Chapter 1

The Context of Public Policy

Public policy is always contextual in that it necessarily comes out of a time and place. The three selections in this chapter examine the context of public policy from three different perspectives: utility, system, and change. They will ask, in turn, what is the usefulness of a policy, where does a policy fit within the overall political system and how does policy evolve or change?

The ancient Greek philosophers and the political analysts that they inspired over the next two millennia were concerned with grand theories of the state and governance, of war and peace, and of power and politics. But someone had to start thinking about the relatively small issues; less about war and peace and more about how best to collect taxes, build sewers, and design prisons. This is where Jeremy Bentham (1748–1832) comes in. He was a one-man think tank for a great many of the comparatively petty details of governance. In consequence he is considered one of the founders of the practice, indeed the science, of policy analysis.

Bentham started his professional life as a lawyer. But instead of practicing law, he decided to devote his life to reforming it. By it he meant both the established doctrines of the law as well as the laws themselves. While the life of a reformer seldom pays well, he didn’t worry—especially after his father died and left him independently wealthy.

Bentham is best known as the British philosopher who held that self-interest was the prime motivator and that a government should strive to do the greatest good for the greatest number. He wanted institutions to justify themselves on the practical grounds of the level of useful welfare achieved. He was thereby the prophet of the movement called Utilitarianism, which held that an action is right if and only
if its performance will be more productive of pleasure than pain, more productive of happiness than unhappiness—than of available alternatives.

By using the principle of utility to explain all human motivation, Bentham felt he had found the key to a science of human welfare. The overall welfare of a society would be measured by how well off each of its members were. Thus governments, through their policies, should strive to achieve the “greatest happiness for the greatest number.” This was not an attitude that endeared him to the British aristocracy who, as a class, were determined to keep themselves happy at the direct expense of the lower social classes.

The difference between Bentham and other would-be reformers was that Bentham sought to develop techniques to deal with policy questions—techniques that others could use to apply to yet unknown problems. In effect, Bentham’s patrimony is so great because he was the first methodologist in policy analysis. He showed the way to find a way.

Bentham admittedly did not originate the principle of utility which can be traced back to the ancient Greeks. However, he was the first to rigorously and mathematically apply the principle to current and proposed public policies. Bentham was the first to empirically examine public policy problems, to use the investigation of social facts as a justification for reforming the law on a matter. A hundred years later this would be called a Brandeis brief, a legal argument that takes into account not only the law but the technical data from social or scientific research that have economic and sociological implications for the law as well as society. This kind of legal argument was pioneered by Louis D. Brandeis (1856–1941), who later served on the U.S. Supreme Court (1916–1939). It was a Brandeis brief, for example, that helped win the 1954 Brown v. Board of Education case when, with testimony from psychologists about the effects of segregation on black children, the lawyers for Brown proved that separate education facilities were inherently unequal. “Bentham brief” would be the more intellectually honest phrase.

Bentham demanded that all laws and policies answer the question “who benefits?” And if the proposal didn’t meet his test of the “greatest happiness for the greatest number,” then it was not deserving of enactment. Above all, Bentham urged practical, pragmatic solutions to the problems of crime, education, welfare, and public health among others. He urged that legislators be guided not by their party but by his principle of utility. To do otherwise is to be dishonorably immoral. That is why his most influential work is called An Introduction to the Principles of Morals and Legislation. After all, the whole point of legislation is to do the moral, the ethical thing. Isn’t it?

Excerpts from Bentham’s Principles are reprinted here.

A system is any organized collection of parts that are united by prescribed interactions; it is designed for the accomplishment of a special goal or a general purpose. A systems approach is any analytical framework that views situations as systems. While they didn’t use the phrase, the ancient big three of the Greek philosophers were fully aware of the utility of how a systems approach could
enhance understanding. For example, Socrates, according to an account by Xenophon (430–355 B.C.E.), understood the universality of management systems—that the same skills are needed whether you are managing a business, a government or an army. Plato presented a complete political system in his Republic. And Aristotle in his Politics systematically explains all of the elements of a political community; that it is best when “formed by citizens of the middle class” and “exists for the sake of noble actions, not of mere companionship.”

Perhaps the best poetic description of the human social system is that of English poet John Donne (1572–1631). When he wrote that: “No man is an island, entire of itself; every man is a piece of the continent, a part of the main;” he provided the preamble for modern social science. When he concluded that “any man’s death diminishes me, because I am involved in mankind; and therefore never send to know for whom the bell tolls; it tolls for thee,” he explained why everyone had to understand the doctrines of systems theory.

Since World War II, the social sciences have increasingly used systems theory to examine their assertions about human behavior. Systems theory views social organizations—whether they are as small as a family or as large as a state—as a complex set of dynamically intertwined and interconnected elements. Every system includes inputs, processes, outputs, feedback loops, and the environment in which it operates and with which it continuously interacts. Any change in any element of the system causes changes in other elements. The interconnections tend to be complex, dynamic (constantly changing), and often unknown. For example, consider a beehive. If the drone worker bees ventured forth one day and most of them never came back (because they inadvertently flew into a mist of insecticide), the whole hive would have to change. Honey production would have to be curtailed so that more drones could be raised until the hive, the system, was back in a state of equilibrium. Similarly, when policymakers make decisions involving one element of the system, unanticipated impacts may occur throughout the system. Systems theorists study these interconnections in order to anticipate what was once unanticipated.

Systems thinking is critically important because the whole world, in essence, is a collection of interrelated systems. Nothing happens in isolation. An open system is any organism or organization that interacts with its environment, as opposed to a closed system which does not. A closed system is mainly a theoretical concept since even the most isolated mechanical system will eventually be impacted by its environment. So for all practical purposes all systems theory—especially in the social sciences—is an open systems theory. Because all social organizations are adaptive (and open) systems that are integral parts of their environments, they must adjust to changes in their environment if they are to survive. In turn, virtually all of their decisions and actions affect their environment.

The systems approach while always there, only became self-conscious after biologist Ludwig von Bertalanffy (1901–1972) in the mid-twentieth century sought to organize scientific knowledge into a unified system. This, in turn, influenced David
Easton (1917–) who first applied the approach to modern political analysis. Any review of a policy that seeks to put it in the context of a larger system is using a systems approach.

Easton emphasized the need for political systems to adapt to environmental and technological changes in order to maintain stability. While Easton first applied the systems approach to politics in his 1963 *The Political System*, reprinted here is his analysis of “The Political System Under Stress,” from his 1965 *A Systems Analysis of Political Life*.

While Easton addressed how political systems had to adapt to change, Thomas S. Kuhn (1922–1996) looked at the more fundamental question of how change occurs in the first place. In his landmark book, *The Structure of Scientific Revolutions*, Kuhn explained that as the natural sciences progressed, they amassed a body of ever-changing theory. Scientific advances were not based on the accumulation of knowledge and facts; but rather on a dominant paradigm (or model) used in any specific period to explain the phenomena under study. Rather than refuting previous theories, each paradigm would build upon the body of relevant knowledge and theories. Once a paradigm was accepted by consensus among current scholars, it would last as long as it remained useful. Ultimately it would be displaced by a more relevant and useful paradigm; this process of replacement was Kuhn’s “scientific revolution.”

Kuhn first discovered his paradigms when he, as a graduate student in physics at Harvard, was asked to teach a course on the history of science for undergraduates. He realized that he had “never read an old document in science.” After reviewing Aristotle’s “Physics” he was startled to find how unlike it was to Isaac Newton’s concepts of physics. Aristotle offered not an earlier version of Newton but an entirely different way of looking at the fundamentals of mass, speed and gravity. This led Kuhn to conclude that science is not a steady, step by step, ever upward accumulation of knowledge. Rather, it is “a series of peaceful interludes punctuated by intellectually violent revolutions.” And when those revolutions occur, “one conceptual world view is replaced by another.” The individuals who create such breakthroughs by inventing a new paradigm are “almost always . . . either very young or very new to the field whose paradigm they change. . . . These are the men [and women] who, being little committed by prior practice to the traditional rules of normal science, are particularly likely to see that those rules no longer define a playable game and to conceive another set that can replace them.” This is why the physics of Newton is so radically different from that of Aristotle. Newton’s ideas didn’t expand upon those of Aristotle. Newton supplanted them with totally new ideas.

While paradigms have their own time frames and contents, they overlap both in time and content because they are constantly evolving. In a parallel sense doctrinal development in public policy and administration has been inherently cyclical. A successful innovation by reformers is followed by a period of increased effectiveness, at least until competing societies or organizations adopt similar reforms. But over time advancing technologies and changing environments allow the innovation to deteriorate relative to other arrangements, first to become less competent, then to become
of the Principle of Utility (1780)

1. Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand the standard of right and wrong, on the other the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think: every effort we can make to throw off our subjection, will serve but to demonstrate and confirm it. In words a man may pretend to abjure their empire: but in reality he will remain subject to it all the while. The principle of utility recognises this subjection, and assumes it for the foundation of that system, the object of which is to rear the fabric of felicity by the hands of reason and of law. Systems which attempt to question it, deal in sounds instead of sense, in caprice instead of reason, in darkness instead of light.

But enough of metaphor and declamation: it is not by such means that moral science is to be improved.

2. The principle of utility is the foundation of the present work: it will be proper therefore at the outset to give an explicit and determinate account of what is meant by it. By the principle of utility is meant that principle which

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approves or disapproves of every action whatsoever, according to the tendency which it appears to have to augment or diminish the happiness of the party whose interest is in question: or, what is the same thing in other words, to promote or to oppose that happiness. I say of every action whatsoever; and therefore not only of every action of a private individual, but of every measure of government.

3. By utility is meant that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness, (all this in the present case comes to the same thing) or (what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered: if that party be the community in general, then the happiness of the community: if a particular individual, then the happiness of that individual.

4. The interest of the community is one of the most general expressions that can occur in the phraseology of morals: no wonder that the meaning of it is often lost. When it has a meaning, it is this. The community is a fictitious body, composed of the individual persons who are considered as constituting as it were its members. The interest of the community then is, what?—the sum of the interests of the several members who compose it.

5. It is in vain to talk of the interest of the community, without understanding what is the interest of the individual. A thing is said to promote the interest, or to be for the interest, of an individual, when it tends to add to the sum total of his pleasures: or, what comes to the same thing, to diminish the sum total of his pains.

6. An action then may be said to be conformable to the principle of utility, or, for shortness sake, to utility, (meaning with respect to the community at large) when the tendency it has to augment the happiness of the community is greater than any it has to diminish it.

7. A measure of government (which is but a particular kind of action, performed by a particular person or persons) may be said to be conformable to or dictated by the principle of utility, when in like manner the tendency which it has to augment the happiness of the community is greater than any which it has to diminish it.

8. When an action, or in particular a measure of government, is supposed by a man to be conformable to the principle of utility, it may be convenient, for the purposes of discourse, to imagine a kind of law or dictate, called a law or dictate of utility: and to speak of the action in question, as being conformable to such law or dictate.

9. A man may be said to be a partisan of the principle of utility, when the approbation or disapprobation he annexes to any action, or to any measure, is determined by, and proportioned to the tendency which he conceives it to have to augment or to diminish the happiness of the community: or in other words, to its conformity or unconformity to the laws or dictates of utility.

10. Of an action that is conformable to the principle of utility, one may always say either that it is one that ought to be done, or at least that it is not one that ought not to be done. One may say also, that it is right it should be done; at least that it is not wrong it should be done: that it is a right action; at
least that it is not a wrong action. When thus interpreted, the words *ought*, and *right* and *wrong*, and others of that stamp, have a meaning: when otherwise, they have none.

11. Has the rectitude of this principle been ever formally contested? It should seem that it had, by those who have not known what they have been meaning. Is it susceptible of any direct proof? it should seem not: for that which is used to prove every thing else, cannot itself be proved: a chain of proofs must have their commencement somewhere. To give such proof is as impossible as it is needless.

12. Not that there is or ever has been that human creature breathing, however stupid or perverse, who has not on many, perhaps on most occasions of his life, deferred to it. By the natural constitution of the human frame, on most occasions of their lives men in general embrace this principle, without thinking of it: if not for the ordering of their own actions, yet for the trying of their own actions, as well as of those of other men. There have been, at the same time, not many, perhaps, even of the most intelligent, who have been disposed to embrace it purely and without reserve. There are even few who have not taken some occasion or other to quarrel with it, either on account of their not understanding always how to apply it, or on account of some prejudice or other which they were afraid to examine into, or could not bear to part with. For such is the stuff that man is made of: in principle and in practice, in a right track and in a wrong one, the rarest of all human qualities is consistency.

13. When a man attempts to combat the principle of utility, it is with reasons drawn, without his being aware of it, from that very principle itself. His arguments, if they prove any thing, prove not that the principle is *wrong*, but that, according to the applications he supposes to be made of it, it is *misapplied*. Is it possible for a man to move the earth? Yes; but he must first find out another earth to stand upon.

14. To disprove the propriety of it by arguments is impossible; but, from the causes that have been mentioned, or from some confused or partial view of it, a man may happen to be disposed not to relish it. Where this is the case, if he thinks the settling of his opinions on such a subject worth the trouble, let him take the following steps, and at length, perhaps, he may come to reconcile himself to it.

1. Let him settle with himself, whether he would wish to discard this principle altogether; if so, let him consider what it is that all his reasonings (in matters of politics especially) can amount to?

2. If he would, let him settle with himself, whether he would judge and act without any principle, or whether there is any other he would judge and act by?

3. If there be, let him examine and satisfy himself whether the principle he thinks he has found is really any separate intelligible principle; or whether it be not a mere principle in words, a kind of phrase, which at bottom expresses neither more nor less than the mere averment of his own unfounded sentiments; that is, what in another person he might be apt to call *caprice*?
4. If he is inclined to think that his own approbation or disapprobation, annexed to the idea of an act, without any regard to its consequences, is a sufficient foundation for him to judge and act upon, let him ask himself whether his sentiment is to be a standard of right and wrong, with respect to every other man, or whether every man's sentiment has the same privilege of being a standard to itself?

5. In the first case, let him ask himself whether his principle is not despotical, and hostile to all the rest of human race?

6. In the second case, whether it is not anarchical, and whether at this rate there are not as many different standards of right and wrong as there are men? and whether even to the same man, the same thing, which is right today, may not (without the least change in its nature) be wrong to-morrow? and whether the same thing is not right and wrong in the same place at the same time? and in either case, whether all argument is not at an end? and whether, when two men have said, 'I like this', and 'I don't like it', they can (upon such a principle) have any thing more to say?

7. If he should have said to himself, No: for that the sentiment which he proposes as a standard must be grounded on reflection, let him say on what particulars the reflection is to turn? if on particulars having relation to the utility of the act, then let him say whether this is not deserting his own principle, and borrowing assistance from that very one in opposition to which he sets it up: or if not on those particulars, on what other particulars?

8. If he should be for compounding the matter, and adopting his own principle in part, and the principle of utility in part, let him say how far he will adopt it?

9. When he has settled with himself where he will stop, then let him ask himself how he justifies to himself the adopting it so far? and why he will not adopt it any farther?

10. Admitting any other principle than the principle of utility to be a right principle, a principle that it is right for a man to pursue; admitting (what is not true) that the word right can have a meaning without reference to utility, let him say whether there is any such thing as a motive that a man can have to pursue the dictates of it: if there is, let him say what that motive is, and how it is to be distinguished from those which enforce the dictates of utility: if not, then lastly let him say what it is this other principle can be good for?
Even if we drop the assumption that change is taking place in the environment and turn to systems whose environments have been relatively stable (an exception in the modern world but frequent in the past and undoubtedly possible episodically in the future), we continue to face the problem of how to deal economically and systematically with influences on a system that come from the environment. Whether a system is imbedded in a constantly changing environment or in a stable one, the elements of the environment continue to exert an effect upon the operations of the system. The analysis of the effect of the stable environment on a system poses the same theoretical problems as in the case of rapidly changing ones, even though the rate of change may have important additional consequences.

Although social science has recently and suddenly become enamored of problems of change and a tidal wave of theories of change threatens to engulf us, it has at least opened our eyes to the fact that any general theory, if it is even minimally adequate, must be able to handle change as easily as it does stability.¹ But the truth is that in the elaboration of the initial fundamental categories of an analysis, there is no need for special concepts to study change. Indeed to introduce them would be a sign of weakness and a disjunction in the theory, not one of strength and integration.

Stability is only a special example of change, not a genetically different one. There is never a social situation in which the patterns of interaction are

¹I am here using the concept “change” in the usual loose sense of social science. The fact is that stability is not related to change or its antithesis. For the difference between static as against changing conditions on the one hand and stability on the other, see my previously cited article “Limits of the Equilibrium Model in Social Research.”
absolutely unchanging. If stability is to have any sensible meaning, it must represent a condition in which the rate of change is slow enough to create no special problems due to change. But some change there always is. Hence, the study of stable systems involves a special case of change, one where the rate is slow. Similarly, so-called change draws attention to another special case in which the rate is high enough to create special consequences of which it is necessary to take note, both analytically and empirically.

Any general theory or conceptual framework, however, should be able to take both special cases simultaneously in its stride. The vital objective at the outset is not to create a special set of categories to examine special cases but, rather, to develop a set that will be useful for identifying the major variables involved in the functioning of the system, regardless for the moment of the rate of change. Whether a system is changing imperceptibly and is, therefore, said to be stable or whether it is changing rapidly and is, therefore, characterized as unstable or in transition does not alter the nature of the fundamental variables that need to be examined. It may add to them, but it cannot detract from them. The categories presented below are designed to be of this generic character.

Environmental Disturbances Under Conditions of Stability

Even under conditions of stability, where the rate of change is low, interaction between the environment and a system continues to occur. Hence, even if a special theory of change were required, it could not eliminate the similarity between change and nonchange with respect to the continuing presence of exchanges between a political system and its environment.

To illustrate, let us assume that we were interested in tracing out the consequences of social stratification upon the political structure. At one point, where a change had taken place in the social structure, we might discover that the realignment of social classes had modified the distribution of power in society in such a way that a new political elite had displaced the old one. The French and Russian Revolutions both led to consequences such as these. But once these effects on the political system had been produced, this did not lead to the elimination of the effects of the new class structure on the society, even if the new class relationship remained absolutely static. Once a change is introduced and stabilized, it may continue to exert its influence on other aspects of society. It is not like a bolt of lightning that does its damage and disappears to leave a single deposit of effects. Rather, it constitutes a continuing pressure on the political system.

The new status and class structure of the society would exert its continuing pressure on the political structure in many ways. It might affect the kind of persons recruited to political positions, the variety of issues raised for discussion, and the kind of decisions actually adopted and implemented. The absence of change implies not that politics escapes the influence of its parameters, but the stabilization of these influences. In other words, the exchanges between an environment and the political system imbedded in it continue, but without important modification.
It is vital to realize this fact. Even under the unreal state of absolutely static conditions in the environment of a political system, transactions between the two would still take place. If it were otherwise, we could never understand how a system could experience stress even if its conditions of existence did not change. If the conditions themselves have always been stressful, a system could be destroyed, not as a result of new kinds of stress occurring, but as a consequence of the failure of the members of the system at some point to handle the old and stable kinds as adequately as their predecessors.

The Linkage Variables Between System and Environment

Two things are clear from the preceding discussion. First, there is an enormous variety of influences coming from the environment of a political system capable of disturbing the way in which the system performs its tasks. Second, these influences are there whether the environment is relatively stable or fluctuating wildly. Environmental change which draws so much attention today, and appropriately so, does not create entirely new theoretical problems in the construction of a general structure of analysis. It simply aggravates an analytic problem that is already present, namely: How are we to systematize our understanding of the way in which the disturbances or influences from the environment are transferred to a political system? Do we have to treat each change or disturbance as a particular or general type, as the case may be, and simply work out its specific effects in each instance? If so, because of the obviously enormous variety of influences at work, the problems for systematic analysis are virtually insurmountable. But if we can discover a way of generalizing our method for handling the impact of the environment on a system, there would be some hope for reducing the enormous variety of influences into a relatively few and, therefore, relatively manageable number of indicators or variables. This is precisely what I shall seek to do.

Transactions Across System Boundaries

Since we have been conceiving of a political system as analytically separable from all other social systems, and frequently empirically differentiated as well through an independent political structure, it is useful to treat the disturbances or influences occurring from behavior in the environmental systems as exchanges or transactions that cross the boundaries of the political system. None of the broad social systems into which I have classified the environment stands completely independent of the other; complex interpenetration occurs. That is, each is coupled to the other in some way, however slight it may be. Exchanges can be used when we wish to refer to the mutuality of the relationship, that is, where each has a reciprocal influence on the other. Transaction
may be used when we wish to emphasize the movement of an effect in one direction, simply across the boundary from one system to another.²

However scientifically important it may be to point this out, by itself the statement is so obvious as to have little interest. What can and will carry recognition of this coupling beyond a mere truism is the invention of a way to trace out the complex exchanges so that we can readily reduce the immense variety of interactions to theoretically and empirically manageable proportions.

In order to accomplish this, I propose to reduce the major and significant environmental influences to a few indicators. Through the examination of these we should be able to appraise and follow through the potential impact of environmental events on the system. With this objective in mind, I shall designate the effects that are transmitted across the boundary of a system toward some other system as the outputs of the first system and, hence, as the inputs of the second system, the one that they influence. A transaction between systems will therefore be viewed as a linkage between them in the form of an input-output relationship.

If we now apply this general conceptualization of the points of linkage between systems to a political system and its environmental systems, it offers us a rudimentary model of the type illustrated in Diagram 2. This is, of course, a gargantuan oversimplification both of reality and of my developing conceptual scheme itself. But the task of analysis is at least to begin by stripping away all incidental relationships in order to lay bare the essential framework. These are the very minimal commitments if we inquire into political life as a system of behavior. In a succeeding volume the objective will be to add complicating relationships of various sorts so that the model will offer a somewhat closer approximation to the relationships in phenomenal systems. Here the analysis will remain macroscopic in intent. We shall be observing political systems from a considerable distance, as through a telescope rather than a microscope. This is in the nature of the case, given the present state of theoretical analysis in political research. Although we have much empirical detail, we have tended to lose sight of the need to see the outlines of the over-all picture.

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²Exchange is sometimes used to suggest some kind of mutually beneficial relationship such as a settlement or contractual tie in which each of the parties feels there is something to be gained. I presume that Talcott Parsons typically uses the concept in this or in a closely related sense. See his use of the term in *The Social System* (New York: Free Press of Glencoe, Inc., 1951), especially at pp. 122 ff and in a volume with N. J. Smelser, *Economy and Society* (New York: Free Press of Glencoe, Inc., 1956), pp. 105 and 184. Here, however, I shall confine the term to a neutral meaning, one that denotes only that events in two or more systems have reciprocal effects on the systems involved and that these effects are not unrelated to each other. Interaction might well have been used to describe the relationship except that it has been customary to restrict this concept to the actions and reactions among social roles rather than among systems.
Diagram 2  A Dynamic Response Model of a Political System

A Flow Model of the Political System

Broadly, this diagramatic representation of the functioning of a political system suggests that what is happening in the environment affects the political system through the kinds of influences that flow into the system. Through its structures and processes the system then acts on these intakes in such a way that they are converted into outputs. These are the authoritative decisions and their implementation. The outputs return to the systems in the environment, or, in many cases, they may turn directly and without intermediaries back upon the system itself. In Diagram 2 on page 000 the arrows from the environments portray the vast variety of transactions between them and the political system. Here, though, the arrows have only single heads, and they are shown in such a way that they are fed into the system in summary form as demands and support. The exchange or reciprocity of the relationship between the system and its environments, previously depicted as double-headed arrows, is now indicated by arrows that show the direction of flow of the outputs toward the environmental systems. This clearly demonstrates that the inputs of the environment are really just the outputs of the political system. The broken lines in the environmental systems reflect the dynamics of the relationship. They indicate that there is a continuous flow of influences or outputs from the political system into and through the environments. By modifying the environments, political outputs thereby influence the next round of effects that move from the environment back to the political system. In this way we can identify a continuous feedback loop. The meaning of the other lines and designations on the diagram will become apparent as our discussion proceeds.
As detailed as the diagram is, much is omitted, as we would expect. First, many other environmental systems could be added even to take into account the few that were identified in an earlier chapter. Second, the interrelationships among environmental systems themselves are completely omitted since they would have so cluttered the diagram as to leave it virtually indecipherable. Finally, the structures and processes through which a political system converts its inputs into outputs are represented only by the serpentine line within the system. It does suggest, however, that the various inputs from the external system are worked upon and converted into outputs that return to one or another of the external systems as inputs for them.

Diagram 3 goes even further in stripping the rich and complex political processes down to their bare bones. It depicts in their simplest guise the dynamic relationships among the processes of a political system. It serves to dramatize an image to which we shall return; it reveals that, after all, in its elemental form a political system is just a means whereby certain kinds of inputs are converted into outputs. At least, this is a highly useful starting point from which to begin plugging in the complexities of political life.

The Input Variables

Demands and Support as Input Indicators

The value of inputs as a concept is that through its use we shall find it possible to capture the effect of the enormous variety of events and conditions in the environment as they pertain to the persistence of a political system. Without the inputs it would be difficult to delineate in any precise operational way how
behavior in the various sectors of society affects what happens in the political sector. Inputs will serve as summary variables that concentrate and reflect everything in the environment which is relevant to political stress. Because it is possible to use inputs in this manner, the concept can serve as a powerful analytic tool.

Whether or not we use inputs as summary variables will depend upon how we define them. We might conceive of them in their broadest sense. Then we would interpret them as including any event external to the system—confining ourselves momentarily to environmental inputs—that alters, modifies, or affects the system in any way. If inputs are used in such a broad sense, we could never exhaust the list of those that leave an impact on the political system. The double-headed arrows coupling environmental systems to the political system could be multiplied a thousandfold, and we would not have begun to skim the surface of the number and variety of influences flowing among these systems.

Let us take only a minute number of illustrations. The effect of the economy on creating and sustaining powerful economic classes, urbanization, interest group segmentation, fluctuations in the business cycle, and the like would constitute inputs, broadly interpreted, that shape the character of the political structure, the distribution of power therein, and the goals of political controversy. The general culture helps to mold the constraints within which political discussion and competition take place (if it is permitted at all), lends color to the style of political life, and signalizes the kinds of issues that will be considered important by the members of the system. Motivational patterns found in modal personality types or in elite personalities within a society will contribute to the availability of personnel to fill the political roles, to the incentives for political participation, and to the types that achieve leadership status and to their perception of policy. We could enlarge this list indefinitely. For each sector of the environment introduced we would need a separate partial theory to explain the effect which its inputs might have. The only unifying element in it all would be that we were seeking to trace out and interrelate the inputs (that is, the general and specific effects) of each of these parameters on a common object—the political system.

However, we can simplify enormously the task of analyzing the impact of the environment on the political systems if we adopt more narrowly defined inputs and use them as indicators that will sum up most of the important effects that cross the boundary between these systems. This conceptualization would relieve us of the need to deal with and trace out the effect on a system of every different type of environmental event separately.

As the analytic tool for this purpose, it is helpful to view the major parameters as focusing their effects on two major inputs: demands and support. Through them a vast range of changes in the environment may be channeled, reflected, and summarized. For this reason they can be used as the key indicators of the way in which environmental events and conditions modify and affect the operations of the political system. On Diagram 2, page 13, the multiple
transactions are collapsed into two major inputs, and these alone are conceived as flowing into and affecting the political system. It will matter little whether we consider these inputs as internal or external to the political system. They stand on the border, bridging and linking the political system with all other intra- and extrasocietal systems. Depending upon the requirements of our analysis, they may be equally conceived to lie within the system or outside it, as long as we recognize that they remain in the neighborhood of the boundary.

"Withinuts" as Intrasystem Indicators

At times I have been writing as though all the influences or disturbances that had to be considered in understanding how a system manages to persist occurred in the environment of a system. As we know from what has already been said, many of these influences may occur within a system itself. Insofar as things happening within a system shape its destinies as a system of interactions, it will be possible to take them into account as they are reflected through the inputs of the members of a system. It does not seem reasonable to speak of these events as inputs since they already occur within the system rather than outside. For the sake of logical consistency we might call them "withinuts." All that would be meant by this neologism is that we have decided to treat, in a unified way, the effects that events and conditions both within and without a system may have upon its persistence. Hence, unless the context requires otherwise, in writing of inputs I shall include "withinuts" in the same category.

We need to take the trouble to make the distinction because recognition of the two categories sensitizes us to the value of looking within the system as well as the environment to find the major influences that may lead to stress. Just as a human body may fail because of an infection received from the outside or from the attrition, through old age, of some organ such as the heart, a political system may suffer stress from disturbances in the environment or from failures that can be attributed directly to processes or structural arrangements within the system itself. For example, members of the American political system have from time to time felt that the whole regime has been threatened by the difficulties that the separation of powers has aggravated with regard to the passage of legislation. This is traditionally brought out in discussions of a responsible two-party system for the United States. To signalize the fact that the disturbance has occurred within the system and that the stressing input has been shaped by internal events, the concept "withinuts" can be used.

Illustrations of the Summary Function of Inputs

It will be helpful to have some brief indication of what demands and support comprise and how they could be used, although a full analysis of their role as summary variables through which stress is transmitted will have to await a later work. To take a specific example, let us assume that we are interested in a developing nation which is undergoing a transition from a tribal form of orga-
nization based upon village headmen, lineage elders, and a lineage-
determined paramount chief with minimal power, toward a national political
leadership based upon secular party organization, a legislature, an efficiency-
oriented bureaucracy, and a dominant leadership. Presumably the modifica-
tions of the old tribal system have been brought about in part through contact
with Western ideals of democracy and administration, buttressed by the needs
of a changing economy and social structure.

In accordance with current procedures of political research, we might
specify the aspect of political change that seems to be important. Normally we
would use as the criteria of relevance those changes in the direction of or away
from Western democratic institutions. We might then seek to account for the
direction, rate, and outcome of these changes by considering all of the exter-
nal changes that can then be shown to be relevant to the political changes
which we have already selected as important according to these criteria.

From the perspectives of our analysis the environmental changes are con-
sidered to be disturbances on the existing tribal system because of the stress
they impose upon it, leading ultimately to its transformation. In response to the
stress the system either becomes extinct and is absorbed by some other soci-
ety, or it responds and adapts by adopting modernized political structures in
the shape of parties, legislatures, rationalized bureaucracy, and a generalized
leadership (rather than a lineage, tribal, or ethnically based leadership).

The critical questions for us do not relate to the way in which environmen-
tal disturbances modify the particular form of the internal structures or
processes of the system. Such changes may take place without any discernible
effect upon the capacity of some kind of system to persist, or they may not be
fundamentally related to this capacity. That is to say, whether the adopted
modernized structure happens to be modeled after the British parliamentary
system or the American presidential type may or may not have relevance to the
capacity of some kind of system to persist. What is important is that the tradi-
tional political forms have given way to at least a semblance of the bureaucra-
tized types. For us the critical questions are: To what extent did the
disturbances constitute stress on the pre-existing system? Precisely how did
this stress manifest and communicate itself? How did the system cope with this
stress, if at all?

A useful way of answering such questions lies in exploring the impact that
contacts with the West, both ideological and economical, have upon the
inputs. Briefly, exposure to the kind of life possible under Western forms of
social organization, together with the emergence of the material means
through transition from a subsistence to a cash and wage economy, has
unleashed a vast increase in the volume of demands which members of the
system now seek to satisfy through political action. This in itself imposes such
a severe burden on the old tribal forms of political organization that they could
not possibly cope with them.

Further, the changes in the environment serve to broaden the types of
demands for which satisfaction is now sought through the political system.
Such new demands, at their most inclusive level, are typically capsulated into
programs for national freedom and political unity among divergent groups, linked usually to policies advocating a rapid rate of economic development. The kinds of commitments required from the members of the system for the fulfillment of these types of demands are dramatically different from those required under the prior traditional systems. The novelty of the demands themselves create severe crises in the developing nations.

Changes in volume and variety of demands represent a major and fundamentally neglected type of stress that environmental changes may be interpreted as bringing to bear upon a political system. In this way a vast host of different kinds of changes such as these may be drawn together and observed through a single kind of variable, that is, as they influence the volume and variety of demands.

3


Thomas S. Kuhn

These remarks permit us at last to consider the problems that provide this essay with its title. What are scientific revolutions, and what is their function in scientific development? Much of the answer to these questions has been anticipated in earlier sections. In particular, the preceding discussion has indicated that scientific revolutions are here taken to be those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one. There is more to be said, however, and an essential part of it can be introduced by asking one further question. Why should a

change of paradigm be called a revolution? In the face of the vast and essential differences between political and scientific development, what parallelism can justify the metaphor that finds revolutions in both?

One aspect of the parallelism must already be apparent. Political revolutions are inaugurated by a growing sense, often restricted to a segment of the political community, that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created. In much the same way, scientific revolutions are inaugurated by a growing sense, again often restricted to a narrow subdivision of the scientific community, that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way. In both political and scientific development the sense of malfunction that can lead to crisis is prerequisite to revolution. Furthermore, though it admittedly strains the metaphor, that parallelism holds not only for the major paradigm changes, like those attributable to Copernicus and Lavoisier, but also for the far smaller ones associated with the assimilation of a new sort of phenomenon, like oxygen or X-rays. Scientific revolutions . . . need seem revolutionary only to those whose paradigms are affected by them. To outsiders they may, like the Balkan revolutions of the early twentieth century, seem normal parts of the developmental process. Astronomers, for example, could accept X-rays as a mere addition to knowledge, for their paradigms were unaffected by the existence of the new radiation. But for men like Kelvin, Crookes, and Roentgen, whose research dealt with radiation theory or with cathode ray tubes, the emergence of X-rays necessarily violated one paradigm as it created another. That is why these rays could be discovered only through something's first going wrong with normal research.

This genetic aspect of the parallel between political and scientific development should no longer be open to doubt. The parallel has, however, a second and more profound aspect upon which the significance of the first depends. Political revolutions aim to change political institutions in ways that those institutions themselves prohibit. Their success therefore necessitates the partial relinquishment of one set of institutions in favor of another, and in the interim, society is not fully governed by institutions at all. Initially it is crisis alone that attenuates the role of political institutions as we have already seen it attenuate the role of paradigms. In increasing numbers individuals become increasingly estranged from political life and behave more and more eccentrically within it. Then, as the crisis deepens, many of these individuals commit themselves to some concrete proposal for the reconstruction of society in a new institutional framework. At that point the society is divided into competing camps or parties, one seeking to defend the old institutional constellation, the others seeking to institute some new one. And, once that polarization has occurred, political recourse fails. Because they differ about the institutional matrix within which political change is to be achieved and evaluated, because they acknowledge no supra-institutional framework for the adjudication of revolutionary difference, the parties to a revolutionary conflict must finally resort to the techniques of mass persuasion, often including force. Though revolutions
have had a vital role in the evolution of political institutions, that role depends upon their being partially extrapological or extrainstitutional events.

The remainder of this essay aims to demonstrate that the historical study of paradigm change reveals very similar characteristics in the evolution of the sciences. Like the choice between competing political institutions, that between competing paradigms proves to be a choice between incompatible modes of community life. Because it has that character, the choice is not and cannot be determined merely by the evaluative procedures characteristic of normal science, for these depend in part upon a particular paradigm, and that paradigm is at issue. When paradigms enter, as they must, into a debate about paradigm choice, their role is necessarily circular. Each group uses its own paradigm to argue in that paradigm's defense.

The resulting circularity does not, of course, make the arguments wrong or even ineffectual. The man who premises a paradigm when arguing in its defense can nonetheless provide a clear exhibit of what scientific practice will be like for those who adopt the new view of nature. That exhibit can be immensely persuasive, often compellingly so. Yet, whatever its force, the status of the circular argument is only that of persuasion. It cannot be made logically or even probabilistically compelling for those who refuse to step into the circle. The premises and values shared by the two parties to a debate over paradigms are not sufficiently extensive for that. As in political revolutions, so in paradigm choice—there is no standard higher than the assent of the relevant community. To discover how scientific revolutions are effected, we shall therefore have to examine not only the impact of nature and of logic, but also the techniques of persuasive argumentation effective within the quite special groups that constitute the community of scientists.

To discover why this issue of paradigm choice can never be unequivocally settled by logic and experiment alone, we must shortly examine the nature of the differences that separate the proponents of a traditional paradigm from their revolutionary successors. That examination is the principal object of this section and the next. We have, however, already noted numerous examples of such differences, and no one will doubt that history can supply many others. What is more likely to be doubted than their existence—and what must therefore be considered first—is that such examples provide essential information about the nature of science. Granting that paradigm rejection has been a historic fact, does it illuminate more than human credulity and confusion? Are there intrinsic reasons why the assimilation of either a new sort of phenomenon or a new scientific theory must demand the rejection of an older paradigm?

First notice that if there are such reasons, they do not derive from the logical structure of scientific knowledge. In principle, a new phenomenon might emerge without reflecting destructively upon any part of past scientific practice. Though discovering life on the moon would today be destructive of existing paradigms (these tell us things about the moon that seem incompatible with life's existence there), discovering life in some less well-known part of the galaxy would not. By the same token, a new theory does not have to conflict
with any of its predecessors. It might deal exclusively with phenomena not previously known, as the quantum theory deals (but, significantly, not exclusively) with subatomic phenomena unknown before the twentieth century. Or again, the new theory might be simply a higher level theory than those known before, one that linked together a whole group of lower level theories without substantially changing any. Today, the theory of energy conservation provides just such links between dynamics, chemistry, electricity, optics, thermal theory, and so on. Still other compatible relationships between old and new theories can be conceived. Any and all of them might be exemplified by the historical process through which science has developed. If they were, scientific development would be genuinely cumulative. New sorts of phenomena would simply disclose order in an aspect of nature where none had been seen before. In the evolution of science new knowledge would replace ignorance rather than replace knowledge of another and incompatible sort.

Of course, science (or some other enterprise, perhaps less effective) might have developed in that fully cumulative manner. Many people have believed that it did so, and most still seem to suppose that cumulation is at least the ideal that historical development would display if only it had not so often been distorted by human idiosyncrasy. . . . Normal research, which is cumulative, owes its success to the ability of scientists regularly to select problems that can be solved with conceptual and instrumental techniques close to those already in existence. (That is why an excessive concern with useful problems, regardless of their relation to existing knowledge and technique, can so easily inhibit scientific development.) The man who is striving to solve a problem defined by existing knowledge and technique is not, however, just looking around. He knows what he wants to achieve, and he designs his instruments and directs his thoughts accordingly. Unanticipated novelty, the new discovery, can emerge only to the extent that his anticipations about nature and his instruments prove wrong. Often the importance of the resulting discovery will itself be proportional to the extent and stubbornness of the anomaly that foreshadowed it. Obviously, then, there must be a conflict between the paradigm that discloses anomaly and the one that later renders the anomaly law-like. The examples of discovery through paradigm destruction . . . did not confront us with mere historical accident. There is no other effective way in which discoveries might be generated.

The same argument applies even more clearly to the invention of new theories. There are, in principle, only three types of phenomena about which a new theory might be developed. The first consists of phenomena already well explained by existing paradigms, and these seldom provide either motive or point of departure for theory construction. . . . A second class of phenomena consists of those whose nature is indicated by existing paradigms but whose details can be understood only through further theory articulation. These are the phenomena to which scientists direct their research much of the time, but that research aims at the articulation of existing paradigms rather than at the invention of new ones. Only when these attempts at articulation fail do scientists encounter the third type of phenomena, the recognized anomalies whose
characteristic feature is their stubborn refusal to be assimilated to existing paradigms. This type alone gives rise to new theories. Paradigms provide all phenomena except anomalies with a theory-determined place in the scientist’s field of vision.

But if new theories are called forth to resolve anomalies in the relation of an existing theory to nature, then the successful new theory must somewhere permit predictions that are different from those derived from its predecessor. That difference could not occur if the two were logically compatible. In the process of being assimilated, the second must displace the first.

Review Questions

1. What is Jeremy Bentham’s principle of utility? Why is Bentham considered one of the founders of the field of public policy analysis?

2. What are the basic elements common to all political, indeed all social, systems? According to David Easton how does a political system respond or adapt to new forces in its environment?

3. Why does Thomas Kuhn believe that scientific revolutions, as opposed to evolution, have been so crucial in the development of new knowledge? How does Kuhn’s concept of scientific revolution apply to understanding developments in public policy?