basic concepts to permit comparison of the magistrates' handling of each case (1988, 236).

34. In a consideration of roughly the same issue, Stinchcombe asked the question, "Is the Prisoner's Dilemma all of sociology?" He meant, roughly, that there might be some phenomena of sociological interest that were not susceptible of comprehension by a game theoretic approach. Seeking to understand how social structures that

solved prisoner's dilemmas might be created and maintained, he concluded that "Deweyan consciousness, existing only when structural strains or unsolved games create personal problems, is adequate to explain many such functional structures" (1980, 187). See also Scharpf's discussion of "Game Real Actors Cold Play," in which he argues that there are important "modalities of non-market coordination whose application is not constrained by the narrow motivational and cognitive limitations of pure forms of hierarchical and negotiated coordination" (1994, 27).

35. I remain, however less optimistic about the essential compatibility of the two great theoretical traditions of substantive rationality and procedural rationality, which, underlie, respectively, positive theory and problem solving, than Dowding (1994).

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