RATIONAL CHOICE EXPLANATIONS OF SOCIAL FACTS

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On the hypothesis that 'those who can do and those who can't do philosophy of science', we shall not dwell long on esoteric matters in this essay on theories of rational choice. Rather, our mission is pedagogical; so our task is to describe and illustrate rational explanations and to argue their utility. In doing so we shall take care to describe what a scientific commitment to rational choice entails. But we also wish to take a pragmatic line; models of rationality must satisfy scientific criteria, not religious ones!

Rational choice theories, in one form or another, have been around for two hundred years and, under the rubrics of general equilibrium theory in economics and public choice theory in the nonmarket realm, have witnessed major developments in the last two decades.[1] These rubrics, however, camouflage a multitude of sins! There is a good deal of diversity in each of these (overlapping) intellectual camps. Amidst this diversity, nevertheless, there is a core of intellectual commitments, and it is to these that we will pay attention in the early parts of this essay. A discussion of abstract commitments, however, fails to display these theories at work. It also fails to convey the way in which abstract commitments change as new questions arise and anomalies emerge. Thus, in the latter portions of this essay, we provide an historical tour of multidimensional voting models, beginning with Hotelling (1929),

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Downs (1957), and Black (1958), and continuing on through the recent spate of disequilibrium theorems of McKelvey(1976, 1977, 1978, 1979), Schofield (1978), and Cohen (1978). These, in turn, have generated new concerns -- especially concerning the overly atomistic, institution-free form of rational choice models – and have stimulated some new developments.

Finally, in the concluding section of this essay, we focus on a particular subject -- the emergence and stability of social norms. This subject has been examined in a variety of ways (psychological, sociological, rational choice) and therefore may serve as a vehicle with which to compare alternative paradigms. It also allows us to articulate the possibly controversial (but nevertheless pedagogically useful) proposition that paradigms are not necessarily competing, as Kuhn (1962) would have it. Rather than serving as substitutes for one another, they may instead be complements, each capturing related segments of a phenomenon.

I. A Methodological Preface

Open a journal of political science to an empirical study and, with extraordinary frequency, you will find the author preoccupied with "explaining" variance in a statistical relationship. The considered judgment of our profession, it would seem, supports the two-fold view that the scientific study of politics consists of specifying statistical models and that a "good" specification is one that explains a large proportion of the variance in the dependent variable.

This, of course, is a caricature (and a slightly unkind one at that!), but one with a point. To put it boldly, a statistical "explanation" alone is not a scientific explanation. It is, rather, an identification of a regularity – an identification of variables that, for some reason or

another, co-vary. The amount of variance "explained" is a measure of the extent to which those variables co-vary. The intellectual sleight-of hand (for it really is a trick) consists in the claim that variations in the dependent variable have actually been explained. They haven't! And the reason is simple: a scientific explanation, in our view, is an answer to a "why?" question. To discover a consistent and strong statistical relationship among variables -- a regression equation with a large R^2-statistic — is not the same thing as to provide an answer (and there normally are many) to the fundamental interrogative of science. Put differently, in our view the interesting scientific questions are those that ask why observed covariations occur.

And the stuff of science is well-stated by Hanson (1958), who observes that "causes certainly are connected with effects; but that is because our theories connect them, not because the world is held together by cosmic glue." Riker and Ordeshook (1973) subscribe to a similar view:

> ...there is assumed to be some reason for the regularity involved in a classification or a relation. Given an observed regularity, one accepts it as genuine only if there is some feature of motion or action that renders the occurrence of regularity logically necessary and non-accidental. Indeed, theoretical descriptions or explanations amount to an assertion and, hopefully, a demonstration that an observed event cannot logically occur in any other way than the way it actually does occur.

In short, explanations are logically coherent arguments that provide theoretical expectations about phenomena. They tell us why some empirical connection is observed and, perhaps more importantly, they inform us of what else we might expect to observe in the empirical world. Thus, in answering a "why?" question, a theory also is, at the same time, a discovery procedure. Conjoined with the rules of deduction, a theoretical

explanation of an observed regularity tells us how to proceed with discovering what else might be true of the world if our explanation of the regularity in question is correct.

The theories or models (since there appears to be no standard usage of these concepts, we use them interchangeably) with which we shall be concerned in this essay are deductive in form. From a set of premises -- the assumptions of the model – a set of consequences are deduced in accord with the principles of logic. Proofs constitute logical demonstrations that the assumptions do indeed entail the consequences. A theorem or proposition, then, is an assertion that the stated assumptions imply something; a proof is a demonstration that the assertion is valid.

To this point any such assertion is entirely analytic. It becomes a synthetic statement -- a statement about the real world of phenomena -- only after either of two tasks is accomplished:

I. a compelling case is made outlining the empirical domain for which the assumptions are accurate descriptions; or

II. evidence is accumulated in support of the conclusions derived from the assumptions.

Since this step from the analytic to the synthetic is a controversial one, let us briefly elaborate with the Metaphor of the Pocket Watch:

> At some pre-scientific stage, a pocket watch attracts the attention of an observer. Specifically, he observes that whenever he winds the stem the two hands move around the circumference of the face in a very regular fashion.[2] He asks why this regularity is so.

Notice that the "why?" question requires (literally) answering the question, "What makes it tick?" That is, what must be true about the

guts of the watch, the external environment, etc. that causes the regular movement of the hands? What is the mechanism that converts or transforms stem winding into hand moving?[2a]

Suppose, now, that our observer "models" the situation by describing a conceivable set of mechanical components which comprise the "guts" of the watch, by postulating the manner in which they interrelate, and by assuming certain physical laws concerning the conservation of energy and the transformation of potential energy into kinetic energy. He then derives some properties of a system characterized by these descriptions, postulates, and assumptions. If he is clever, he might even devise some experiments, observations, or statistical formulations which allow inferences to be drawn about the empirical quality of the derivations from the model. On the other hand (no pun intended!), he might be satisfied by convincing himself of the logical correctness of his derivation from premises to properties, and then open up the back of the watch to see if its insides were as he had guessed!.

Opening up the watch is somewhat akin to task I above, while testing model consequences is what is proposed in task II. Either operation allows one to make a synthetic claim about phenomena. More accurately, it permits us to reject or to fail to reject such claims. But one or both tasks may be infeasible. If the watch were a metaphor for "the humand mind" or "the cosmos," then much of science must proceed indirectly – the task II methodology – since "opening up the back of the watch" is nearly identical to the original question posed -- "what makes it tick?" -- and, for all intents and purposes, is

infeasible. It is, of course, conceivable that task II is infeasible since the evidence sought may exceed our technological capabilities. Rarely, we would conjecture, is task I feasible and task II not; so much of science proceeds along the task II trajectory, though on occasion task I will be feasible as well. Not too infrequently, neither task can be accomplished, in which event we must be satisfied in making only analytic statement and in hoping for methodological breakthroughs that permit appropriate empirical studies in the future.

A final observation: science is economical, not only in the sense of incorporating a preference for parsimony in explanation but in two other, deeper senses. First, opportunity costs serve as a central barometer of progress. This is to say that a model is not rejected but rather is replaced with a superior alternative. A model is 'rejected' only if the opportunity cost of maintaining it exceeds that of replacing it with an alternative. One should be prepared, especially in the social sciences, to live with (and learn from) severely flawed models, since superior alternatives *are* often unavailable at this time. The flaws of models currently available, however, represent obvious points of departure for generalization or reformulation. This suggests a second economic force at work in the doing of science. In order to replace one model with another – to declare one superior to another – one must be able to order models on some scale and determine that one stands higher than the others. Statistically, this may occasionally be done by nesting models.[3] In general, however, we must tolerate partial orderings, a circumstance in which some models may be declared inferior to others, but those that remain cannot be ordered further.

Thus any collection of facts is normally compatible with many different models (indeed, any finite set of facts is compatible with an infinity of models) and there is no natural device by which to rank order these surviving contenders further.

This last observation is correct, however, only if the scientific enterprise is viewed statically. If, for instance, several theories are all compatible with (i.e., predict, imply) regularity x, then we cannot further discriminate among them. However, if an additional regularity, y, is adduced, with which some subset of those theories is compatible but with which the remaining theories *are* not, then the former subset is superior to the latter on the grounds that theories in it are compatible with both x and y. The normal circumstance, then, has many theories compatible with certain facts and great interest in uncovering new regularities with which to pare the list of survivors. In this manner, "purely descriptive" research aids the model-building enterprise by providing additional bases for discrimination. It should be emphasized that "paring the list of survivors" and deriving predictions to serve as "additional bases of discrimination" are fundamental features of the scientific enterprise.

This methodological preface provides some background for a discussion of the most ambitious and the most successful (to date) family of scientific models of politics, varyingly called public choice, rational or positive theory.

2. Rational Choice Models: Some Criticisms

Several years ago, one of us offered the following general characterization of rational choice models:

> Theories of [rational] choice ... concern the implementation and conduct of decision-making processes by and/or for collections of individuals, and the enforcement and administration of the decisions that emerge from these processes. While various theories may alternately emphasize implementation (a theory of constitutions), conduct (a theory of institutions), or enforcement and administration (a theory of social control), most share the properties [to be examined below], namely, a tendency to be general theories of collectivities; reliance on the individualistic perspective and the assumption of purposeful behavior; and employment of some form of the choice paradigm to link purpose with behavior. (Shepsle, 1974, p.3).

We defer a detailed description of the choice paradigm and a definition of rationality to the next section, concentrating here on the domain of rational choice models -- what kinds of things are they devised to explain? -- and some common misconceptions about the rational choice approach to social phenomena. The best way to begin is to look at some criticisms of rationality, criticisms that are wide of the mark.

Rational choice modelers have probably given themselves a bad press by appearing to be preoccupied with individual behavior. Their models are "individualistic," after all, and the formalisms they employ have, at their core, a commitment to individual purposeful behavior (described in the next section). But, unlike social psychologists, students of political socialization and public opinion or, in the main, employees of the Institute for Social Research at the University of Michigan, rational choice modelers are only peripherally interested in individual behavior. Hence, their models contain extremely uncomplicated people – people with pretty clear goals or objectives, people unburdened by emotional hangups, cross-pressure or cognitive dissonance, people capable of connecting means with ends in a commonsensical fashion -- in short, mere shadows or abstractions of "real" people.

We would argue, however, that criticisms of these models on the grounds that they purport to describe real individual choice, but do so rather badly (or unrichly, at any rate), are "intellectual mudpuddles," clouding more important scientific issues. The reason such criticisms are misplaced is that the concern of most rational choice models is with the explanation of social facts -- constitutions, institutions, social control, as noted above – not individual behavior. Models of individual behavior are employed, instrumentally, in order to see whether, in specified contexts or under stated institutional conditions, their equilibria are consistent with those social facts. Thus, characterizations of individuals found in rational choice models are not to be taken literally (they are not behavioral models), but rather as vehicles by which to derive implications at more aggregated levels. They permit deductions of the following sort: "If individual behavior is characterized as purposeful and rational, then majority rule elections (or proportional representation or plurality systems, etc.) have property thus-and-so." The first point we wish to emphasize, then, is that rational choice models are individualistic in scientifically instrumental ways. What can be deduced from this instrumentality, and the commensurability of such deductions with observed social facts, are the criteria by which they should be judged.

A second problem mistakenly associated with rational choice models involves inheritability, which deals with the notion that a system or collectivity inherits characteristics of its component individuals. While this is more a nineteenth century than a contemporary problem, it nevertheless leads to some current confusion. To be specific, individual

properties -- rationality, purposive behavior, preference -- are not, except by linguistic convention, inherited by the group or collectivity of which they are a part. To read substance into any such linguistic convention is to commit the fallacy of anthropomorphism. Individuals are endowed with preferences; groups are not. Legislators make choices; legislatures do not. Lawyers, criminals, judges, and law enforcement bureaucrats are purposive in their behavior; the criminal justice system is not. Voters are rational; the electorate is not. In short, distinctions need to be made between individuals and collectivities, even when we slip into conventional linguistic usages, e.g., "the Congress decided," "the electorate chose," "the committee reported." Put differently, in positive discourse the inheritability question is just that -- a scientific question. To make it a premise is to commit the anthropomorphic fallacy.

A third problem is that of incorrectly attributing to rational choice models the principle of intentionality (though occasional extremists from the Chicago School of economics may be accused of contributory negligence). This principle states that whatever happens in some social setting is intended by some decisive individual or coalition. Yet we know, and shall discuss in some detail in a later section, that outcomes and intentions often diverge and that this divergence, moreover, is often inherent in the structure of the situation being studied. Consider these wonderfully perverse examples given by Fishburn (1974, pp. 538-540):

Example 1. The Dominated-Winner Paradox:

Consider a sequential elimination procedure by majority vote in which an ordered set of alternatives is given. A vote is taken between the first two alternatives. The majority loser is eliminated and the majority winner is paired against the next alternative in the ordering. The process is continued until the last alternative enters the voting. The survivor is declared the winner. Let the order of alternatives be

L = x a b y

and consider three voters with the following preferences

1: x y b a ("x is preferred to y which is preferred to b which is preferred to a.").

2: a x y b

3: b a x y

Each voter is assumed to vote sincerely, i.e., directly in accord with his preferences. In the first vote, according to L, a beats x (since 2 and 3 prefer a to x). a then loses to b, and b loses to y. Thus, y is declared the winner. But y has the following perverse property: every voter prefers x to y.

Example 2. The Inverted-Order Paradox:

Let Andrews, Baker, Carter, and Davis be nominees for chairperson of a committee consisting of seven members. These members rank-order the candidates as follows:

1: D C B A
2: A D C B
3: B A D C
4: D C B A
5: A D C B
6: B A D C
7: D C B A

The voting system used is Borda point voting in which each voter awards three points to his first preference, two to his second, one to his third, and none to his last. Accordingly, the point totals for each candidate are:

Andrews: 0 + 3 + 2 + 0 + 3 + 2 + 0 = 10
Baker: 1 + 0 + 3 + 1 + 0 + 3 + 1 = 9
Carter: 2 + 1 + 0 + 2 + 1 + 0 + 2 = 8
Davis: 3 + 2 + 1 + 3 + 2 + 1 + 3 = 15

The collective ordering, then, is DABC. Suppose now that Davis, for some reason, is declared ineligible so that the election has to be re-run with D deleted from each committee person's preference-ordering:

1: CBA
2: ACB
3: BAC
4: CBA
5: ACB
6: BAC
7: CBA

Now each voter assigns two points to his first preference, one to his second, and none to his third, with the following results:

Andrews: 6
Baker: 7
Carter: 8

The collective ordering is CBA – precisely the reverse of the ordering of these three candidates when Davis's candidacy was allowed

As these two examples show, methods of preference aggregation often have peculiar properties. Surely, as in example 1, one would not want to claim that someone intended for y to win (in light of the fact that everyone preferred x to y). Again, surely one would hardly maintain that someone intended for the three candidates in example 2 to be ordered ABC in the presence of D and CBA in his absence. The more general point, one we shall develop more fully below, is that social facts and regularities are the product of individual intentions and institutional ways of doing things.

We have dwelled mainly in this section on what rational choice models are not, although we did offer a brief definition at the outset. They are individualistic without being behavioral; they do not require inheritability; and they do not entail intentionality. The three criticisms reviewed above construe rational choice theories in the narrowest

of terms, as theories of individual behavior, when in fact they are theories of social systems. To explicate this further, we now turn to a more detailed description of rationality.

3. Rationality and the Choice Paradigm

Definitions and definitional discussions are sterile and boring, so we shall dwell on such matters here only to establish the terms of debate on the utility of rational models. The utility of models or approaches . – rational choice *or* any other kind -- rests on their persuasiveness and success in application so, in the concluding two sections of this essay, we present some applications; but first the terms of discourse.

The hypothesis of individual rationality or rational choice is articulated at several different theoretical levels. At its simplest and most general, rationality only requires consistency in the following sense: if A = {x,y,z,...} is a collection of alternatives from which a choice is taken and, say, x is in fact chosen, then the chooser is consistent-rational (CR) if he prefers x to each of the remaining available alternatives, i.e., xRy for *every* yeA, where R is the chooser's preference relation.[4] As Sen (1970) establishes, this amounts to requiring the existence of a maximal element (an R-best element) and, if consistency is required in every choice environment (from *every* subset of A), then the preference relation must be acyclic, i.e,, "xPy" and "yPz" implies "not zPx." In most choice environments, then, rationality entails picking R-maximal elements from sets -- a not *very* demanding task -- and this will always be possible whenever the chooser's underlying preferences are acyclic. That is, a chooser is CR whenever his preferences do not cycle.

A slightly stronger version of rationality requires the strict preference relation, P, to be transitive. Specifically, a chooser is quasi-transitive rational (QTR), if, whenever "xPy" and "yPz," then "xPz." This definition still requires consistency (QTR implies CR) but since it is quite possible for a relation to be acyclic and not quasi-transitive, the latter requires more. The principal difference is that acyclicity permits a chooser to prefer x to y and y to z but be indifferent between x and z. Quasi-transitivity requires x to be strictly preferred to z in this case.

Stronger still is the notion of transitive rationality (TR): a chooser is TR if xRy and yRz imply xRz. Whereas QTR requires the strict preference relation, P, to be transitive, TR requires the "at least as good as" or "weak preference" relation, R, to be transitive. The difference, then, resides in the TR requirement that indifference be transitive; QTR does not require this.

There are several lessons to be learned from these fine distinctions. First, and most apparent, "rationality" has many gradations: TR implies QTR and QTR implies CR. Full rationality (TR) is, therefore, a stronger requirement than either QTR or CR and, in some empirical situations, may be unrealistically strong. But this is a synthetic statement, isn't it? So, second, as in the case of our metaphorical pocket watch, the form of rationality required or deemed appropriate will depend upon the empirical quality of deductions flowing from some model in which rationality is embedded. While we can occasionally conduct experiments on rationality directly -- open up the back of the pocket watch -- the typical empirical circumstance does not permit this. Candidates for office, legislators,

revolutionaries, political entrepreneurs, bureaucrats, or whoever is the object of our enquiry will not normally sit still for experiments.[5] Third, and related, the form of rationality assumed in a given application should be regarded as a conditional commitment. The appropriate test of this commitment is an empirical one. Finally, rationality, of whichever form, is a technical property of choosers; it is a procedural characteristic of choice based on subjective valuation (preference), not a normative ideal. In this sense, contemporary social choice theory (Sen, 1970; Pattanaik, 1971; Fishburn, 1973; Kelly, 1978; Schofield, forthcoming) differs dramatically from its more normative 19th century counterpart.

Let us take the definition of rationality one additional step by characterizing a more "quantitative" sense often given to rational choice. It is this last sense that we shall use in the applications to follow on multidimensional voting models and social norms. We shall say that preferences are <u>representable</u> if there exists a numerical function (called a <u>utility function</u>), u, that associates a real number with each $x \in A$ such that

(i) xPy if and only if $u(x) > u(y)$,

(ii) xRy if and only if $u(x) \geq u(y)$, and

(iii) xIy if and only if $u(x) = u(y)$.

"Quantitative" is in quotation marks to underscore that we do <u>not</u> employ all of the characteristics of real numbers, but rather only their ordinal properties. Thus, the function u is not unique; any monotone transformation ϕ of u, i.e., $v = \phi(u)$, where ϕ is an increasing function of u, will do.

4. Rational and Stable Social Choice

Rationality, as we have noted, is a property of individuals but, except in some exceptional circumstances, the sense it makes about individual behavior depends intimately upon the context in which that behavior takes place. In some contexts, for example, it makes sense for a chooser to consult his preferences and to choose sincerely, i.e., to choose x over y if x stands higher in his preferences than y. This would surely be the case in the final vote on a pair of alternatives, for example.

On other occasions, strategic or sophisticated behavior is rational, a circumstance in which an individual rationally misrepresents his preferences. The classic instance of this occurs in the provision of a public good in which individual payment is tied to individual demand for the public good. In this case, it often pays for an individual to understate his demand, thereby reducing his payment and free- or cheap-riding on the payments of others (Olson, 1965; Laver, 1981). In the legislative voting context, to take another example, suppose a legislator prefers an amended version of a bill (x") to *an* unamended bill (x^1) and the latter to the status quo (x°). According to normal legislative practice x^1 is paired against x^1 and the winner is paired against x° in a second vote. Suppose, however, that on the second vote it was evident that x^1 could defeat x° but x" could not. A strategic response to this circumstance would have the legislator voting against x" at the first vote, even though he preferred it to x^1, so as to insure that something preferred to x° ultimately prevails (Farquharson, 1969).[6]

The point we wish to emphasize here is that preferences are not self-enacting. Individuals, at a minimum, pursue their goals in a social context -- a market, a committee, an election, a negotiating session – reveal (or misreveal) their preferences at various stages of the structured process governing that context, and observe the outcome that is produced. We say "at a minimum" because, even though we endow individuals with a capacity to behave strategically, this caricature still has them rather passively (though cleverly) responding to the social choice process governing the context. In a more active mode, individuals may be endowed with a capacity not only to misrepresent their own preferences but also to manipulate the social choice process, itself (Gibbard, 1973). Consequently, while the preferences $\{R_1, R_2, \ldots, R_n\}$ of each member of a collectivity $\{1,2,\ldots,n\}$ underlie social choices, it is the strategies $\{s1.s2,\ldots,s_n>$ that each individual employs, and the mechanism that transforms these strategies into outcomes -- the so-called "rules of the game" – that constitute the social choice system studied by rational choice theorists.

Given this setting, we may now state the principal finding of rational choice theorists in the last few decades. Indeed, it is a finding that has been discovered and rediscovered in so many contexts and formulations as to convince many of its genericity. Almost never (and this can be made very precise) can rational social choices be guaranteed. The maximizing behavior which is attributed to rational individual behavior rarely characterizes social behavior. The classical statement of this central fact is Arrow's famous Possibility Theorem (Arrow, 1963), though its manifestations had been noted as far back as the 18th century by

Condorcet. The standard illustration is the following three-person, three alternative voting circumstance, but it must be underscored that the problem is not limited to small examples, to majority rule, or even to voting:

> Let Mssrs. I, II, and III choose, by majority rule, among alternatives x, y, and z. Their preferences are:
>
> I: x y z
> II: y z x
> III: 2 x y
>
> The social preference relation, P_s, is (according to majority rule voting):
>
> x P_s y
> y P_s z
> z P_s x
>
> That is, the social preference violates acyclicity, noted earlier to be among the weakest of rationality characteristics.[7]

Problems involving strategic behavior, misrepresentation of individual preferences, and manipulation of collective choice processes compound and reinforce this central fact of social life.

From this central fact has flowed a rich and voluminous literature (recently summarized in Sen, 1977, and Riker, 1981) emphasizing its normative content and consequences. Riker, for example, draws out its consequences for the long-standing philosophical controversy pitting the populism of Rousseau against the liberalism of Madison. There is, in addition, a complementary literature of a more positivist bent that takes the cyclicity of social preferences as a condition of social life and seeks to determine the effects of this condition on individual maximizing behavior and on social outcomes. It is this more positivist literature that we survey next.

In this context, attention shifts from the artifice of social preference and its attendant cyclicity to the notion of equilibrium. The notion of equilibrium is of scientific interest because a behavioral system possessing it should also possess regularities and therefore is amenable to empirical analysis testing theoretical predictions. A social outcome is said to be an equilibrium if no individual or group of individuals (coalition) can unilaterally alter their behavior so as to produce a different, more preferred outcome. If we restrict our attention to individuals only, then we are in the noncooperative realm and speak of Nash Equilibrium (Nash, 1950, 1951). A Nash equilibrium is an outcome along with a supporting set of behaviors in which no individual, acting alone, has any incentive to alter his behavior, either because such a switch would not change the social outcome or because if it did the new outcome would be inferior to the old one according to Mr. i's preferences.[8] In the cooperative realm we may speak of a strong equilibrium. An outcome is a strong equilibrium if no coalition with the power to effect a change in the social outcome (by virtue of its size, institutional position, resources, or whatever) can agree among its members that the change is desirable. We shall say that such an outcome is stable.[9] A strong equilibrium is seen to be a natural cooperative generalization of a Nash equilibrium, and contains it as a special case (let K be a single individual).

We may now give, in the context of majority rule, the positivist version of the "central social fact" given above: Almost never are social choices stable. Put differently, any social choice is vulnerable to individual or coalitional strategic maneuvering. This is the fact

demonstrated in a series of "Chaos Theorems" established by McKelvey (1976, 1979), Schofield (1978), and Cohen (1978); its implications have recently been traced in an American Political Science Review symposium (Riker, 1980; Ordeshook, 1980; Rae, 1980) which has been reprinted, along with other discussions, in Ordeshook and Shepsle (forthcoming). These results, which we examine and critique in the next section, may be generally characterized as follows: for any outcome $x \in A$, let $W(x)$ -- the win set -- be the set of outcomes to which it is vulnerable. That is, if $y \in W(x)$, then there exists a coalition and set of strategies according to which y prevails over x whenever the two are compared. Outcome y may be said to dominate x. The "Chaos Theorems" assert:

Almost always, for any $x \in A$, $W(x) \neq \phi$ (where ϕ is the empty set).

The cyclicity of social preferences, with which we began this discussion, is replete with normative and anthropomorphic overtones. The relevance of the positivistic note on which we have concluded resides in the inference that instances of social choice are opportunities, opportunities that may be exploited politically. Unless social values are extremely homogeneous (Kramer, 1973) or political power extremely concentrated (Brown, 1975), any status quo ante $x \in A$ is vulnerable to some $y \in W(x) \neq \phi$. The intellectual history of this provocative conclusion is our next order of business.

5. Equilibrium and Disequilibrium in Multidimensional Voting Models

It is now nearly twenty-five years since Anthony Downs's An Economic Theory of Democracy appeared and, though Downs traces intellectual obligations back to the first edition of Arrow (1951), Bowen (1943),

Hotelling (1929), and Smithies (1941) (and should have alluded to the early work of Black (1948a, b) and Black and Newing (1951)), it is with his work that we shall begin. Downs observed, in the context of a model of two-party competition, that, when individual preferences satisfied a certain property, the method of majority rule (which would otherwise be vulnerable to the cyclicity conclusion of Arrow's Possibility Theorem) possessed an equilibrium. Moreover, he determined that the lust of politicians for votes, election, and reelection comprised an incentive system that caused candidates for political office to converge toward that equilibrium (and each other). Thus, in what came to be known as the Median Voter Theorem, Downs (and Black, 1958) had a theory of party competition and majority rule equilibrium, as well as the initial ingredients for a theory of public policy formation.

The crucial condition on individual preferences goes by the name of single-peakedness. A very technical and precise definition could be provided (see Sen, 1966; McKelvey and Wendell, 1976; Shepsle, 1979), but a more casual one will suffice here. Associate with each individual i in the set of voters (legislators, committee members, etc.), $N = \{1,2,\ldots,i,\ldots,n\}$, a distinguished point, x_i^*, in the set A of alternatives. The point x_i^* is i's ideal point (bliss point, most-preferred point) and has the property that $u_i(x_i^*) > u_i(y)$ for any $y \in A$, where u_i is i's utility representation. A collection of preferences is said to be single-peaked if there exists an ordering of the alternatives in A so that, when each u_i is graphed against this ordering, the shape of each graph is unimodal with its maximum lying above x_i^*. This is depicted in Figure 1.

The Median Voter Theorem asserts that the single-peakedness condition implies a majority rule equilibrium:

> If utility representations $\{u_1,\ldots,u_n\}$ are single-peaked, then there is a distinguished point
> $x = \text{median}_{i\in N} \{x_1^*,\ldots,x_n^*\}$
> with the stability property that $W(x) = \phi$.

That is, with single-peakedness the set of points preferred by any majority to the median of the voter ideal points is empty: x is stable.

As a theory of party competition, Downs's work is not without its critics (for example, Barry, 1970). At any rate it generated a very active decade of research during the 1960s under the rubric of spatial models of party competition. The analytic tradition spawned by Downs began in earnest with the early papers of Davis and Hinich (1966, 1967) and is summarized in great detail in Davis, Hinich and Ordeshook (1970) and Riker and Ordeshook (1973). A comprehensive theoretical critique, synthesis, and application to the voting data of ten democracies is provided by Budge and Farlie (1977).

But it is important to distinguish between two interpretations of Downs's theory. As a theory of party competition in a democracy, Downs presented a synthetic statement about real phenomena, specifically about the forces operating on parties, candidates, and voters in an election. Here, it stimulated both analytical and empirical improvements. In the analytical domain, the Downsian framework was generalized to incorporate, for example, multidimensionality (Davis, Hinich, Ordeshook, 1970), uncertainty and ambiguity (Shepsle, 1972a, b; Page, 1976), electoral dynamics (Kramer, 1977, 1978), party activists (Coleman, 1972; Aranson and Ordeshook, 1972; Aldrich, 1981), primaries (Aldrich, 1980), campaign

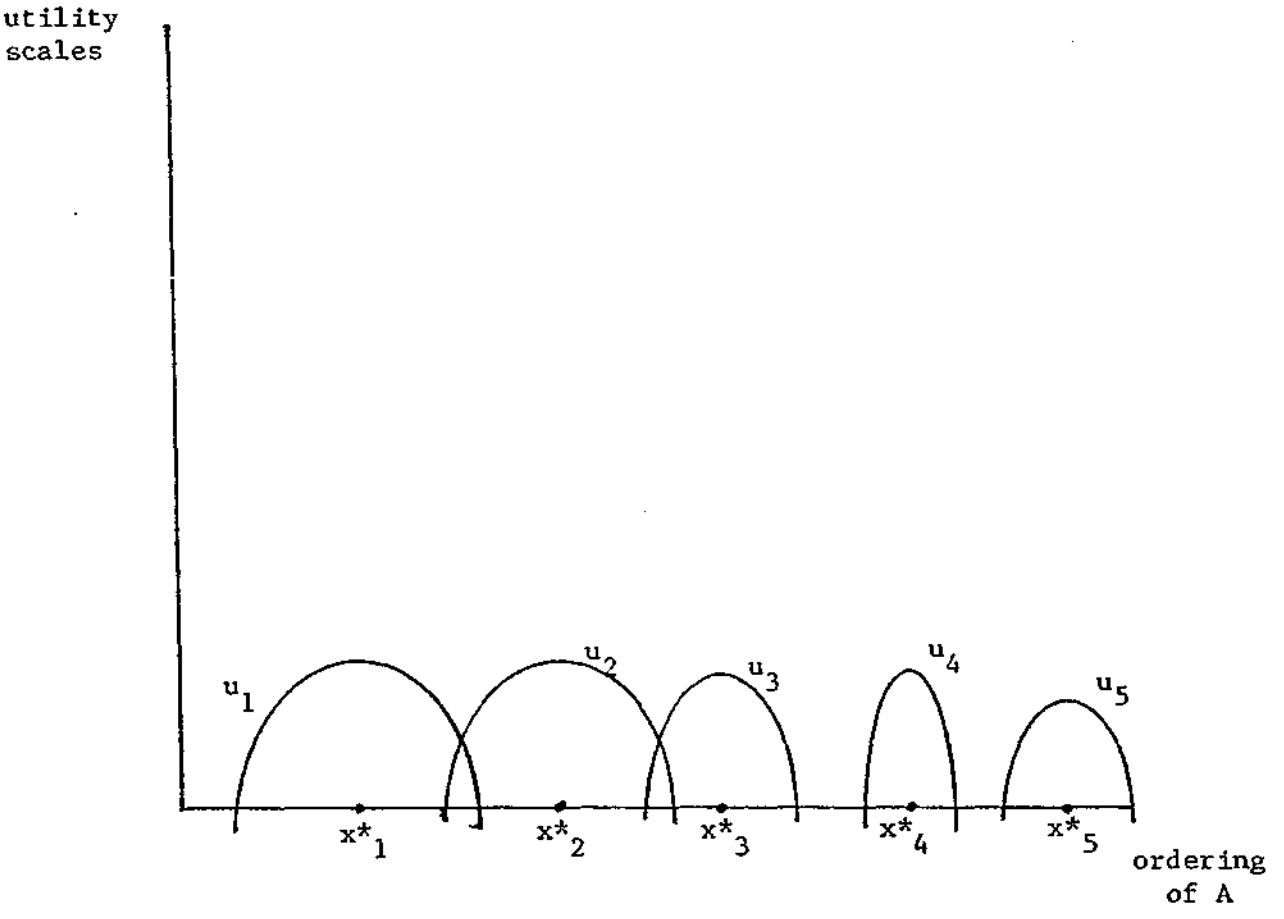

FIGURE 1

finance (Hinich, 1977), and polling and information search (Ferejohn and Noll, 1978). In the empirical realm, the Downs model may be credited with stimulating the debate that raged among voting scholars on issue voting and with providing an intellectual foundation which encouraged at least one major academic survey organization (the SRC at the University of Michigan) to begin routinely ascertaining individual-level data ("feeling thermometer" scores) with which the theory might be tested systematically.

Downs's theory, however, is not only a theory of party competition. A second interpretation would characterize it (together with Black, 1958) as a theory of majority rule, that is, as a theory of the majority rule mechanism and its equilibrium states. Under this interpretation, it is applicable to any decision making system that incorporates majority rule, and is not restricted to electoral competition. In this context it falls in the domain of social choice theory and stands as something of a challenge to the "pessimistic" Arrowian view that social choice systems generally are badly behaved. The challenge took the form of seeking how far the Median Voter Theorem could be pushed before its equilibrium property disappeared. The answer, provided by Plott (1967), is, "Not very far!"[10]

Plott sought to generalize the notion of majority rule equilibrium to the multidimensional setting. Let R^n be an n-dimensional space each dimension of which is a characteristic of an outcome. For example, in an abstract sense, we could let R^2 be the space the first dimension of which is "amount of budget devoted to 'guns'" and the second "amount of budget devoted to 'butter'." In a more specific setting, we might be interested in the decision setting represented by R^{435}, where the jth dimension is "Model Cities' monies to be spent in the jth congressional district."

Preferences are defined over points in the geometric space in analogous fashion to single-peaked preferences in the Downsian one-dimensional space. Now, however, the notion of single-peakedness is ambiguous. A natural extension of single-peakedness to multidimensional settings in the property called convexity: if x and y are two points in R^n and i (weakly) prefers one to the other (say, $x\ R_i\ y$), then he prefers any point on the line connecting x and y to y. Together with the existence of a distinguished point, x_i^* (i's ideal point), we can represent preferences in terms of indifference contours like those given in Figure 2. In this figure x_i^* is i's most preferred point. Each ellipse represents the set of points among which i is indifferent, and the points on "smaller" ellipses -- those nested closer to x_i^* -- are more preferred by i than the points on "larger" ellipses. If preference is monotonic in Euclidean distance from x_i^*, then the indifference contours are circles rather than ellipses. In either case convexity is satisfied, and it generalizes single-peakedness in the following sense: if i has convex preferences defined on R^n, then along any line (that is, in any unidimensional space) his preferences are single-peaked.

Voila! With convex preferences we have the multidimensional generalization of Downs's setting. Before turning to Plott's theorem, we present a now-standard three-person illustration to see some of the new complexities. In Figure 3 we have located Mssrs. 1, 2, and 3 by their respective ideal points, x_1^*, x_2^*, and x_3^*. We depict a two-dimensional issue space and draw indifference contours as circles (rather than ellipses), though neither of these features mitigates the generality of the story we are about to tell. We pick an arbitrary point z and pass an

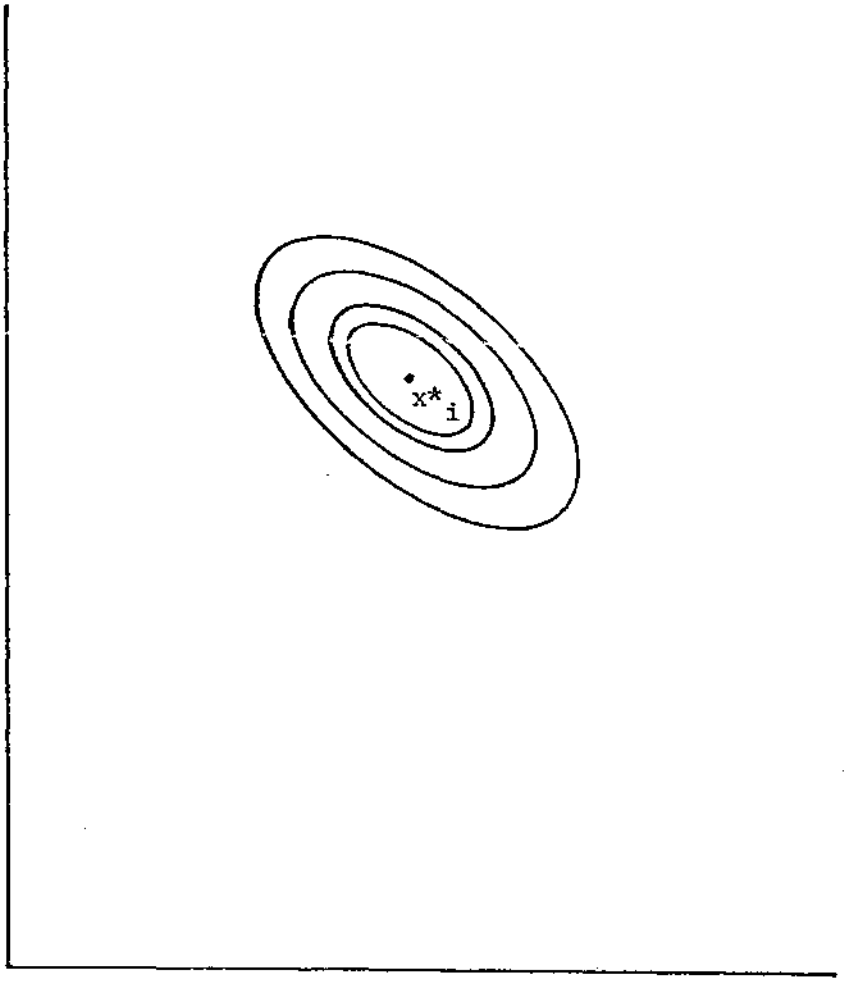

FIGURE 2

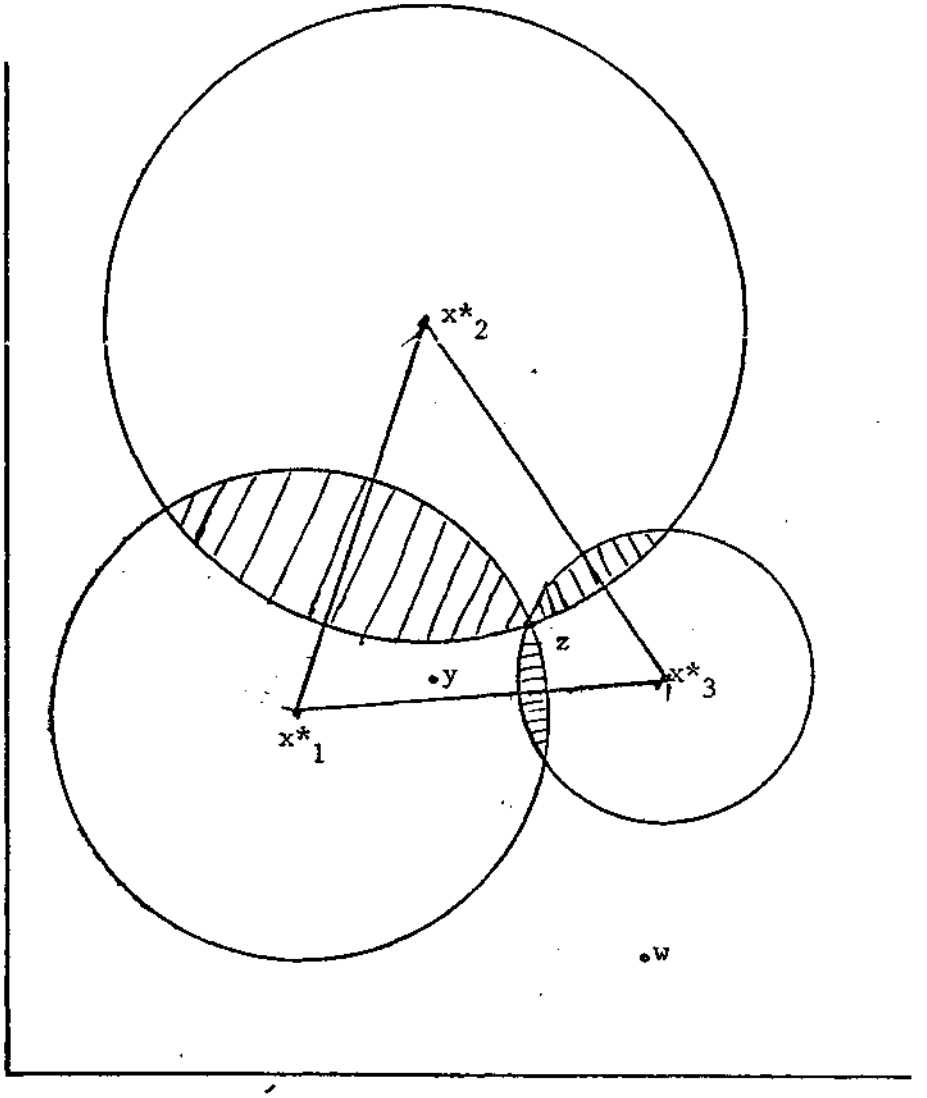

FIGURE 3

indifference curve for each voter through z. For each voter, then, any point in the interior of the circle through z is strictly preferred by him to z. The three shaded "petals" represent the locus of points strictly preferred to z by at least two of the three voters (a majority). The fact that these regions exist assure us that z is not an equilibrium point. Voters 1 and 3, for example, would support any point in the southeastern petal against z; 2 and 3 would support any point in the northeastern petal; and 1 and 2 prefer points in the northwestern petal to z. What Plott established is that this little example is the general case, except under some highly restrictive conditions (to be spelled out shortly). Specifically, for any point inside the triangle connecting voter ideal points (the Pareto optimal surface), nonempty "petals," demarcating regions preferred by majorities, exist. For any point outside the Pareto surface, like w, there will not only be regions of points preferred by majorities; there will also be regions preferred to the point by <u>everyone</u>.

As noted, the essence of the Plott Theorem is that no outcome is invulnerable. Only in a highly restrictive circumstance is this false. A point is a majority rule equilibrium, according to Plott, if (i) the number of voters is odd, (ii) the point is the ideal point for a voter, and (iii) the remaining (even number of) voters can be paired so that each pair's ideal points lie on a line through the point in question on opposite sides of that point. That is, a majority rule equilibrium requires a radially symmetric distribution of voter ideal points about that equilibrium. In Figure 3, for example, if we moved x_2^* onto the line connecting x_1^* and x_3^*, then it would be an equilibrium -- there would be no "petals" of majority preference.

Several implications flow from this theorem. First, and most apparent, the precise requirement of radial symmetry is so demanding as virtually to guarantee that majority rule equilibria will fail to exist in empirical settings. Second, even if by terrifically good luck, an equilibrium does exist, it is very, very fragile. Imagine one million voters distributed symmetrically about the ideal point of the one million and first voter, the latter constituting an equilibrium according to the Plott Theorem. Now add two voters nonsymmetrically. This small perturbation destroys the equilibrium.

Third, when an equilibrium is destroyed (or if it failed to exist in the first instance), the resulting disequilibrium is total. The Chaos Theorem, as we have previously called it, may be illustrated again using Figure 3. Let z and w be any two arbitrary points. Then there exists a sequence of points, $\{y_1,\ldots,y_m\}$, with the following properties:

(i) y_1 is preferred to z by a majority
(y_1 is in one of the shaded regions).

(ii) y_2 is preferred to y_1 by a majority.

(iii) Generally, y_{j+1} defeats y_j in a majority contest.

(iv) w defeats y_m.

That is, between any two points there is a majority trajectory (McKelvey, 1976, 1977, 1978, 1979) so that from any initial status quo, <u>any</u> other point in the space may be reached with a properly selected agenda of votes. Schofield (1978) shows the even more surprising fact that these trajectories may be continuous so that each victorious alternative entails only an incremental change from its predecessor. As Bell (1978) notes, "When majority rule breaks down, it breaks down completely!"

Fourth, power over the agenda becomes decisive. A monopoly agenda setter, e.g., an all-powerful Speaker of the House like Thomas Brackett Reed, may select an order of voting that terminates at his ideal point.

Fifth, and finally, the majority preference relation[11] ain't what it's cracked up to be! That is to say, whatever outcome transpires cannot be attributed to majority preferences since all that can be asserted with confidence is that the ultimate winner was preferred to its predecessor by a majority. And, since that predecessor (and all its predecessors) may well have been artfully selected by an agenda setter, no normative significance may be associated with ultimate winners. This is Riker's (1981) case against the populism of Rousseau. It also constitutes a case against many normative conceptions of the "Public Interest," e.g., the "will of the majority."

The thrust of the Chaos Theorem and related results is that rational behavior in a majority rule context produces badly behaved social choices. "Anything can happen" is the order of the day: $W(x) \neq \phi$ for any $x \in A$. This analytic conclusion about pure majority rule, however, does not square well with empirical observations. Electoral sympathies, for example, do not jump all over the place; rather there are electoral cycles and party systems, perhaps separated by critical elections (Burnham, 1970) but nevertheless presenting a picture of at least a modicum of continuity between these "catastrophes." Similarly, legislative coalitions are not completely fluid and shifting. This year's majority does not undo all of last year's majority program. Experimental evidence (Fiorina and Plott, 1978), too, suggests that outcomes are not scattered all over the place, as one would expect from

the Chaos Theorem. All this has led one scholar, in the legislative context, to ask "Why so much stability?" (Tullock, 1981).

This intellectual development illustrates the manner in which a paradigm generates its own anomalies which, in turn, set the agenda of further research. As we noted in an earlier section of this essay, anomalies are insufficient to reject a theory. To do that one needs an alternative theory, one capable of handling the anomaly on the one hand, and one not so idiosyncratic as to be unable to handle other phenomena in the original theory's domain, on the other. The anomaly to which we have alluded constitutes the current research frontier in the study of majority rule.

One direction of research, currently being conducted by the authors of this essay among others, involves the study of structure-induced equilibrium (SIE) (Shepsle, 1979a, b; Shepsle and Weingast, 1981). This is in contrast to a preference-induced equilibrium (PIE), one that satisfies the conditions of the Plott Theorem. Recall that a point $x \in A$ is an PIE if and only if $W(x) = \phi$. That is, x is a PIE if its "win set," the set of points that majority dominate it (the shaded petals of Figure 3), is empty. The SIE concept distinguishes another set, the "proposal set" $P(x)$. This set may be thought of in either of two ways. One interpretation defines $P(x)$ as the set of points that institutional rules allow to be proposed against x; here it is assumed that if the rules permit a comparison, there will always be someone prepared to make the appropriate motion. Consider, as an example, a sort of germaneness rule in common use in legislatures which restricts comparisons to those pairs of points that differ on only a single dimension. It is straightforward to

demonstrate, in Figure 3, that the point y -- the vector of medians -- is a SIE if the germaneness rule is the structural restriction. At point y, any move in an easterly direction is rejected by the coalition {1, 2}; a westerly move is opposed by {2, 3}; a northerly move by {1, 3}; and a southerly move by {2, 3}. And, since germaneness permits only these four kinds of moves (and not, say a northeasterly move that might be supported by {2, 3}, y is a SIE. It is a SIE because

$$W(y) \cap P(y) = \phi$$

Whereas $W(y) \neq \phi$ -- as noted, {2, 3} prefer points lying to the northeast -- its intersection with P(y) is empty. Thus, the rules have created this equilibrium.[12]

There is a second interpretation that may be attached to the proposal set. Subscript P(x) with the name of a specific coalition, K, viz., $P_K(x)$. That is, let the proposal set be the set of points preferred to x by, say, a monopoly agenda committee, K. Then, if the set of points preferred to x by K has no common intersection with the set of points preferred to x by some majority of the entire institution, W(x), then we obtain

$$W(x) \cap P_K(x) = \phi$$

and no change occurs. Once again, x is a SIE.

Let us recapitulate. Having observed in both the Plott Theorem and the Chaos Theorem that majority rule is badly behaved, i.e., $W(x) \neq \phi$ generically, majority rule was nested in an institutional context characterized either by formal (and formidable!) rules governing comparisons, or by rules empowering "gate-keeping" and "veto-groups," or by

both. The institutional context often induces equilibrium, even if preferences do not. But, and this is the kicker, what is an institution? The current research in rational choice has been driven to this question partly in response to the institution-free atomism of previous models, the absence of equilibrium in those models, and the strong belief (in some quarters at least) that institutional rules are created and institutional deals are cut in recognition of this underlying instability.

One of the more promising ways to think about the congeries of rules, norms, practices and arrangements that constitute an institution is as a game. A game, after all, is defined in terms of its rules (Luce and Raiffa, 1957). Choosing among institutions, then, is the same as choosing among games. Now it is possible to think about constitutional questions -- the choice of institutional practices -- in terms of the SIEs associated with different institutions. As in most other domains of science, anomalies lead to reformulations that produce new research questions. And so it is here.

This has hardly been a comprehensive review of multidimensional voting models. We have cheated history a bit in order to demonstrate the dynamical process set in motion by a powerful paradigm that is not without its warts and anomalies. To persuade the reader further that this is not idle intellectual play, we proceed to one additional illustration, the study of norms, which displays the rational choice paradigm at work on the "choice among games" problem alongside alternative paradigmatic treatments of the same problem.

6. Rational Choice as a Complementary Paradigm: The Case of Legislative Norms

In this last section we provide an application of the rational choice approach to a more traditional area of political scholarship, the case of congressional norms. While this topic has largely been in the domain of the political sociology, we believe that rational choice theorists have much to contribute to the knowledge and understanding of ongoing congressional processes and the norms that govern them.

Rational choice theory and political sociology have generally been interpreted as competing paradigms, that is, as different explanations of the same events. Several authors have contrasted their relative ability to explain and analyze particular events (Harsanyi, 1962, and Barry, 1970). While there are significant differences between these approaches, particularly for the study of elections, we believe these differences have been overemphasized and their similarities and complementarities largely ignored. We argue, in the case of congressional behavior, that these need not be regarded as competing paradigms but rather are complementary analytical tools for understanding a complex social system. Each approach has a comparative advantage, a point made more concrete in this brief examination of the existence and maintenance of legislative norms.

Congress is a remarkably complex institution. A few of its permanent features, such as its division into two houses, are set down in the U.S. Constitution; most, however, have evolved over time to suit the needs of the individual members. Of the latter, two types stand out. First is the official structure which includes the committee system, leadership offices, and other elements of the formal hierarchy. Prior to the behavioralist revolution in the post World War II *era,* students of Congress focused

almost exclusively on these elements (see Rohde and Shepsle, 1978). The second category consists of the unofficial rules which constitute regular patterns of behavior. Political sociologists concerned with explaining actual events in the congressional process found that explanations were elusive without a more detailed knowledge of the informal rules. The amazing fact uncovered by these scholars was that, over and above the official rules, there were unwritten but equally binding informal rules, practices, and arrangements that significantly constrained individual behavior and hence influenced final policy outcomes. It made sense to political sociologists to see these rules in terms of the manner in which they regulated interaction among different members and the way they served specific purposes. To quote one recent student of Congress,

> Legislatures, like other human organizations, are social systems characterized by stable patterns of action and by widely shared standards of what that action should be. These standards are norms. Norms are informal rules, frequently unspoken because they need not be spoken, which may govern conduct more effectively than any rule. They prescribe "how things are done around here." (Hinckley, 1978, p.59)

Put differently, norms *are* simply informal (unwritten, though nonetheless binding) rules of behavior. They are established practices appropriate in specific circumstances.

Fenno (1966) identifies two factors that must be part of any norm: (1) agreement or consensus on what constitutes appropriate behavior for group members, and (2) social processes to produce adherence to these agreements. That is, benefits to individual members must derive from observance of these practices (in terms both of private benefits and of benefits to the entire group in the form of "system maintenance" and continuity); and second, there must be a system of sanctions and incentives to induce compliance.

The two broad approaches to the analysis of social systems -- rational choice and political sociology – are generally seen as distinct partly because of a language barrier. The latter focuses on "institutional needs," "social systems," "expectations," and so on, while the former focuses on "individual goals and choice," "payoffs," "outcomes," and so on. In order to see what we believe are important relationships between them, we present three different levels of analysis of norms. We argue that the behavioral approach is appropriate for the first two, while the rational choice approach is appropriate for the last. In general, however, all three categories (and hence both approaches) are required for a complete study of institutional phenomena.

(1) Descriptive: What *are* the norms? At this level of analysis, we are interested in a complete understanding of the system as it actually works. In addition to knowing the formal rules of an institution, we seek to learn the informal rules which may have as important a role in determining behavior and outcomes as the more visible formal structure. In large part, this process amounts to providing a catalog of the norms, including a list of circumstances under which they are observed, the process by which they are learned (called the "socialization process"), and so on. Following this approach, prominent norms discovered by congressional scholars include specialization (the practice in which members become specialists in one or two policy areas, typically within the jurisdictions of their committees; this behavioral practice stands in contrast to that of the generalist who seeks broad knowledge, expertise, and influence on a range of issues); reciprocity (the complement of specialization, this norm consists of deference to specialists and, hence, implies greater influence for committee

members in their respective jurisdictions); seniority (the practice of associating status, formal authority, and access to resources with years of continuous service); universalism (the tendency toward unanimous inclusion of members in the benefits of particular types of programs).[13]

(2) Analysis: Why are observed norms followed? These discussions are more analytical (and more rare). The focus here is on the benefits to individuals (and consequences for the system -- e.g., public goods) from the operation of a norm. For example, the twin norms of specialization and reciprocity underpin the committee system and benefit the individual by increasing his influence over issues of direct relevance to his electoral constituency. This arrangement also fosters the development of legislative expertise, a public good for the legislature vis-a-vis the executive branch. As well, this level of research focuses on the sanctions available to leaders for punishing those who violate established norms. Mechanisms include denial of desired committee assignments and the deletion of pet projects from omnibus bills.

This level of analysis goes beyond simple description, inquiring into the effects of the rules (costs and benefits), the incidence of the effects (who receives benefits and/or bears costs?), thereby explaining why individuals follow them., This is an important link between the behavioral and the rational choice approaches since it brings the level of analysis from the system down to the individual to explain what motivates individual actors to behave in the prescribed manner.[14]

(3) Explanation: Why this set of norms (i.e., rules) instead of some other? This level is the most removed from descriptive social science and is also the most demanding. It requires a calculus of choice nested in a

theory of behavior. The fundamental challenge of this analysis is to relate the outcomes of a process (who wins and loses, and, importantly for the case of Congress, the types of policies pursued) to the goals of individuals. One must show why some particular rules among the set of all rules lead in some sense to the most desirable outcomes.

Mayhew (1974), in his magnificent survey, integrates modern congressional research from the rational choice point of view. He assumes that individual congressmen are singleminded in their rational pursuit of reelection and then interprets many features of Congress in terms of how they serve this purpose:

> the organization of Congress meets remarkably well the electoral needs of its members. To put it another way, if a group of planners sat down and tried to design a pair of American National assemblies with the goal of serving members' electoral needs year in and year out, they would be hard pressed to improve upon what exists. (Mayhew, 1974, pp. 81-2)

The Mayhewian links are goals->structures->-outcomes. The focus on structures, in our case norms, requires us to understand them as serving in a manner superior to possible alternatives. Fenno (1973), too, argues along these same lines, showing that the informal structures of the various committees (called "strategic premises") make sense in terms of the type of policy areas or task assigned to the committee, given the type of member typically attracted to that committee. In still another example of the way in which norms are regarded as rational responses, a series of writers has examined the "universalism" norm in terms of its expected net benefits in comparison to alternative "ways of doing things" (see Weingast, 1979; Fiorina, 1980, and Shepsle and Weingast, 1981).

Far from being competing approaches to the study of norms, the behavioralism of political sociology and the analytics of rational choice

theory are simply different components of a more comprehensive approach to the congressional policymaking process. The former is particularly appropriate for learning what the norms are, for understanding when they are appropriate (e.g., when they are observed), what mechanisms support these norms, and so on. It is unlikely, for example, that a formal modeler studying legislative institutions in abstract settings could hope to arrive at these types of behaviors, particularly without a rich understanding of the individual goals and of the empirical details of legislative policymaking. By the same token, it is quite improbable that behavioralists could explain the existence of one system of norms in contrast to some other. Indeed, many behavioral scholars are unable to provide more than a list of norms, unable to show their mutual dependence, their effect on policy outcomes, or their effect on the ability of individuals to attain their goals (see, for example, Matthews, 1960, or Hinckley, 1978). An individualistic analytical approach like rational choice theory is better suited for this task.

Our argument, then, is that rational choice approaches *are* an important ingredient in understanding social systems. They provide a logic, a mechanism, a deductive framework with which to explain the behavioral regularities uncovered by the more inductive approaches of political sociologists. We have a complete integration of these two complementary approaches when we can deduce, using rational choice theory, the basic descriptive generalizations concerning norms observed and catalogued by the behavioralists. And this integration is what we intend to present in order to illustrate the complementarity. We turn now to an in-depth analysis of a specific congressional norm, universalism.

In the empirical policy literature, scholars have noted a "distributive tendency" (Stockman, 1975) in the allocation of benefits; this tendency manifests itself in the form of inclusive legislative coalitions, sometimes approaching unanimity. This stands in stark contrast to other types of "hardball" coalitional politics in which the majority excludes the minority from the benefits of legislation. Examples of the distributive tendency include the traditional pork barrel of rivers and harbors (Maass, 1951; Ferejohn, 1974); models cities and urban renewal (Plott, 1967); tax loopholes (Manley, 1970); the traditional tariff (Schattschneider, 1935); military procurement (Rundquist, 1973); categorical grants-in-aid (Mayhew, 1974); and private member bills (Froman, 1967).

As Mayhew observes, the pattern of universalism contradicts the theoretical models of a number of rational choice theorists that entail the prediction of minimal winning coalitions (MWC) for distributive politics (see, for example, Buchanan and Tullock, 1962). We shall first present the rationale for MWC and then show why rational legislators would choose to impose and maintain a norm of universalism in an effort to avoid associated unpleasantries.

To see the rationale for minimum winning coalitions, consider the Distributive Legislative Game (DLG). This is an n-person majority rule game defined as follows. Each legislator proposes a project or program with local benefits, b, and total costs, c, where $b > c$.[15] The benefits from the project are concentrated in the legislator's constitutency while the costs *are* dispersed evenly over all constituencies through the taxation system (which extracts revenues to cover this and other costs of

government activity). To see what happens under this system, consider the payoffs to any individual legislator from a given project. For the legislator proposing a project, his net benefits are $b - \frac{1}{n}c$ since he gets his project with its associated benefits while he pays only his share $(\frac{1}{n})$ of the total costs. For all other legislators, however, the payoff is negative since they receive none of the benefits but must pay their share of the costs $-\frac{1}{n}c$. If projects come up for a vote one-by-one, they will all fail by a vote of n-1:1. Thus, some form of logrolling is called for in which legislators put together packages of projects that will benefit at least a majority of districts and thereby command a majority of votes.

Using game theory, we can predict what the outcomes of this situation will be in terms of the coalitions that will form and the number of projects that will be built. In fact, it has been shown that only minimal winning coalitions will form under majority rule (Weingast, 1979). This result establishes that the set of minimum winning coalitions possesses an important stability property in the DLG. Any winning coalition which is not of minimum size can be beaten by any MWC. Moreover, once a MWC forms, no other coalition can upset it.

Thus, pure majority rule in a distributive policy arena is characterized by "hardball" coalitional politics in which bare majorities form coalitions to provide themselves with benefits and pass the costs (in part) onto others who are excluded from the benefits of legislation. This result, however, fails to explain instances of universalism. Indeed, such instances are anomalies in the DLG.

One problem with the DLG and minimum winning coalitions is that individuals face uncertainty as to whether they will gain the benefits of legislation. To the degree that their electoral fortunes depend upon "bringing home the pork," this uncertainty is quite consequential for legislative goals. If legislators seek to maximize the expected benefits for their district in order to further their own reelection efforts, then they will choose to institute practices which raise the expected benefits. We now show that universalism is one such practice. Since different rules (norms) imply different games, the choice between different institutions is a choice between games. Rational self-interested legislators, we claim, have compelling reasons to prefer a decisionmaking game with maximal (universal) coalitions rather than one with minimal coalitions (DLG). Indeed, the following argument provides a rationale for Mayhew's claim:

> On legislation supplying particularized [i.e., distributive] benefits, two points may reasonably be made. The first is that it is vital for members to win victories; a dam is *no* good unless it is authorized and built. The second is that winning victories can be quite easy; the best way for members to handle the particular is to establish inclusive universalistic standards. (Mayhew, 1974, p.114)

Consider the Universalism Legislative Game, or ULG, an alternative legislative institution in which any legislator that proposes a project may have his proposal included in the final omnibus bill. The legislators, in choosing whether to institute and maintain the norm of universalism, must choose between the two games, DLG and ULG. Each legislator will evaluate the alternatives in terms of the ex ante expected payoffs from the two institutions.

Under ULG, the payoff to any legislator is b - c (which is the benefits from his project minus his share $(\frac{1}{n})$ of n projects which cost c).

In contrast, under DLG, outcomes are characterized by the uncertainty over which MWC will form. If a particular legislator is in the MWC, his payoff is $b - \frac{n+1}{2n}c$ (which is his benefits, minus his share, $\frac{1}{n}$, of the cost of $\frac{n+1}{2}$ total projects). For a legislator not in the winning coalition, however, his payoff is simply his cost-share of those $\frac{n+1}{2}$ projects that are built, or $-\frac{n+1}{2n}c$. When considering the DLG, any given legislator must discount the benefits from being in a MWC by the probability he will be included, and combine these with the costs associated with being one of the losers weighted by the probability of this occurrence. We can show that if all MWCs are equally likely then the probably of any one legislator being in a MWC that actually forms is $\frac{n+1}{2n}$ (Weingast, 1979). With this fact, we can state and prove our main result, namely that under these circumstances, all legislators prefer ULG to DLG.

> Universalism Theorem (Weingast, 1979): If legislators maximize the net benefits which accrue to their districts, and if all minimum winning coalitions are equally likely, then ULG dominates DLG for all legislators (i.e., the expected net benefits are greater under ULG than DLG for all legislators).

Proof: Let EP_d be the expected payoff under DLG for legislator i. If $i \in MWC$, then his payoff is $b - ac$ where $a = \frac{n+1}{2n}$. However, if $i \notin MWC$, then his payoff is $-ac$. Since his chances of being included in the MWC are equal to a,

$$\begin{aligned} EP_d &= a(b - ac) + (1-a)(-ac) \\ &= ab - a^2c - ac + a^2c \\ &= a(b-c). \end{aligned}$$

We need to compare this with the expected payoffs under ULG, EP_u. In all cases, this yields every legislator b-c, since each gets a project and pays $\frac{1}{n}$ of the cost of n projects. To see that the expected payoffs under

ULG are greater than under DLG, we show that $EP_u - EP_d$ is positive:

$$EP_u - EP_d = (b-c) - a(b-c)$$

$$= (1 - a)(b-c) > 0,$$

since $(1-a) > 0$ and $(b-c) > 0$.

Q.E.D.

This theorem establishes that legislators have good reason to institute and maintain the practice of universalism. As Mayhew observes in the passage quoted above, it makes each legislator better off than he has a right to expect in the hardball coalition politics that attend the DLG of pure majority rule. It is not that the model of pure majority rule is wrong. Rather, it is the inevitable logic of this process that leads rational legislators to seek to avoid it. The practice of universalism is one such mechanism. The norm of universalism is adopted precisely because maximal coalition outcomes dominate those of minimal winning coalitions for all legislators in the case of distributive politics. In the language of social psychology, the ULG better meets members' expectations; and, because it reduces the inevitable conflict associated with MWC formation, it promotes integration and cohesion of the social system.

As noted above, Fenno (1966) states two conditions which norms must satisfy. The first is the requirement that individual benefits are secured when norms are obeyed. We have just demonstrated that this condition is satisfied for the case of universalism. The second requirement is the existence of a sanctioning mechanism to enforce compliance and to punish deviation. Several scholars of the pork barrel process have described how this works. As long as universal omnibuses are the vehicle for distributive politics, it will always be in the interest of some subset of legislators to attempt to form a smaller coalition, thereby reducing their respective tax

bills. If this were costless, then we would expect the norm of universalism to break down completely. However, it is not costless since those seeking short run gain are subject to sanction. At one level, this entails denying pet projects to those who do not comply with the norms. As Ferejohn (1974, pp. 114-5) observes, Senator Proximire learned this the hard way.[16] Swanson (1969) has shown that a more permanent form of sanction is the denial of requests for preferred committee assignments, a sanction employed by party leaders against those who systematically fail to observe unwritten norms. As that great political sociologist, Speaker Sam Rayburn, said, "To get along, go along." Thus, we have shown that the second Fenno condition holds as well.

We have used rational choice theory to show why rational legislators would seek to institute and maintain a norm of universalism. This exercise has also demonstrated the complementary use of rational choice techniques for problems raised but left unanswered by more traditional analysis. Our discussion of universalism has shown that this norm satisfies both of Fenno's conditions.

The power of rational choice theory rests in its ability to address the question of why one set of rules is observed or chosen instead of another. While traditional behavioral analysis can suggest the benefits from norms, it simply lacks the analytical capabilities to address this latter question. Indeed, beyond Mayhew (1974) and Fenno (1973), there few examples of studies that provide much in the way of answers to this class of question. A more important feature of our analysis, in contrast to most rational choice expositions (particularly those of the more abstract sort summarized in previous sections), is that it rests solidly on a

substantive foundation. The tendency to separate the political sociology and the rational choice approaches into competing paradigms in part reflects the fact that they largely attend to different issues. The abstract legislatures usually studied by formal modelers have only a vague resemblance to those special cases studied by the behavioralist. We hope that our view suggests that a more complete integration is possible. In our opinion, the real reward of rational choice theory comes from an ability to deduce from a theoretical model the descriptive generalizations observed by the behavioralists.

7. Conclusion

A survey should whet the appetite, not satiate it! We hope this overview of rational choice explanations inspires some readers to continue their education with the articles and books in the appended bibliography. Subtleties of argument are precluded in this type of essay; they are to be found in the original sources, however, and we urge those interested to pursue them with some intellectual vigor.

For both the whetted and the satiated, we conclude briefly with three observations:

1. Most theorists are engaged in constructing explanations of social facts. We would emphasize that such explanations are constructed, not discovered. They do not inhere in phenomena; they are imposed by our theories.
2. Rational choice theories employ an individualistic vehicle to explain empirical regularities; purposive, rational choosers (in contrast to passive, responsive, sociological men) animate, and are animated by, the social context in

which the regularities occur for which rational explanations are sought. Some theories suppress the individual altogether in a complex of macro-level relationships; other theories seem interested in little beyond the individual (extreme behavioralism). Rational choice theories chart a middle ground.

3. Some theoretical approaches emphasize the philosophy of science at the expense of science. They emphasize descriptive schema and conceptual apparatuses, but fail to supply a logic, a mechanism, an answer to "why" questions. Rational choice theories do indeed provide the latter. However, this emphasis comes at the expense of the institutional context and the social fabric which define alternatives and constrain the aggregation of choice behavior. The "institutional connection" remains relatively underdeveloped, a condition we predict will be dramatically reversed in the coming decade.

FOOTNOTES

1. The Public Choice Society, for example, was founded in the mid-1960s, publishes a journal that now appears six times a year, holds an annual meeting, claims 1200 members (many of whom are political scientists), and is well-represented on panels of national and regional political science meetings. In 1982, an entire section of the program of the American Political Science Association is devoted to public choice.

2. From our earlier caricature, some political scientist's initial instinct would be to operationalize 'regular movement of hands' and 'amount of winding of stem', regress the former on the latter, compute the proportion of variance explained, and rest content that he had "explained" the phenomenon!

2a. It should be noted that the pocket watch metaphor was developed by Einstein to illustrate related controversies in particle and wave mechanics. See Zukav (1979).

3. For example, suppose model 1 specifies that $x_1,\ldots,x_m$ are significant for y (in some particular way) whereas model 2 specifies $z_1\ldots,z_n$. Regress y on <u>both</u> sets, <u>viz.</u> estimate

$$y = \alpha + \sum_{i=1}^{m} \beta_i x_i + \sum_{j=1}^{n} \gamma_j z_j$$

and test joint hypotheses of the form H_0^1: $\beta_1 = \beta_2 = \ldots = \beta_m = 0$ and H_0^2: $\gamma_1 = \gamma_2 = \ldots = \gamma_n = 0$. If both H_0^1 and H_0^2 may be rejected, or if neither may be, then we are unable to claim superiority for either model vis-a-vis the other. If one cannot be rejected, and one can, then the latter model can be rank-ordered above the former.

4. Preferences are characterized by a binary relation, P, against which alternatives are compared. Thus, if $x,y \in A$ (translated: "x and y are elements of the set of alternatives"), xPy means "x is strictly preferred to y." If the chooser is indifferent between x and y, then we write xIy. And, finally, if the chooser either prefers x to y or is indifferent between them -- xPy or xIy -- then we say that the chooser regards x to be "at least as good as" y and write this fact as xRy.

5. For an exception involving officials of the Federal Communications Commission, see Ferejohn, Forsythe, and Noll (1977).

6. Those who prefer x^0 also have a sophisticated strategy -- namely to support x" in the vote comparing it to x', even if they prefer x' to x". One interesting implication of this fact is that studies of roll call voting are likely to be terribly misleading to the extent that representatives and senators practice the art of sophisticated behavior!

7. Acyclicity would require "not z P_S x." Thus, the social preferences cycle and there is no maximal element ("best" element) among the alternatives.

8. More formally let individuals 1,2,...,n with preferences $R_1,R_2,\ldots,R_n$, respectively, and behavioral alternatives (strategy sets) $\Sigma_1,\Sigma_2,\ldots\Sigma_n$, respectively, choose $s_1,s_2,\ldots,s_n$, respectively, where $s_i \epsilon \Sigma_i$ for each i=1,...,n. With social choice process F -- a voting system, exchange system, bargaining system, etc. -- an outcome is given by $F(s_1,s_2,\ldots,s_n)$. $F(s_1,s_2,\ldots,s_n)$ is said to be a Nash equilibrium and $s_1,s_2,\ldots,s_n$ Nash strategies if, for no $t_i \epsilon \Sigma_i$ is it the case that $F(s_1,s_2,\ldots,s_{i-1}, t_i,s_{i+1},\ldots,s_n)$ P_i $F(s_1,s_2,\ldots,s_{i-1},s_i,s_{i+1},\ldots,s_n)$.

9. Let $K=\{1,2,\ldots,k\} \subset \{1,2,\ldots,n\}$ be an arbitrary set of individuals (coalition). An outcome $F(s_1,\ldots,s_n)$ is invulnerable to K if there are no strategies $t_1,t_2,\ldots,t_k$ (with $t_i \epsilon \Sigma_i$ for each $i \epsilon K$) such that $F(t_1,t_2,\ldots t_k,s_{k+1},\ldots s_n)$ R_i $F(s_1,\ldots,s_n)$ for all $i \epsilon K$ and P_i holds for at least one $i \epsilon K$. If $F(s_1,\ldots,s_n)$ is unvulnerable to all possible coalitions, it is said to be a strong equilibrium and is stable.

10. Nevertheless, the Median Voter Theorem remains quite popular in the literature on modern public finance. See, e.g., Inman (1978).

11. a P_Sb if and only if a P_ib for a majority of voters.

12. It should be of some comfort to know that if y is a PIE, then it also is a SIE, but not conversely. That is, PIE $\subset$ SIE and, as the Plott Theorem suggests, normally PIE = ϕ. See Shepsle, 1979a.

13. Some of the earliest work on legislative norms is by Huitt and Matthews (1960); many of Huitt's contributions are reprinted in Huitt and Peabody (1967) and summarized in Peabody's introduction to this volume. Recent work includes Asher (1973) and Hinckley (1978).

14. Fenno (1966) is full of remarkably detailed descriptions and analyses of the appropriations process along these lines; it remains the exemplar of this genre.

15. This and other restrictions allow us to present the model in simplified terms. They do not seriously restrict the theory's domain, as generalizations by Fiorina (1980) and Shepsle and Weingast (1981) demonstrate.

16. More recently, former Senator Buckley (R.NY) sought to delete one project from each state from an omnibus public works bill. Each of his amendments failed, but one: a New York project was deleted! See Mayhew (1974).

REFERENCES

Aldrich, John. Before the Convention. Chicago: University of Chicago Press, 1980.

_____. "A Downsian Spatial Model With Party Activists." Delivered at Annual Meeting of the Midwest Political Science Association. Cincinnati, 1981.

Aranson, Peter A. and Peter C. Ordeshook. "Spatial Strategies for Sequential Elections." In Niemi, Richard G. and Herbert W. Weisberg (Eds.). Probability Models of Collective Decision Making. Columbus, Ohio: Merrill, 1972. Pp. 298-332.

Arrow, Kenneth A. Social Choice and Individual Values. New York: Wiley, 1951. 2nd ed. 1963.

Asher, Herbert B. "The Learning of Legislative Norms." American Political Science Review 67 (1973): 499-514.

Barry, Brian. Sociologists, Economists and Democracy. London: Macmillan, 1970.

Bell, Colin E. "What Happens When Majority Rule Breaks Down? Some Probability Calculations." Public Choice 33 (1978): 121-127.

Black, Duncan. "On the Rationale of Group Decision Making." Journal of Political Economy 56 (1948): 23-34.

_____. "The Decisions of a Committee Using a Simple Majority." Econometrica 16 (1948):

_____. The Theory of Committees and Elections. Cambridge: Cambridge University Press, 1958.

_____ and R. A. Newing. Committee Decisions with Complementary Valuation. London: William Hodge, 1951.

Bowen, Howard R. "The Interpretation of Voting in the Allocation of Economic Resources." Quarterly Journal of Economics 58 (1943): 27-48.

Brown, Donald J. "Aggregation of Preferences." Quarterly Journal of Economics 89 (1975): 456-469.

Buchanan, James M. and Gordon Tullock. The Calculus of Consent. Ann Arbor: University of Michigan Press, 1962.

Budge, Ian and Dennis Farlie. Voting and Party Competition. New York: Wiley, 1977.

Burnham, Walter Dean. Critical Elections and the Mainsprings of American Politics. New York: Norton, 1970.

Cohen, Linda. "Cyclic Sets in Multidimensional Voting Models. Journal of Economic Theory 20 (1979): 1-12.

Coleman, James M. "The Positions of Political Parties in Elections." In Niemi, Richard G. and Herbert F. Weisberg (Eds.). Probability Models of Collective Decision Making. Columbis, Ohio: Merrill, 1972. Pp. 332-358.

Davis, Otto A. and Melvin J. Hinich. "A Mathematical Model of Policy Formation in a Democratic Society." In Bernd, Joseph (Ed.). Mathematical Applications in Political Science, II. Dallas: Southern Methodist University Press, 1966. Pp. 175-208.

_____. "Some Results Related to a Mathematical Model of Policy Formation in a Democratic Society." In Bernd, Joseph (Ed.). Mathematical Applications in Political Science, III. Charlottesville: University Press of Virginia, 1967. Pp. 14-38.

_____ and Peter C. Ordeshook. An Expository Development of a Mathematical Model of the Electoral Process." American Political Science Review 64 (1970): 426-449.

Downs, Anthony. An Economic Theory of Democracy. New York: Harper, 1957.

Farquharson, Robin. Theory of Voting. New Haven: Yale University Press, 1969.

Fenno, Richard F. The Power of the Purse. Boston: Little-Brown, 1966.

_____. Congressmen in Committees. Boston: Little-Brown, 1973.

Ferejohn, John A. Pork Barrel Politics. Stanford: Stanford University Press, 1974.

_____ and Roger G. Noll. "Uncertainty and the Formal Theory of Political Campaigns." American Political Science Review 72 (1978) 492-506.

_____, Robert Forsythe, and Roger G. Noll. "An Experimental Analysis of Decisionmaking Procedures for Discrete Public Goods." Pasadena, Ca.: Caltech Social Science Working Paper 155, 1977.

Fiorina, Morris P. "Legislative Facilitation of Government Growth: Universalism and Reciprocity Practices in Majority Rule Institutions." Research in Public Policy Analysis and Management 1 (1980):

_____ and Charles R. Plott. "Committee Decisions Under Majority Rule: An Experimental Study." American Political Science Review 72 (1978): 575-598.

Fishburn, Peter C. The Theory of Social Choice. Princeton: Princeton University Press, 1973.

_____. "Paradoxes of Voting." American Political Science Review 68 (1974): 537-547.

Froman, Lewis A. The Congressional Process. Boston: Little-Brown, 1967.

Gibbard, Allen. "Manipulation of Voting Schemes: A General Result." Econometrica 41 (1973): 587-601.

Hanson, Norwood Russell. Patterns of Discovery. Cambridge: Cambridge University Press, 1958.

Harsanyi, John C. "Rational-Choice Models of Political Behavior vs. Functionalist and Conformist Theories." World Politics 21 (1969): 513-538.

Hinckley, Barbara. Stability and Change in Congress. 2nd Ed. New York: Harper and Row, 1978.

Hinich, Melvin J. "A Model for Campaign Contributions." In Auster, R. and B. Sears (Eds.). American Re-evolution. Tucson: University of Arizona Press, 1977. Pp. 47-53.

Hotelling, Harold. "Stability in Competition." Economic Journal 39 (1929): 41-57.

Huitt, Ralph K. and Robert L. Peabody (Eds.). Congress: Two Decades of Analysis. New York: Harper and Row, 1969.

Inman, Robert P. "Testing Political Economy's 'As If' Proposition: Is the Median Income Voter Really Decisive?" Public Choice 33 (1978): 45-67.

Kelly, Jerry S. Arrow Impossibility Theorems. New York: Academic Press, 1978.

Kramer, Gerald H. "On a Class of Equilibrium Conditions for Majority Rule." Econometrica 41 (1973): 285-297.

_____. "A Dynamical Model of Political Equilibrium." Journal of Economic Theory 16 (1977): 310-334.

_____. "Existence of Electoral Equilibrium." In Ordeshook, Peter C. (Ed.). Game Theory and Political Science. New York: New York University Press, 1978. Pp. 375-391.

Kuhn, Thomas S. The Structure of Scientific Revolutions. Chicago: University of Chicago Press, 1962 (2nd Ed., 1970).

Laver, Michael. The Politics of Private Desires. New York: Penguin Books, 1981.

Luce, R. Duncan and Howard Raiffa. Games and Decisions. New York: John Wiley, 1957.

Maass, Arthur. Muddy Waters. Cambridge: Harvard University Press, 1951.

McKelvey, Richard D. "Intransitivities in Multidimensional Voting Models and Some Implications for Agenda Control." Journal of Economic Theory 2 (1976): 472-482.

_____. "Constructing Majority Paths Between Arbitrary Points: A Solution to the Agenda Design Problem for Quadratic Preferences." Presented at Annual Meeting of the American Economic Association. New York, 1977.

_____. "A Theory of Optimal Agenda Design." Presented at Conference on Political Science and the Study of Public Policy. Hickory Corners, Michigan, 1978.

_____. "General Conditions for Global Intransitivities in Formal Voting Models." Econometrica 47 (1979): 1085-1111.

_____ and Richard E. Wendell. "Voting Equilibria in Multidimensional Choice Spaces." Mathematics of Operations Research 1 (1976): 144-158.

Manley, John M. The Politics of Finance. Boston: Little-Brown, 1970.

Matthews, Donald R. U.S. Senators and Their World. Chapel Hill: University of North Carolina Press, 1960.

Mayhew, David R. Congress: The Electoral Connection. New Haven: Yale University Press, 1974.

Nash, John F. "The Bargaining Problem." Econometrica 18 (1950): 155-162.

_____. "Noncooperative Games." Annals of Mathematics 54 (1951): 286-295.

Olson, Mancur. The Logic of Collective Action. Cambridge: Harvard University Press, 1965.

Ordeshook, Peter C. "Political Disequilibrium and Scientific Inquiry: A Comment on William H. Riker's 'Implications from the Disequilibrium of Majority Rule for the Study of Institutions'." American Political Science Review 74 (1980): 447-450.

_____ and Kenneth A. Shepsle (Eds.). Political Equilibrium. Boston: Martinus-Nijhoff, 1982.

Page, Benjamin I. "The Theory of Political Ambiguity." American Political Science Review 70 (1976): 742-752.

Pattanaik, Prasanta K. Voting and Collective Choice. Cambridge: Cambridge University Press, 1971.

Plott, Charles R. "Some Organizational Influences on Urban Renewal Decisions." American Economic Review 57 (1967): 306-321.

_____. "The Notion of Equilibrium and Its Possibility Under Majority Rule." American Economic Review 57 (1967): 787-806.

Rae, Douglas W. "An Altimeter for Mr. Escher's Stairway: A Comment on William H. Riker's 'Implications from the Disequilibrium of Majority Rule for the Study of Institutions'." American Political Science Review 74 (1980): 451-458.

Riker, William H. "Implications from the Disequilibrium of Majority Rule for the Study of Institutions." American Political Science Review 74 (1980): 432-447.

_____. Liberalism vs. Populism. San Francisco: Freeman, 1981.

_____ and Peter C. Ordeshook. An Introduction to Positive Political Theory. Englewood Cliffs, N.J.: Prentice-Hall, 1973.

Rohde, David W. and Kenneth A. Shepsle. "Taking Stock of Congressional Research: The New Institutionalism." Delivered at Annual Meeting of the Midwest Political Science Association, Chicago, 1978.

Rundquist, Barry S. "Congressional Influence on the Distribution of Prime Military Contracts." Unpublished Ph.D. dissertation. Stanford University, 1973.

Schattschneider, E. E. Politics, Pressures and the Tariff. Englewood Cliffs, N.J.: Prentice-Hall, 1935.

Schofield, Norman. "Instability of Simple Dynamic Games." Review of Economic Studies 45 (1978): 575-594.

_____. Social Choice and Democracy. Forthcoming.

Sen, Amartya K. "A Possibility Theorem on Majority Decisions." Econometrica 34 (1966): 491-499.

_____. Collective Choice and Social Welfare. San Francisco: Holdon-Day, 1970.

_____. "Social Choice Theory: A Re-Examination." Econometrica 45 (1977): 53-89.

Shepsle, Kenneth A. "The Strategy of Ambiguity." American Political Science Review 66 (1972): 555-569.

_____. "Parties, Voters, and the Risk Environment." In Niemi, Richard G. and Herbert F. Weisberg (Eds.). Probability Models of Collective Decision Making. Columbus, Ohio: Charles Merrill, 1972. Pp. 273-498.

_____. "Theories of Collective Choice." In Cotter, Cornelius (Ed.). Political Science Annual, V. Indianapolis: Bobbs-Merrill, 1974. Pp. 3-87.

_____. "Institutional Arrangements and Equilibrium in Multidimensional Voting Models." American Journal of Political Science 23 (1979a): 27-60.

_____. "The Role of Institutional Structure in the Creation of Policy Equilibrium." In Douglas W. Rae and Theodore J. Eismeier (Eds.). Public Policy and Public Choice. Beverly Hills: Sage, 1979b. 249-281.

_____ and Barry R. Weingast. "Political Preferences for the Pork Barrel: A Generalization." American Journal of Political Science 25 (1981): 96-112.

_____. "Structure-Induced Equilibrium and Legislative Choice." Public Choice (1981), forthcoming.

Smithies, Arthur. "Optimum Location in Spatial Competition." Journal of Political Economy 49 (1941): 423-439.

Stockman, David. "The Social Pork Barrel." The Public Interest 39 (1975): 3-30.

Swanson, Wayne R. "Committee Assignments and the Nonconformist Legislator: Democrats in the U.S. Senate." Midwest Journal of Political Science 13 (1969): 84-94.

Tullock, Gordon. "Why So Much Stability?" Public Choice. Forthcoming, 1981.

Weingast, Barry R. "A Rational Choice Perspective on Congressional Norms." American Journal of Political Science 23 (1979): 245-263.

Zukav, Gary. The Dancing Wu Li Masters: An Overview of the New Physics. New York: William Murrow, 1979.