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How Government Processes Information and Prioritizes Problems

On Monday, July 28, 2003, Republican senator James Inhofe of Oklahoma, chairman of the Committee on Environment and Public Works, rose to deliver a speech to the Senate on global warming. He began by stating, "One very critical element to our success as policymakers is how we use science." He went on to claim that environmental extremists dismiss science as "irrelevant" because they are "prophets of doom who peddle propaganda masquerading as science in the name of saving the planet from catastrophic disaster." The senator continued: "The evidence is overwhelmingly in favor of those who don't see global warming posing grave harm to the planet and who don't think human beings have significant influence on the climate system." Inhofe ended his speech by saying, "Over the past two hours, I have offered compelling evidence that catastrophic global warming is a hoax. . . . Natural variability, not fossil fuel emissions, is the overwhelming factor influencing climate changes; . . . no meaningful warming has occurred over the last century; and climate models predicting dramatic temperature increases over the next 100 years are flawed and highly imperfect" (Inhofe 2003).

Senator Inhofe certainly has a point: Scientific information is very often distorted, ignored, misused, and cited selectively in the heat of political debate. And of course when one side does this type of thing, we can expect the other side to respond in kind. Just as he accused his opponents of distorting the facts in support of their agenda, his statements can be seen in a similar vein. They are clearly "propaganda masquerading as science," although his distortion serves the purpose of saving America from "an agenda of energy suppression" (as he might put it). Almost all of the evidence he cited as supporting his claim to sound science is either misleading or outright wrong. Prevailing evidence clearly supports the thesis of global warming since the

mid-1800s, and there is ample evidence that humans have influenced the climate cycle—though there is scientific debate on this point (Alley 2000; Mayewski and White 2002).

It is indeed true that the earth's climate is highly cyclical, and climatologists must take great care in separating natural cycles and trends from human-caused (or at least more recent) changes. Moreover, Inhofe is on target with his critique that the Kyoto Treaty on Global Warming will do little (he says "nothing") to lower the earth's temperature through setting greenhouse gas emission targets. Inhofe's claim that predictive climate models "are flawed and highly imperfect" is entirely correct. But his conclusion, that his position that no meaningful warming has occurred in the last century is "supported by the painstaking work of the nation's top climate scientists," is not just misleading. It is not true.

Such misuse of information is quite common in politics, and it's been done on all sides of the climate debate. Luckily for all of us, we are not dependent on a single source of information in any complex policy debate. Information matters, even though it enters the political process imperfectly, policy advocates and government officials often attempt to distort it, and there is no guarantee that all relevant pieces of information will enter the political debate on any given subject. But the policy process, and government in general, is rife with information, and this provides a critical but often overlooked dynamic in politics.

The Role of Information in Political Systems

This book is about how political systems, and in particular the American political system, process information in producing public policies. It may seem strange to use a "J'accuse" speech full of distortions and misleading accusations by an energy-state politician with an axe to grind as a starting point for this exploration. Yet through his severely selective use of evidence and downright fabrications, surely Inhofe has scored a major point: many environmentalists have consistently overstated the scientific consensus, and made an even greater leap by implying that lowering greenhouse emissions is both possible and effective. They, too, are sinners.

Thoughtful observers may abhor Inhofe's methods. Indeed, calm people may, with just cause, reject the whole debate as "politics as usual." Many people are turned off by politics because of these types of distortions. We do not have this reaction. Rather, we want to understand how information is used, and how it can be used, in government. Government includes elected

officials representing constituencies that will lose jobs if certain policies are enacted. Of course officials distort the facts. In some ways, that is their job; they were elected to protect the interests of their constituents. Others have different beliefs, and they fight for what they believe serves their interests or the public good. The key question is not how one actor behaves (or misbehaves) but how the entire system of government makes use of the conflicting and often ambiguous information thrust upon it by scientists, advocates, and others. We are not cynical or pessimistic about the ability of the American political system to process information, but neither are we complacent. The political process, with its complex machinery of government and its associated interest groups, communities of professionals in scores of policy domains, and tight links to other social and economic actors, processes massive amounts of information. It does so imperfectly and in fits and starts, with no guarantee of proportionality (indeed, with little likelihood of proportional response to new information). We spend the rest of this book explaining how the government processes information, and why that matters. Along the way, we develop a new theory of policy change, one based on disproportionate information-processing in policymaking that integrates seemingly discredited old theories of incrementalism with the theory of punctuated equilibrium.

Policymakers, interest groups, media outlets, and government agencies all have vested interests, ideological blinders, short attention spans, and self-interested motivations, so how is information incorporated into public policy? Scientists and engineers often abhor the political process because it is not "objective." The prevailing view of politics among most citizens and many political scientists is profoundly cynical: politics is simply the struggle among interests, and interests win because they have resources. We don't disagree with this (though we think it is vastly overstated), but we add to this a different focus. We note in the pages to come a litany of other human limitations that interfere with sound decision making. Yet we see information as providing a profound dynamic element to the political process, and we see the pursuit of democratic politics as essential to the processing of information in public policymaking. Just as important, the effective processing of information is necessary for the conduct of democratic government. They are as intertwined as the strands of DNA's double helix. Like it or not, we can't understand government and how it operates without understanding how it processes information, including how it distorts information.

In this argument we are far more optimistic about American democracy than the prevailing tone of cynicism would lead many to be. Citizens—many in the academy, the so-called think tanks that hype propaganda as scientific studies; most in the media; and a certain senator from Oklahoma who seems

› think that distortion by the other side is wrong, but not so bad when done
›y his side—by actions or words all communicate that cynicism. And we
ontinue our claims, laid out a decade ago, that a dynamic view of American
›olitics leads not to "gridlock" and inaction (or, in the modern terminol-
›gy, dominance by "veto groups"), but to destruction of prevailing elite "sys-
ems of limited participation" and to dynamic, if punctuated and uncertain,
›hange (Baumgartner and Jones 1993). We are not Pollyannas with a naive be-
ief in progress. Our optimism is tempered by today's harsh and unforgiving
›olitics and the seeming failing of the American political system to focus
›n our own well-thought-out priorities. But it is buoyed by our study of his-
tory: democratic political systems respond to information. President Abra-
ham Lincoln summarized it best when he commented that you can fool all the
people some of the time, and some of the people all of the time, but you can't
fool all of the people all of the time.

Overview of the Argument

The primary purpose of this book is to move toward placing information processing at the heart of the study of American politics and public policy. We do not stop with exhortation; we use the Policy Agendas Project datasets to develop a full set of empirical results from this approach. In the process, we show how an appreciation of the ways political systems cope with vague, ambiguous, and uncertain signals from the environment can integrate two great enterprises in the study of American politics: policy process approaches and institutional analyses. We do so by focusing not primarily on the preferences and procedures of the institutions, and not on the specifics of particular public policies, but on how institutional procedures constrain policy reactions to the flow of information. Compared to standard institutional analyses, our approach is dynamic. Compared to standard public policy process studies, our scope is comprehensive.

In developing this line of argument, we solve a long-standing problem facing the study of decision making in public policy: why no model of choice has been put forward to replace the discredited incremental theory. In incrementalism, policymakers were supposed to make small adjustments on past actions. But incrementalism had a "hidden assumption": that the information causing the small adjustments was processed proportionately (we show that the information flow itself does not have to be well behaved; only the processing of it need be so). Several studies recognized and pointed to problems with this assumption, but only two came anywhere close to solving the problem:

Larkey's (1979) idea of "error accumulation" in budget decisions, and Padgett's (1980, 1981) stochastic process studies of budgetary change. We build on those insights and show here that a model of *disproportionate information-processing*, based on how the cognitive limits of decision makers and formal and informal arrangements of groups of decision makers affect the dynamic processing of information, solves the problem by integrating incrementalism into a broader theory of political choice. Incrementalism was not wrong; indeed we show that it was probably understated by its proponents. But it is far from the full story. It must be combined with a theory of punctuated equilibrium to reach its full potential.

Disproportionate information-processing leads to a pattern of extreme stability and occasional punctuations, rather than either smooth adjustment processes or endless gridlock. It subsumes the punctuated equilibrium model of policy change, which we developed more than a decade ago (Baumgartner and Jones 1993). The term *punctuated equilibrium* was popularized by the work of paleontologists Niles Eldridge and Steven Gould (1972). We were not the first to employ the metaphor; it has been used loosely in political science to refer to reactions to large-scale crises in the environment (and occasionally more rigorously; see Carmines and Stimson 1989). We argued instead that punctuations in policy outcomes reflected an interaction between change in the environment and reverberations inside the political system. In particular, we took the traditional static notion of policy subsystem, in which specialized interest groups, congressional committees, and federal agencies responsible for implementing policies interact to find an equilibrium of interests, and added a dynamic. The dynamic is an appeal by the disfavored side in a policy subsystem, or those excluded entirely from the arrangement, to broader political processes—Congress, the president, political parties, and public opinion. This mobilization could act to destroy or radically alter the prevailing and powerful arrangements among privileged interests.

There were already key scholarly works on this mechanism (Jones 1975; Redford 1969); we added the important component of *policy image*. We argued that destroying or altering a subsystem of interests required changing the image of the policy prevailing outside the subsystem. We also noted that *policy venues* are typically not fixed in the U.S. political system and that shifting images are often linked with aggressive venue-shopping by protagonists shut out of the old venues. Venues resisting change resist new images; however, nothing stops policy entrepreneurs from seeking new venues more receptive to the new policy images, and in the U.S. system jurisdictions are often in dispute.

It is only a small step from the notion of policy image to a theory of infor-

nation processing, but it is not a simple one. The reason is that *information* implies something firm, while *image* seems squishy. The trick is to see information as ambiguous (subject to differing interpretations), not just uncertain (subject to high variance). We see information as possessing dimensionality; each dimension is associated with an interpretation. Each dimension or interpretation is weighted—more or less prevalent and persuasive, more or less relevant to the decision, central or tangential to understanding the policy. In the extreme, many dimensions are effectively ignored (assigned a weight of zero), only later to be "discovered" by policymakers who should have known about them all along. Nuclear power in the 1950s was viewed through the lens of "atoms for progress," but by the 1960s it had become associated with environmental danger, workplace safety, and the fear of nuclear proliferation. Somehow over time the weights on these competing interpretations changed. They changed partly because of the facts, and partly because of the political arguments put forth by opponents of nuclear power. When images shift, punctuations can occur; image shifts are part of disproportionate information processing. Over the long term, it is sometimes surprising in retrospect how important elements of policy debate can be virtually ignored for very long periods of time. While specialists are often aware of them, they simply do not gain attention compared to other dimensions of the debate.

Of course, the American political system is not processing just one issue at a time. It juggles numerous issues simultaneously. Most issues most of the time are far from the national political agenda, far from the front page of the newspaper, relegated to the various communities that exist in all areas of public policy, and subject to subsystem equilibrium processes. If and when these issues have won the attention of the primary policymaking institutions, errors have often accumulated, and punctuations must occur to "catch up" with changing reality. While institutions can parallel process numerous policy matters simultaneously, the processing system is imperfect, and these imperfections lead to punctuations.

Finally, institutions add "drag" even beyond what the information-processing approach sketched above implies. Political institutions impose costs on the process of coming to collective choice by requiring supermajorities within institutions and collaborations among them. These decision costs do not lead invariably to gridlock, as the existing institutional literature implies. Nor do they require a change in political party (or legislative/presidential preferences) to produce major punctuations, although this is clearly one major source of change. Any flow of information can overcome the institutional friction inherent in the American political system, but either it must

be very intense objectively or it must reverberate around the system via the interpretative arguments that political actors make. That is, an image change, born either of strong external signals or of internal debate (or both), must occur. And that completes the integration of policy change theories, punctuated equilibrium, and static institutional analyses.

In the rest of this chapter, we introduce the fundamental idea of information processing in policymaking; give an overview of the major features of our approach; and show how we plan to integrate incremental decision making, punctuated equilibrium, and institutional analysis within the theory.

Information Processing

Information processing may be defined as collecting, assembling, interpreting, and prioritizing signals from the environment. A *signal* is simply some detectable change in what is happening "out there." All signals are characterized by *uncertainty* (we can't always be sure something out there has actually changed) and *ambiguity* (we can't be certain what the signal means). As a consequence, it is never fully clear that there has been a relevant change in the policymaking environment. Moreover, objective changes in the environment—signals—must be distinguished from attention to these signals. Signals are information, but when we become aware of signals, they become "news." In politics, as in communication theory, signal detection is critical to future action.

Signals may be misinterpreted once they are detected, because of uncertainty or bias. Not only are many signals unclear (that is, subject to differing possible interpretations, not self-evident), but those who interpret signals are often biased. They may have professional training that leads them to focus on one issue rather than another, an ideological bias, an economic interest, or a political position that makes them support one outcome rather than another. In politics and in public policy, most who are involved care about the outcomes; they are not and should not be expected to be "neutral." Some mischaracterize signals because of conscious or unconscious bias, and others may do so purposefully for strategic reasons. In sum, there are many reasons to question not only the accuracy of signals but the ways in which signals get interpreted through the policy process. Decision makers, like all people, often ignore important changes until they become severe or until policy entrepreneurs with an interest in the matter highlight such changes. The fact that decision makers filter signals through their attentiveness, assimilate informa-

tion in a biased manner, and generally act as bounded rationalists, means that they cannot be expected to respond proportionately to the strengths of incoming informational signals. That is, they have great difficulties in matching a response to the strength of a signal.

This concept of *disproportionate information-processing* is critical to this book, and we develop a full theory of how this works in policymaking. There is no one-to-one correspondence between the severity of a signal and the response of a government. At first glance, one might be tempted to assume that governments respond to signals when they cross a threshold, at which time they cannot be ignored. While threshold effects are clearly part of disproportionality, they do not tell the whole story. Governments are quite capable of overrreacting to vague or ambiguous signals, as the case of the George W. Bush administration's attack on Iraq based on the claim of "weapons of mass destruction" indicates. Further, attention to a problem almost always consumes precious agenda space; thus, a crowding effect can occur, prioritizing problems unintentionally. The same signal, at the same level of intensity, could lead to action when few issues crowd the agenda, while it would not when the public agenda is more congested. This implies that the threshold itself is contingent. Finally, signals do not generally interpret themselves. Interest groups, policy entrepreneurs, think tanks, political leaders, and mobilized citizens all may attempt to spin the issue. Because of its electoral coalition, one party may be more sensitive to an issue than another party; the party in power matters in responsiveness to mobilizations. So again the threshold is contingent—this time on the extensiveness of mobilization.

While at times decision makers must search for the information they need in making policy, just as often they are inundated with information. In this case, how they sort through, interpret, and prioritize information is critical, more so than how they search for it. Partly, this is a consequence of past policymakers establishing the tools for acquiring information. The Central Intelligence Agency, the Defense Intelligence Agency, the Office of Management and Budget, the Congressional Budget Office, and the Government Accountability Office are all agencies whose primary responsibility is the production of information for policy. But information is freely supplied by interest groups, public policy think tanks, officials from agencies that are not directly involved in the information business, state and local government agencies with experience in the area, university professors and other researchers, and citizens. As a consequence, there are two primary issues with incorporating information into the policymaking process. The first concerns the supply of information, and the second concerns how that information is prioritized through the political process, given that it is supplied.

Supplying Information

When will information relevant to the policy process be supplied? From one point of view, information may be seen as a scarce and valuable good, one that is not supplied without remuneration. If policymakers need estimates of the intentions of foreign countries, they set up agencies with paid professional staffs to study and report on the problem. Similarly it is common for Congress to delegate information-gathering functions to specialized committees and subcommittees, which make recommendations to the chamber. The "payoff" is some deference by the chamber to the committee (Krehbiel 1991). In short, policymakers delegate the collecting and assembling of information to others more expert in the particulars.

That leads to an assumption that information is generally in short supply on matters of public policy. Only experts provide information, and they do so only if compensated. This corresponds with classic economics-based understandings of "search" and "information" costs. But that cannot be the whole story, for the assumption that information is undersupplied in politics flies in the face of the clamoring diversity of information that characterizes modern America. Information on policy matters is supplied by interest groups, think tanks, political parties, bureaucratic agencies, and congressional committees. Oversupply rather than undersupply seems to be the problem. Policymakers generally report that they are bombarded with information of varying quality; they are not normally in the position of having to seek it out. As Richard Hall (1996:90) notes, "policy-relevant information is abundant, perhaps embarrassingly rich, on Capitol Hill. Interest groups, Congressional Research Service, Government Accounting Office, various administration reports, preprinted hearing testimony, studies conducted by academics, think tanks, and policy analysts in and out of government" supply it.

This does not mean that the issue of supply is solved. The structure of a political system can induce increases in the supply of information. Our earlier study of congressional committee jurisdictions indicated that overlapping jurisdictions in which committees mutually interfered with one another led to breakdowns in informational monopolies, thereby increasing the supply of information available for policymaking (Baumgartner, Jones, and MacLeod 2000). In general, we strongly suspect that pluralist, nonhierarchical systems produce more information than unitary, hierarchical systems, such as those envisioned in many conceptions of delegation to experts. That information may be less reliable (but the question of bias is open), and it will be more difficult to prioritize, because it comes from diverse sources. But there will likely be more of it. Finally, ebbs and flows of information may occur, stimulated

by the perceptions of participants that policymakers are open to this information. In fact, James Madison and his colleagues seemed to have understood this as well, since the separation of powers and federal system they devised seem perfectly designed to generate multiple independent sources of information.

Prioritizing Information

The general oversupply of information in politics, for whatever reason, leads to what Herbert Simon (1983, 1997) referred to as an *information-rich* world where evaluating information in light of existing goals is more important than searching for new information. For the rest of this book we pursue Simon's insight, focusing on how policy information is detected, filtered, winnowed, and prioritized, putting the question of supply in abeyance for the present.

In his speech on climate change, Senator Inhofe offered no new information. He was engaged in the time-honored process of prioritizing the information available by offering an "interpretation," a "spin," or perhaps a "distortion," depending on one's point of view. In democracies, this process of weighting and prioritizing the available evidence is at least as important as the acquisition of evidence. Even if evidence were neither uncertain nor ambiguous, the process of prioritization would still be necessary. In a world in which individuals as well as policymaking institutions have limited capacities to process issues, paying attention to problems prioritizes them.

Prioritizing in information-poor environments requires search, while prioritizing in information-rich environments requires winnowing. That is, when we lack information we need to set up a system for searching for what we need. When there is lots of information available, we need to find ways to plow through all the signals bombarding us, decide what is relevant and what is not, and estimate the quality of the information. These are vastly different tasks, requiring very different approaches.

In either case, a decision maker needs two kinds of information: an understanding of the problem and knowledge of the possible solutions. Most formal approaches to decision making treat the problem as if it is given, and the issue focuses on how one chooses among the available solutions. If search is required, it is invariably directed at the solution space. If one needs a car, then one searches among the various alternatives. If the country needs a political leader, a voter chooses among those presented by the political parties. If the economy is weak, governmental leaders debate whether a stimulus is needed, and if so what kind.

But how does a person (or a government) choose what problem to address? In the case of a single individual, we generally assume that he or she knows when to begin searching for a new car. But why would one expect a government to know what problems to address and in what order to address them, and only debate solutions? There must be some prior process by which problems are detected and prioritized. A pretty good beginning assumption is that the desires of citizens to have their problems addressed (including the desire *not* to spend money on someone else's problem) are infinite. Indeed, this is just the economist's assumption that demand is infinite restated in political terms. Of course, not all people will express their desires to government, because such expression has costs. But encouraging free expression is a very good way for democracies to do business, because it functions to identify problems (in information-processing terms, to detect signals). Moreover, politicians, to the extent that they wish to be elected, have clear motivation to raise issues that will resonate with citizens, hence pushing them into the public problem space.

In short, it is a very good bet that public problem spaces—the set of issues that government is called upon to address—are information-rich, not information-poor. If so, then the first issue for government is to prioritize problems, not to cycle through possible solutions. And prioritizing somehow means winnowing—dropping from consideration for the time being problems that can wait. Of course, in the real world of policy choice, solutions are pushed forward simultaneously with problems in a confusing cacophony, but that does not make the distinction any less valid.

The Index Construction Problem

Central to the prioritization problem is how decision makers react to information from numerous sources. In effect, information from multiple sources and about diverse issues must be combined and weighted in making a policy choice. We refer to this as the *index construction problem*. The index construction problem is two problems in one. The first problem is how to decide which of many competing problems to address with public policy action. The second is how to weigh and combine the various sources of information that affect the particular problem chosen for action. Some combination of source reliability and importance of the message is necessary, across all sources and messages. But how should a decision maker weigh the various sources and messages?

For example, should a president focus on reforming education, creating jobs, ensuring better health care availability, fighting terrorism, enhancing the

arts and humanities, reforming entitlements, or focusing global attention on human rights and religious freedom? All of the above, naturally. And to many other issues that press for his attention. There are scores of potential issues from which to choose, and each involves uncertain and ambiguous information. Which educational reforms will work? At what cost? With what side effects? How best to create jobs? Does invading Iraq enhance or threaten our national security? Will privatization solve the Social Security funding shortfall? It is one thing to select some social problems that deserve to be addressed but quite another to adopt a set of policies that will simultaneously reflect the relative importance of all the possible social issues that demand attention, be effective, and minimize unintended negative consequences of the policies themselves. And despite all this we want government to attend to the same issues that the public thinks are important (and, as we show later, government does so).

Interpreting Signals

Even when a signal is detected and is elevated to a high priority, its full meaning is often debated. Policymaking means attempting to solve problems based on flows of information. That statement immediately raises the questions of what problems, problems for whom, what information, and how to use (or misuse) that information. These are, in effect, questions about how a political system understands and prioritizes the situations it faces. Information is not neutral in its effects on the interests and well-being of citizens. If advocates of a point of view distort information, or if they are just better at highlighting the aspects of a complex situation that benefit them, they are more likely to succeed in getting the policies they want from government. Raising anxieties or manipulating enthusiasm can lead to support for a point of view.

Information has "color." It raises emotions. Political information has bright colors. The simple concept of "problem" adds color to "signal" or "information about a situation," and, indeed, much of politics involves getting people to see a "situation" as a "problem" by adding color. While a situation can be described objectively, a problem is essentially subjective. People translate "situations" into "problems" when they think the situation is relevant to their well-being. The raising of emotions in politics is essential to the prioritization of problems, because emotion governs the allocation of attention. As a consequence, the strategic manipulation of emotions in politics is an essential part of the process of detecting and weighting the importance of signals.

Uncertainty and Ambiguity

Information is very seldom some sort of neutral fact. Almost any "bit" of information is subject to interpretation, and any information that has consequences for humans is subject to debate. Uncertainty and ambiguity are relatives, often confused with each other, but they are not identical twins.

Every policy decision involves uncertainty, and usually lots of it. Most information, as almost everybody understands, is uncertain. It is characterized by a probability of being correct. Statisticians have shown that pure rational analysis must proceed according to different rules when information is uncertain—the "probability calculus"—than when information is certain. In particular, the probable gain from a choice must be weighed against the risks associated with the choice. An outcome may not occur even employing the best solution possible. Further, every decision involves some risk that the information it was based on was wrong. Imperfect information compounds uncertainty.

The effects of reducing greenhouse gases in the earth's atmosphere on global climate change are obviously uncertain. Climatologists are pretty sure that regular climate cycles affect today's period of warming, and for the most part they think that human activities, in particular the burning of fossil fuels, contribute to that warming. But they are less certain when it comes to the precise combination of each, and even less certain that a reduction in the burning of fossil fuels will lead to a reduction in the warming trend. They are even uncertain whether the effects of warming will lead to continued warming or a catastrophic collapse of temperatures in the North Atlantic, leading to a European "deep freeze" (Mayewski and White 2002). On this, as in many important topics of political debate, there is no shortage of uncertainty.

Further, information is almost always ambiguous. That is, it is subject to differing interpretations or perspectives. Some perspectives are comparable, but in many cases they are incommensurate. A tax cut stimulates the economy, but in a progressive tax system any cuts will go disproportionately to the wealthy. How does one compare the effects on the overall economy with distributional justice? Different people may make different value judgments about the worth of these two elements of a trade-off, even if they agree fully on the facts. Demanding increased pollution controls improves the health and general quality of life around a factory, but how does one weigh that against the lost jobs and income that may result from the costs of pollution control? Different people bear the costs and reap the benefits from the action. But factory owners are quite willing to impose costs on others, and only pol-

itics can change this. So ambiguity and conflicting perspectives are essential parts of politics. Politics is not only about information and how it should be interpreted. Often it involves straightforward conflicts of interest, competing and incommensurate goals. In such situations information can be both ambiguous and uncertain, and those seeking a certain policy goal may focus on the uncertainty, rather than the ambiguity, of the information presented by their opponents—as did Senator Inhofe in his climate speech. That their own side often has uncertain information as well is for others to discover.

Competing interpretations of information may be thought of as *attributes* or dimensions that underlie information signals. Any interpretation is some weighted combination of these attributes. In many cases, people gravitate to an interpretation that involves only one attribute out of many that could have been chosen. Today, managing the economy centers only on the issue of growth, completely ignoring the issue of distribution—who gets what—even though in the past many great political battles centered on whether creditors or debtors were helped or hurt by government fiscal policies. We return to this point in chapter 3.

Solving Problems and Making New Ones

Once a signal is detected and interpreted, a debate about the proper solution may occur. Solving public problems is neither simple nor straightforward. Each solution may have multiple implications for the problem and various "side consequences" going beyond the first problem and potentially creating new issues to deal with. These unintended consequences can add benefits or costs to other social groups, creating new supporters, new opponents, and more ambiguous information about the overall impact of the policy solution chosen. And these side effects can be uncertain as well.

Not all political systems solve problems equally well, and any given political system may vary in its problem-solving capacities across time. Some people clearly benefit more than others from problem-solving activities, and the anticipation of such benefits can even drive the search for problems. (Did President George W. Bush's tax cuts of 2001 and 2003 stem from a desire to stimulate an ailing economy? Or were they a device to distribute resources to his supporters? How would we judge them if they both stimulated the economy and distributed wealth?) In such complex situations, the information we associate with a given policy is the main target of Washington spin masters. Information is neither neutral nor always objectively defined, because the aspect of the policy that is emphasized in the debate (stimulation or distribution) often determines the outcome.

As human decision makers are fallible, so too are political systems. Emotions are aroused inappropriately: short-term gains may be maximized at great long-run cost; the collectivity is sacrificed to individual greed; ideology can trump common sense. Surely all of these shortcomings, and many more, have not been avoided in America since the Second World War. Part of good decision making is anticipating problems and avoiding them, but perhaps an even larger part is correcting errors that inevitably are made. As we suggested in a previous work, political systems may best be judged by the errors they correct rather than by the errors they make (Baumgartner and Jones 2002: 306). As we will see in the chapters to come, the U.S. political system has overreacted, hesitated, and lurched its way through scores of problems over the past fifty years. It is far from perfect, or even perfectible. It does have inherent self-correcting and self-adjusting mechanisms (albeit ones that are sometimes slow to start and deplorably inefficient), as we will show.

Even in a democratic political system, government itself can become a problem, as former president Ronald Reagan was fond of emphasizing. The search for information by government officials can itself become intrusive, as any small business owner will verify, and actually limit the civil liberties of citizens, as the aggressive use of the Patriot Act by former attorney general John Ashcroft has demonstrated. It is necessary to view whole political systems, which include political parties, interest groups, and other elements of civil society (at least in democratic systems), as the keys to public information processing and problem solving. When government cannot control itself, then civil society must intervene.

In many ways, the problem-solving capacities of government get better over time—policy learning occurs. Surely we understand how to manage the economy, or the environment, or the safety of the workplace better than we did in 1930, or in 1965, or in 1980. In other ways, these capacities may be diminished. The more tasks an organization takes on, the less effective it can become in solving any one of those problems. In solving one problem, it may contribute to others. The more capacity it adds, the more it interferes with other problem-solving mechanisms in civil society. And since government does more now than it once did, we can be sure that unintended consequences of various policies are greater now than they used to be.

Bounded Rationality, Emotion, and Interests

If decision makers were infallible, then we would need no theory of them, and we could analyze information processing from a knowledge of the nature of the information and the set of rules for making decisions within a political

system. That, alas, is not the case. Decision makers in politics, like elsewhere in life, are boundedly rational (Jones 2001). They are goal-oriented and strategic, and they update their beliefs about the world based on information. But they make mistakes—not just random mistakes, but systematic and repetitive ones. These include bias in the use of information, simplification and distortion in comprehending information, and cognitive and emotional identification with particular ways of solving problems. All of these biases are on display in politics every day when the argument turns to the appropriateness of a governmental remedy to a problem.

Bounded rationality, however, is more than a laundry list of failures in human decision making. Three aspects of information processing provide the basis for a model of human decision making capable of supporting our arguments: selective attention, difficulties with trade-offs, and learning. Bounded rationality assumes that humans are strategic and goal-oriented but are equipped with cognitive architectures that limit and channel their abilities to maximize. The major constraints are straightforward, centering on an exceedingly small short-term memory (or attention span), a very large long-term memory, a rule-bound system of encoding information into long-term memory and extracting it when necessary, and an emotional "governing system" to regulate attention and action.

Selective attention is far and away the most important cognitive limitation that influences political choice. Cognitive processing capacities are constrained by a "bottleneck" of short-term memory that allows us to attend to only limited elements of the environment at any given time. The limits of attention force us to deal serially with problems, leading directly to severe difficulties in comparing different courses of action. Emotion is the gateway to selective attention: when emotion is roused, attention follows.

One major consequence of the "bottleneck of attention" and its association with emotion is that people have great difficulties in assessing trade-offs among competing strategies (Simon 1996). This characteristic is manipulated regularly in politics. Trade-off calculations, so easily modeled in economic choice by indifference curves, are extraordinarily difficult for people to make. In political debates involving ambiguous information, proponents almost always "frame" the information, stressing one perspective and ignoring others. This plays to the serial processing capacity of the audience, who often quickly focus their attention on the limited perspective advocated in the debate (B. D. Jones 1994).

In addition, the manner in which people encode and recover information affects political choice. Information is coded into long-term memory via rules, and the application of rules to new situations is governed by the ability to

view the new situation as analogous to the one in which the rule was learned. People come to value the rule in itself—they identify with the means—and often apply the rule in situations where it is not fully applicable, rather than searching for more appropriate strategies to follow. In the study of military strategy, this tendency is recognized by the aphorism that "generals are always fighting the last war."

This means that learning is not Bayesian—in the face of new information, people do not drop learned behavior that they value intrinsically, according to Bayes' rule, which in a rational but uncertain world would govern how people react to new information. Instead, they update with difficulty, sporadically and episodically. In politics, partisans defend their president even though the signals all point to failed policy choices. Changes may come, but they come grudgingly. Proponents who fought long and hard to get a new policy implemented or a new agency created do not suddenly admit mistakes; they resist, resist, and resist until either they are outmaneuvered or the evidence simply overwhelms them. In politics, information is not neutral; it creates winners and losers. People prefer to be seen as winners and do not like to admit when they are wrong.

Bounded rationality leads to disproportionate information-processing. Signals are ignored, responses are delayed, and ineffective strategies are deployed. The whole story is not delay, however—people are clearly capable of overreaction and rushes to judgment. In fact, our model of how information is used leads to a model of delay, then overreaction. Once evidence or pressure accumulates indicating that some new dimension deserved more attention, the system often overresponds to this in turn.

The General Punctuation Hypothesis

Things get even more complex when we put fallible decision makers facing uncertain and ambiguous flows of information together with other decision makers holding differing preferences and values in a policymaking system. Add yet another complexity: the decision makers occupy different roles in the system, some having more institutional power than others.

Political scientists understand reasonably well the effects of the set of rules that govern decision making in political systems. We know that different election results, and different configurations of preferences for policies, stem from different electoral arrangements. Systems of separated powers yield different results than parliamentary systems. Constitutions can be designed to retard change and slow the translation of mass passions into policy action, as in the

U.S. system, or they can be designed to reflect public opinion in intricate detail, as in modern parliamentary systems.

What is less recognized is the first principle of behavioral organization theory: formal organizations, like the Roman god Janus, face two ways. They allow people to escape their cognitive and emotional information-processing bounds, but, being constructed by humans, they also fall prey to the same limits that affect human information-processing capacities. Formal organizations, such as governments, allow the coordination of individual behaviors toward the accomplishment of a collective end. When they operate properly, they also allow the combining of diverse preferences and viewpoints to come to a decision. What is less noted is that organizations can be designed to allow for the correction of errors that humans invariably make. The key notion is feedback. Firms that make products that are unwanted or inferior may be driven out of business. Political parties that make policies that don't satisfy voters can lose control of government.

In appropriately designed markets and democracies, feedback is available for course corrections before disaster strikes. Firms may suffer as demand declines and profits wither, and they can adjust their product lines accordingly. Parties may lose the support of key interest groups, or find increasing support for opponents in "pulse taking" back home in the constituency. (In both cases, careful "market research" can allow leaders to avoid products or policies that will cause a problem in the first place.) A close election, or even the anticipation of a close election, may send a signal for a course correction.

Directors of firms or leaders in government may or may not attend to cues calling for changed policies, and this process may be more or less efficient. Some companies may keep close tabs on where they stand in the market, constantly adjusting to changing conditions. Some ignore powerful signals until they are forced out of business and others take their place. The system responds but the individual organisms may die. Similarly in politics, some institutions may adjust relatively continually to new demands; others may resist calls for change until they are compelled by outside forces either to change their behaviors or to go out of existence (yes, this does happen even in government). Why are powerful signals sometimes ignored, even when they often are obvious in hindsight? One reason is selective attention. Selective attention in individuals is agenda setting in politics, and the human limitations in juggling attention apply to agenda items in political systems. Comparing competing courses of action is very difficult, especially across policy domains. A political system focusing on potential terrorist attacks has trouble comparing the potential damage from these acts to the damage stemming from climate warming, or traffic accidents, or pandemic influenza. This is not

only a consequence of the uncertainties surrounding these events. More Americans died in traffic accidents in the month following the terrorist attacks on September 11, 2001, than died in the acts themselves. Most would recoil with horror at the implied suggestion that we ought to take money from Homeland Security and put it into traffic safety. In effect, they reject making the implied trade-off explicit, yet rational decision making requires just such explicit calculations.

If we put together the limits of human information processing and the characteristics of democracies that encourage error correction, we get a model of politics that is very static but reluctantly changes when signals are strong enough. The system resists change, so that when change comes it punctuates the system, not infrequently reverberating through it. Even in systems with well-articulated feedback mechanisms, such as in developed democracies, change comes in bursts. Different institutions may have different capacities for change. Some are relatively efficient in reacting to new inputs; others resist change until forced by overwhelming pressures to give in. But, as we shall demonstrate empirically in the chapters to come, all institutions of government share these characteristics to some extent. It is an inevitable part of the policymaking process where there are so many potential problems and so many potential ways of responding to them.

We described this process in our earlier work on punctuated equilibrium as applying to policy subsystems (Baumgartner and Jones 1993). A set of partial equilibria characterizes policy subsystems, with each subsystem subject to destructive change if mobilization is strong enough. The "driver" of the model was attention. It was long noted that the inattention of policymakers allowed policy subsystems to flourish; we asked what happens when attention gravitates to a subsystem. The *general punctuation hypothesis* adds institutional analysis to this model.

The set of rules that constitutes the American political order affects different parts of the policymaking process differently. It is relatively easy to gain a hearing in the councils of government, but it can be extraordinarily difficult to gain satisfactory policy action. Agenda access is comparatively simple; policy commitments come hard. The implication is that agenda processes will be less punctuated than policy changes.

We make three claims, explored in detail throughout the book. First, all distributions involving human decision making exhibit patterns of stability and punctuations. Second, the operation of the formal rules that govern the policymaking process—the system of checks and balances characteristic of American democracy—also lead to punctuations. Third, the interaction among cognitive characteristics of decision making and formal rules and pro-

cedures allows us to order the severity of punctuations from the least punctuated, where formal rules are not restrictive and "veto groups" are not empowered, to the most punctuated, where formal procedures operate to magnify punctuations. So we will observe a greater likelihood of punctuations in some institutions of government than in others; this is related to the efficiency of the institutional design. But cognitive limits are ubiquitous, so we observe the effects of these in all institutional settings.

The Disproportionality of Attention

Because of the nature of cognition and the capacities of the political systems we construct, there is no one-to-one correspondence between the severity of problems in the decision-making environment and the policy responses of government. Information processing in politics is disproportionate; it is disjoint and episodic; it is stasis interrupted by bursts of innovation. Immediate one-to-one responsiveness to problems is hindered not just by the obvious set of rules requiring concurrent majorities in the branches of government. It is hindered also by aspects of human and organizational information-processing capacities.

A major hindrance in producing proportionate policy responses to information stems from limits on the capacity of the policy agenda. Governments, like individuals, have limited attention spans. Focus on one issue, and you become inattentive to others. The only way to avoid this is not to try to pay attention to lots of things simultaneously, but rather to juggle attention, rapidly cycling through the various information flows. If you face lots of issues, however, it will take time to cycle through them. The "shortcut" is to monitor emotions as indicators of priorities (Marcus, Neuman, and MacKuen 2000).

The same is true for governments. Issues must be prioritized for action, but in a world of many problems such agenda juggling has important consequences for proportionality in response. If policymakers are focused on addressing the problem of the fairness of the tax structure, they are liable to ignore deteriorations in the public health infrastructure. When they become attentive to public health problems, they may find that large policy "fixes" are required. While they attend to public health, problems in the management of public lands may accumulate. And so forth. The juggling is often accomplished via emotions, usually when constituents or groups are mobilized and angry.

Disproportionate information-processing implies policy punctuations. Mostly, policy in a particular area is static or changes incrementally as responsible bureaus are able to adjust within the bounds of the enabling legislation they operate under. But major policy advances require the intervention of the policymaking branches—the president, Congress, the courts. For reasons of politics and of agenda inefficiencies, these branches respond only sporadically to any particular problem—especially when emotions are running high.

Methods

Our study of information processing in American politics relies on a vast data-collection effort that we began more than ten years ago. That effort, which we call the Policy Agendas Project, involved assembling, managing, integrating, and coding data on congressional hearings, U.S. laws, budget authority, media coverage, and public opinion from the end of the Second World War to the end of the twentieth century. The result is a set of high-quality data sources that can be used to study the processes of policy change in a manner hitherto impossible.

The Policy Agendas Project provides a consistent and reliable set of policy content categories applied to many different archived data sets that record political change in the federal government. We have explained the philosophy and details of this approach elsewhere. (See in particular chapter 2 and the appendix of Baumgartner and Jones 2002; our Web site, http://www.policyagendas.org, also provides more information, including all the data reported in this book.) Briefly, the idea is to be able to trace changes in policy activity across diverse data sources with confidence. For the first time, we have reliable time series data on many aspects of policymaking, time series data that may be explicitly compared across data sets. For example, we have consistent and reliable information that allows us to compare the policy priorities of citizens (though a recoding of Gallup's "most important problem" polls), the attention given in Congress to those same matters (through a coding of all hearings conducted since the Second World War), and the policy responses of the federal government on those issues (though a coding of all statutes passed since the Second World War, and a weighting system for ranking these statutes according to their importance). These data allow the exploration of a whole new way of thinking about representation, and we do that in chapter 10. A description of these data sets, and our content coding system, may be found in appendix 1.

The use of this resource, harnessed to an information-processing perspective that immediately shifts the discussion toward dynamics and evolution, allows us to broach entirely new questions about American politics, public

policy, and democratic governance. We are able to unify critical aspects of more recent American political development with both the statics of institutional analysis and the dynamics of political processes. Political development has insisted on the relevance of history and prior organizational arrangements to explain change; institutional analysis demands explicit consideration of the decision rules governing choice in a political system; political dynamics points to the raucous roles of parties, candidates, and voters in determining political outcomes. Just how these elements interact has eluded political scientists. While we do not claim to have all the answers, we try to demonstrate that we have lots of them, and that our approach yields the right questions as we struggle to make sense of democratic governance in America.

Most important, the ability to measure policy change with much more precision allows the systematic study of policy punctuations. Policy punctuations are unavoidable. Yet most of the time most policies are stable. If we want to understand policy most of the *time*, we study those facets of government that reinforce stability. These include the structure of American political institutions, the power of interest groups, the ideologies of elites, and the party identifications of masses. Most of the total change in public policies across time, however, comes about because of the punctuations—they happen not incrementally but in large bursts, even if there are many, many more incremental changes than punctuations. If we want to understand most of the *change*, we have to understand the punctuations. Of course, if we want to understand the entire system we need to understand both the stability and the change.

Punctuations stem from signals from outside the political system as these are variously ignored or amplified by forces within the system. Disproportionate information-processing implies that prediction based on information alone is virtually impossible. The political system operates as a "filter," sometimes dampening and sometimes amplifying any given signal. To appreciate patterns of punctuations and stability across the full range of public policies, we drop the traditional political science focus on "point prediction," the prediction of exactly when an event will occur, or even exactly how a particular external event will affect the course of a particular public policy. We need to be more sensitive to the complex set of interactions that can set off major changes. Previous studies have not done this, partly because people often want to know about the development of a particular policy issue, and partly because the large data sets we have constructed allow us to approach the question in a way others have not been able to do before.

Fortunately, tools from other disciplines are available to us to summarize characteristics of the entire system, and we use these in this book. These tools

are quite straightforward but may well be unfamiliar to political scientists steeped in regression modeling. Regression modeling is well suited to descriptions of trends, for testing well-understood hypotheses, and for analyzing the functioning of a stable institutional environment, but for explanatory power it relies on point prediction. That is, to model a process over time correctly, we need to be able to specify in advance how the precise dynamics work. If we are wrong, of course we can reject and modify.

But what if we know only that a system will lead to punctuations, if we really have no a priori idea of when those punctuations will occur? This question is especially crucial in situations where many causes can bring about the same effect. In some circumstances, perhaps social movements have brought about major policy change; in others, it was elite-generated; in still others, it was developed and carried by the political parties. Large-scale policy changes are historically contingent, and to date the most successful approach to understanding them is the careful case study. Some scholars have attempted to understand the operations of American institutions by lumping policy changes across contexts—as for example, has David Mayhew (1991) in his important study of divided government using a weighting scheme for most important statutes. But these approaches are incapable of distinguishing when the important statute will be directed at voting rights and when it will be directed at environmental protection—it is by its nature insensitive to the policy context.

Another issue involves positive feedback effects (Baumgartner and Jones 2002). Straightforward linear regression fails to model correctly outbreaks of self-reinforcing positive feedback changes in the policy process. If we look at a series of policy activities, as we do for crime, social welfare, and other policy arenas, we find clear evidence of self-reinforcing changes. While it is possible to model such complex series, how does one know in advance when these interactions will occur? Looking at the series and redescribing it with regression models can be useful—by eliminating chance as a potential factor—but it does not really get us very far, because we are generally in the position of not being able to predict such positive feedback outbreaks beforehand, nor do we have a theory of when to expect them that is itself not historically contingent.

To address such issues we introduce in a systematic manner stochastic process approaches to the analysis of policy dynamics. Stochastic process approaches focus on an entire distribution of data—for example, on budgetary outputs not for a single policy or program but across the entire range of spending for the entire government over the entire postwar period. Often we can postulate serious and testable hypotheses about distributions of activities

when we are at a loss to do so for particular occurrences of these activities. We find that we can make firm predictions about and observe clear patterns in the distributions of policy changes even when we cannot predict individual policies. But we can probably learn more about the characteristics and dynamics of the political system through this type of population-level analysis than through the case-study approach that has been more common in the literature (including, we hasten to point out, much of our own previous work). In sum, we develop some new ideas here and use some unfamiliar techniques to analyze a comprehensive set of data concerning the federal government's activities over a fifty-year period.

Plan of Development

In the chapters to come we examine how the American national government detected, prioritized, and responded to information across the period after the Second World War. We focus primarily on the process by which this happens rather than trace the particulars of policy development or partisan struggles through time, although much of what we have to say is directly relevant to political dynamics and policy development. We move from theories of individual choice to organizational choice to the policymaking process, developing as we go the theory of disproportionate information-processing. Then we turn to the policy process, showing that old incremental theories of policy change are wrong, but salvageable and fundamentally important. If we integrate disproportionate information-processing into the incremental model, the resulting theory of policy change subsumes both incrementalism and punctuated equilibrium. Then we show how formal rules of governance can be incorporated into the theory. Having achieved the major goal of the book, we turn to exploring how it works in particular situations—including how government translates objective indicators into policy in particular areas, how "agenda crowding" makes the process inefficient (and disproportionate), and how representation may be reconceived to incorporate not just public preferences but the priorities of the public as well.

Here is how we proceed. The first part of the book, "Information, Choice, and Government," details the mechanisms that invariably lead to policy punctuations. Chapter 2 examines the process of decision making, drawing on behavioral decision theory and cognitive science to depict individual-level processes. Then we show how organizational decision making corresponds to individual-level processes. While there are major and important differences—particularly in the extent to which organizations, including government, can process multiple streams of information and in the problems that organizations have in combining the observations, priorities, and policy preferences of the members of the organization—there are critical similarities as well. These similarities, including critically the process of attention allocation, allow us to apply a theory of cognitive information-processing to policymaking. Chapter 3 looks at how policymakers combine and prioritize multiple streams of information from multiple sources of varying reliability to detect problems and attach solutions to those problems. These chapters, together, offer a theory of organizational processing of information and link it to an individual-level understanding based on bounded rationality.

In part 2 we apply the theory to the broad political system. Chapter 4 turns directly to the policymaking process. Because information is complex, uncertain, and ambiguous, and because policy responses are contingent on prior information processing as well as on the configuration of political forces, the trace of policymaking across time is complex and contingent, defying simple interpretation. We show that no single explanation will account for U.S. public expenditures in all policy areas; rather, explanation requires familiarity with the particulars of policy histories of each policy area. If we give up that quest and simply prepare a frequency distribution of all budget changes across all policy areas for the period of the Second World War, we find that the pooled frequency distribution is highly punctuated—strong support for punctuated-equilibrium theory.

Our earlier theory of punctuated equilibrium is perhaps best known as an alternative to the seemingly discredited incremental theory developed by Richard Fenno, Charles Lindblom, and Aaron Wildavsky. In chapter 5 we show that incrementalism, far from being discredited, may actually be integrated with punctuated equilibrium to produce a full theory of information processing in politics. The incrementalists had no theory of attention allocation and information processing—or rather they assumed proportionality without realizing it. It can be shown that incrementalism must lead to a bell-shaped distribution of outputs; the finding of punctuated or leptokurtic budget distributions discredits this form of incrementalism. (*Leptokurtic* means that a distribution is statistically not normal, but has a higher central peak as well as more outliers than a normal distribution.) But if we build disproportionate information-processing into incrementalism, the resulting frequency distribution is punctuated, and we have a theory of incremental budgeting that is fully integrated with information processing in policymaking.

Chapter 6 completes the development of the theory by adding the formal rules and procedures that govern how American public policy is made. As in our general approach, we do not analyze each particular facet of Madisonian

democracy for its effects. Rather, we think of these procedures as adding *decision costs* to policymaking in a manner that allows us to disentangle these effects on the severity of policy punctuations. Then we provide both static and dynamic simulations of these processes. Punctuations occur in all distributions we simulate; they range from mild to more extreme in parallel with the imposition of institutional costs, or friction.

Chapter 7 provides a strong empirical test of the theory developed in chapter 6. Whereas chapter 6 develops a simulation that explores the parameters that explain the distribution of data we observed in chapter 4, here we provide further and extensive empirical tests. Basing our ideas on the concept that different institutions of politics are closer to the input side or the output side of things, and therefore impose either few or a great number of institutional costs, we explore the level of *institutional friction*. By looking at the distribution of outcomes across data sets covering financial markets, elections, media coverage, congressional hearings, lawmaking activities, presidential orders, and budgets, we demonstrate powerfully that institutions with the higher decision costs also have the more punctuated patterns of outcomes. This shows that some institutions are much more efficient than others. All, however, demonstrate the signature patterns of punctuated equilibrium that we expect.

In part 3 we explore some critical facets of the theory. In chapter 8 we study the particulars of the translation of informational signals into policy outputs. Not surprisingly, we find different patterns even in the three areas of public policy where widely used quantitative indicators of conditions are readily available—economic policy, crime and justice, and poverty. Chapter 9 explores in some detail the "bottleneck of attention" and its effect on disproportionate policy response. Not only do particular issues rise and fall on the agenda, but the overall capacity of the system has risen and dropped over the postwar period. Capacity has not simply grown with the economy and population; agenda capacity is part of the political dynamics that influences the weighting of issues. In fact, capacity has dropped as conservatives have argued that government has grown too large, so there is nothing inevitable about the growth in the size of the government agenda; this can be reversed. Finally, chapter 10 shows how representation may be reconceived within an information-processing approach. Instead of asking whether the policy positions of citizens and the government correspond, we ask whether the issues discussed in Congress correspond to the issues that reach the highest level of concern among the public. We find that the correspondence is very high; when the public is concerned about an issue, Congress discusses it. We also find attenuated correspondence between the public's priorities and actual

lawmaking. It is clear that a proper conception of representation must include an agenda-setting component.

We conclude with some comments about the nature of democratic governance. Because of the inevitable consequences of cognitive limits and institutional design, the theory of disproportionate information-processing developed here integrates punctuated equilibrium and standard incremental approaches to government. As any democratic government simultaneously assesses disparate pieces of information on different dimensions of choice, resulting policy outputs will be disjoint and episodic, and attention to critical matters will often be fleeting. Government with fleeting and shifting policy priorities may seem inefficient, and it is, compared to some ideal standard. In these inefficiencies and overreactions, however, come openness, flexibility, corrections, feedback, and innovation.

PART I

INFORMATION AND CHOICE

In the next two chapters, we develop in some detail the theory of disproportionate information-processing. While we aim to develop a theory of policy processes—basically a theory of organizations—we need a microtheory of individual information processing as a foundation. We show how a fundamental model of boundedly rational decision makers, abstracted from scientific findings from biology, psychology, and several social sciences, has important implications for how organizations, and therefore governments, process information. We first lay out the theory as it relates to an individual; then we show how it applies in organizations. Organizations differ in some respects from individuals in how they deal with information, so we avoid any type of argument that anthropomorphizes organizations. For example, organizations may have a complex division of labor that allows them to deal simultaneously with thousands of things; people can't do that. But both organizations and individuals share certain characteristics, especially how they allocate attention, which we use as a basis for our theory.

Our theory of disproportionate information-processing has three components. The first is the unavoidable juggling of numerous issues—to which issue among many should one pay attention? The second is how decision makers understand and interpret the issue of choice—the process of weighting the attributes that characterize the issue. Given that one is concerned about international security, for example, how does one understand the issue? The third is the choice of competing solutions to the problem. Even when one has decided on how to understand a complex problem, and which elements of it are most relevant, there can often be different possible solutions, each with different costs, benefits, ambiguity, and uncertainty. Of course, in organizational settings, different advocates may especially prefer certain solutions

over others, since these may affect the role that they can play in the policy. In any case, there are three elements: which issues, which dimensions, and which solutions.

Each of these elements adds a measure of disproportionality to the policymaking process. They "bend" the response to new information, and they do so in complex and interactive ways so severely that it is very difficult to connect information signals to policy responses even in democratic governments. That is, neither individuals nor organizations are efficient in monitoring and reacting to new situations in the environment. Threshold effects, status quo bias, and other characteristics of bounded rationality affect how we choose which issues to pay attention to, how we understand those issues once we start to attend to them, and how we choose among possible courses of action in addressing them. We decouple these components, examining them separately, in the next two chapters. Each part of the process is prone to discontinuous and abrupt shifts at some points, even if most of the time established routines rule the day. People sometimes lurch from one topic to another, acting with surprised discovery that some new problem urgently requires their attention. We sometimes dramatically rethink our understanding of the causes of a given situation, even if we resist this most of the time. And we sometimes adopt wholly new solutions to old problems, even if again we don't typically like to do so.

Organizations do these things even more than individuals, in fact, because organizations, unlike people, can have changes in leadership. In democratic politics, elections provide one way to bring in a new set of leaders who may have a different approach to existing problems, or different priorities in addressing problems. So there are many elements of this theory to explore. In chapter 2, we lay out in full form the parallel natures of individual and organizational decision making, showing how disproportionate information-processing is inevitable at both levels. In chapter 3, we show how this leads directly to disproportionality in the policy process. These two chapters lay the foundation, then, for the empirical chapters that come in parts 2 and 3.

2

A Behavioral Model of Policy Choice

Although most public policy issues are fundamentally complex, public discussions of them are generally simple. This chapter is about the process by which complex issues get whittled down to simplified choices amenable to public discussion or individual choice. Both individuals and organizations, including governments, go through such a process. The explanation we lay out here about decision processing leads directly to our theory of disproportionate information-processing, which is the focus of chapter 3.

Consider the problem of poverty. How many different elements, facts, considerations, and dimensions of evaluation are relevant? Does poverty exist because poor people lack the work ethic? Because of discrimination? Because the welfare system has provided a perverse incentive structure? Because of a failure of the health-care and educational systems to provide opportunities for people to do well? Because of a lack of child care and a breakdown of the traditional family structure? Because of transformations of the economy that have taken away low-skilled job opportunities? Because of crime and failures of the criminal justice system? Because of the flight of jobs overseas, to Mexico, or to other regions of the United States? Because employers pay too little in many low-wage job categories and typically provide no health benefits?

There may well be truth in each of these "issue definitions" (and there are certainly more aspects of the issue than are mentioned here). How should we weight the various elements of the issue? More important, how does the political system ascribe weights to a multidimensional issue such as poverty? Liberals and conservatives certainly have their favorite aspects of the issue on which to focus, and we can bemoan the shortsightedness and bias of those with whom we disagree. But in fact, such restricted attention is inevitable.

Poverty, like most policy issues, has so many underlying dimensions that efforts to address them can never be truly exhaustive. Rather, policy responses are almost by definition partial. That is because our cognitive understanding of the issue is necessarily incomplete.

But we have played a trick on the reader—or at least we tried to. We focused on poverty without asking why one would treat poverty as a problem, anyway. Is it not simply a condition? Some people are poor, others are rich; that's just the way life is. The existence of a condition does not automatically create a political problem or an issue. And even if it is a problem, why would anyone want to discuss it when other important problems—such as terrorism, and chronic disease, and the emergence of "super-germs," and war and peace, and the decline of moral values in America, and the tax burden, and the crisis in public education, and the loss of eco-diversity, and traffic congestion, and smog, and the cost of health care, and economic malaise—may be more important? Political systems are juggling not just a collection of definitions of a single issue but a panoply of issues as well, and all of these issues have several components, just as poverty does. Not only do we have to figure out how to assess a problem once we decide to pay attention to it, but we also have to figure out which issues to pay attention to in the first place.

In this chapter we develop a model of decision making that addresses how individuals and organizations prioritize and evaluate numerous multidimensional issues. First, we consider individual decision-making processes, and then we look at collective decisions as might be made in groups, in organizations, or in government. We will show that the two processes are parallel in the most important aspects. We then turn to the dynamics of choice, that is, how individuals and organizations move from decision to decision. No decision ever starts from a completely fresh perspective; rather, people evaluate where they are going in light of where they are now. Moving from decision point to decision point traces a time path of decisions, and the change from point to point assesses how disjoint the time path is.

Our model is a *behavioral* model, in the important sense that it builds in the cognitive capacities of individuals directly. This is not true of most so-called information theories as applied in the social sciences, which deal only with the precision of signals. The key component of this behavioral model is attention shifting. Because of the extremely limited attentional capacity that people have, they must make abrupt changes as they shift from dimension to dimension for an issue. Most of the time, for most decisions, we pay little attention to the underlying issue, and we don't change our approach to the problem—we stick with the status quo. Organizations, with limited agenda capacities, behave similarly. Occasionally, however, issues force themselves

to our attention—or to an organizational agenda—and at that point we may fundamentally reevaluate. Or we may not; but unless we attend to the issue, we cannot change our strategy. Choice presupposes attention. Thus, decisions when considered over time display a characteristic pattern of usually high levels of stability for most issues and occasional major change. These features of decision making are not pathologies but are inherent in how humans process large amounts of information about difficult issues.

In the next section of this chapter, we focus on a single decision. First, we go through the model as it applies to individuals; next, we show the parallels with organizational decision making. Whereas individuals are clearly limited by cognitive capacities and the number of issues they can deal with at any one time, organizations can solve many of these problems through the division of labor that allows different parts of the organization to contribute to the same decision. In spite of these advantages for organizations, both individuals and organizations share important features that characterize boundedly rational decision making.

A Behavioral Model of Individual Decision Making

How does a single decision maker process information? While there are lots of complexities, the outlines of the process can be laid out in stages. Like any stage theory, this one is a reconstruction; in reality stages blur and even merge, differing from decision to decision. Yet it is useful to organize the decision-making process in terms of four sequential stages: a *recognition stage,* in which a decision maker recognizes that a problem exists; a *characterization stage,* in which the problem comes to be understood based on the competing attributes that could define it; an *alternative stage,* in which reasonable alternatives are delineated; and a *choice stage,* in which alternatives are examined and a choice is made. Below we detail some relevant aspects of each stage. While we focus for the moment on individuals, it is apparent that organizations must go through a similar sequence.

- *Recognition stage*
  - Attend to aspects of the decision-making environment that are potentially problematic.
  - Understand the problems presented by the environment.
  - Prioritize these problems.
  - Decide which of these problems will be addressed and which can safely be ignored for the time being.

- *Characterization stage*
  - Construct a "problem space" by determining the relevant attributes of the problem focused on from the previous stage.
  - Decide the weights of the attributes—which are most relevant to the problem (highest weight), which are relatively less relevant (lower weight), and which are irrelevant (weight of zero).
- *Alternative stage*
  - Given a list of relevant attributes from the previous stage, for each attribute consider the alternative courses of action that might be useful.
  - Examine alternatives that have been used in similar problems.
  - Search for new alternatives.
  - Construct "solution spaces" to these problems consisting of the available alternatives. Each attribute may be linked with one or several potential solutions or alternatives.
- *Choice stage*
  - Decide which alternative(s) to choose.
  - Implement the favored alternative(s).

A given choice situation may lead to the implementation of several alternatives, since many problems may be identified, many attributes may be relevant to each problem, many alternatives may be appropriate solutions to the different attributes, and more than one choice may be made. While the model above is a simplification, it allows us to focus on some key elements of the process. Considering these in some detail will be helpful in understanding the typically incremental, but occasionally disjoint, nature of most decisions as they are made over time.

Recognition

In the recognition stage, many issues clamor for attention, but only one can be addressed at a time. People prioritize problems by devoting attention to them. Herbert Simon refers to attention as a "bottleneck" of conscious thought. Attention is a scarce good; directing attention at one problem means ignoring others. A person cannot simultaneously give conscious consideration to every problem facing him or her at a given time. One cannot balance one's checkbook, work out at the gym, pay attention to family, write a book, and teach a class all at the same time. An organization, on the other hand, may deal with multiple problems through the division of labor. A university can simultaneously be active in teaching multiple classes, providing recreation

services, conducting research, operating a hospital, promoting public service activities and state services, and conducting an internal audit. Even in an organization, however, there comes a point when the leader of the organization must direct attention to one problem rather than another. To be sure, some individuals and some organizations may be more efficient at dealing with problems, and better able to switch quickly from one problem to the next, but at any given time, attention focuses only on a minute subset of all the issues. The scarcity of attention governs the first stage in our model.

Characterization

Once an issue becomes the focus for a problem-solving effort, we move to the characterization stage. Here attributes underlying the problem are set and weighted by importance; that is, we characterize the problem, we define the issue. What am I looking for in purchasing a new car? Prestige? Basic transportation? A demonstration of financial success? A demonstration of responsibility and modesty? A way to impress someone? Finally having a car that works, after years of junkers? Even a simple consumer choice must be characterized, and the same purchase can mean different things to different people or to the same person at different times. Of course, as we move to public policy issues and our opinions on those, the issues are generally even more complex.

How we characterize a problem implies goal setting. For example, if we define the problem of poverty as being strongly related to nutrition and educational opportunity, then some obvious solutions are implied. These differ from solutions that would be implied if we saw the issue as fundamentally related to family structure, the structure of the economy, individual motivation, personal choice, or job training. So defining or characterizing the problem has many implications, but all issues once recognized must also be characterized or understood, and typically, for a complex problem, there are many possible ways to understand the issue.

Alternatives

In the alternative stage, a causal theory is constructed or at least implied by how the problem is understood, thereby justifying some solutions. But solutions do not flow automatically from the definition of a problem. Sometimes several solutions are available even if people agree on the nature of the problem. In any case, once an issue has been characterized, then a decision maker has to choose among available solutions or alternatives suited to

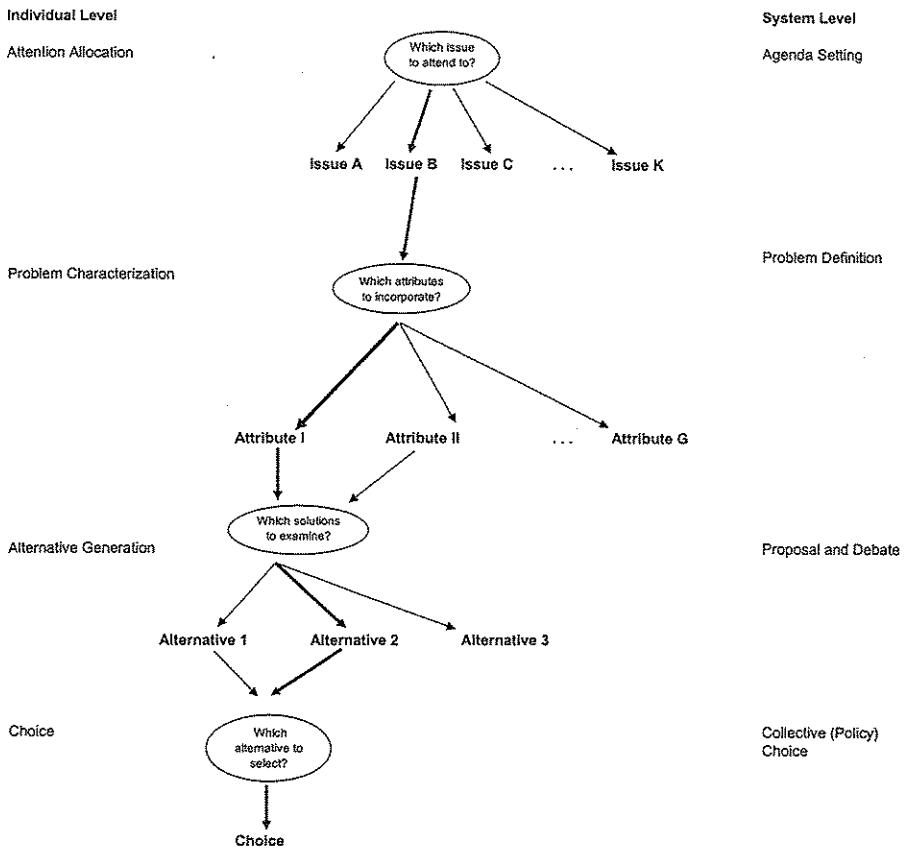
solve the problem. Some of these alternatives may have been used before with greater or lesser success; some may have ready-made and available implementation mechanisms; others may not have been tried before. Choosing among available solutions to a given problem is not a trivial or an obvious process.

Choice

Once a problem has been recognized and characterized, and the available alternatives scrutinized, then a choice can be made. Some alternatives may be discarded because they are not under the control of the decision maker, because they are not politically feasible, or for other reasons. The alternatives remaining after this winnowing process constitute the choice set—those alternatives from which a choice is made. Most of choice theory, rational or otherwise, has focused on this stage, almost to the exclusion of the rest of the information-processing model we have described above. In fact, the winnowing down of which problems to focus on, which attributes of those problems to weight most heavily as being relevant, and which alternatives to choose from in addressing those attributes, determines much of the decision. Of course, the final stage of the decision-making process, actual choice, can involve many complicated trade-offs. Our point is not that the last stage is trivial; rather, that earlier stages are equally important.

The combination of four stages, each of which is nontrivial for most issues, and each of which builds on the decisions made at the previous stage, means that the overall process can be exceedingly complex. In particular, the fact that decisions at one stage have strong implications for available decisions remaining at the following stages means that decisions made over time can be either highly inertial or greatly disjoint. They can be highly inertial because previous decisions are often not examined but are ratified again without much thought. They can be highly disjoint when new issues arise, when new characterizations of old issues become more prominent, when new alternatives are proposed and taken seriously, and finally, when new choices are made. Of course, new choices can be made in the absence of differences at the previous stages (that is, people can change their minds, or new evidence can lead them to a different choice even when the available problems, understandings, and alternatives remain the same). But when we consider that decisions made over time involve not only the final choice but all the stages that come before, we can see that disjoint change can be expected at least some of the time. The process of decision making, when laid

Figure 2.1. The Logic of Choice



out in stages, allows both for highly inertial outcomes and for dramatic departures from previous habit.

Figure 2.1 summarizes the sequence of events in our choice model. We have discussed these stages with reference to the behaviors of an individual decision maker. Along the left-hand margin of the figure we have noted that these stages involve recognition, characterization, alternatives, and choice. Along the right-hand side of the figure we note that the analogous stages for collective decision making are agenda setting, issue definition, proposal and debate, and collective choice. We turn to that discussion next.

A Behavioral Model of Organizational Decision Making

Organizations differ from individuals in how they make decisions, of course, but the stages that we identify in figure 2.1 apply to them, with many of the same implications. The division of labor that is possible within an organization does not completely mitigate the problem of attention scarcity. Further, the complex interactions among subunits within an organization can add important new dynamics to the decision-making process that individuals do not experience. Since organizations are made up of humans, the cognitive architecture of human decision making affects how decisions are made within organizations. In figure 2.1 we laid out some terms along the right-hand margin that indicate how our decision-making model applies to collectivities. In this section, we go through each of these stages in turn as they apply to organizations, including governments.

Agenda Setting

Agenda setting is the organizational analogue to attention allocation at the individual level. Agenda setting is simply the process by which the organization comes to pay attention to some issues rather than others. One fundamental difference between individuals and organizations is that an organization can adopt a new policy choice at a given time and then create a specialized unit (agency, department, etc.) to implement this new policy; this specialized unit may go on for decades routinely implementing the policy without the issue ever appearing as part of the formal agenda again. Past decisions therefore leave a policy trace over time. In governments, there can be thousands of such policies. In sum, the parallel-processing capabilities of large organizations imply that even if agenda setting has to come first, there may be a great number of decisions routinely being made on the basis of the implementation of previous policy choices, not recent ones. Past agenda-setting activities leave policy traces in today's bureaucratic agencies, laws, regulations, and budgetary commitments.

Twenty years ago, Herbert Simon (1983) distinguished between serial and parallel capacities in processing information. Serial processing is how one processes information when attention must be focused on that single decision and no others; this is decision making *in seriatim*, or one at a time. Parallel processing capacity involves separating tasks into their component parts and assigning each one to specialized units, effectively dealing with many things simultaneously. People can do it to a limited extent, but their parallel processing capabilities are limited by the size of short-term memory. Computers can do this; some of the most powerful computers are in fact not particularly powerful individually but simply link "in parallel" great numbers of processors. Organizations can parallel process information as well, through the division of labor. The Postal Service continues to deliver the mail no matter what the Energy Department is doing; specialized functions of government allow for massive parallel processing, where literally thousands of issues are being processed, each within its own specialized community. But at some point, even large organizations capable of dealing with hundreds or thousands of different tasks at the same time must switch from parallel processing to serial processing; this is agenda setting. The bottleneck of attention that Simon described and we mentioned above applies to the agenda-setting process for organizations just as does attention allocation for individuals. While an organization can create specialized subunits to deal in parallel with separate problems, the leadership of the organization still has a limited attention span. So there is a serious bottleneck of attention; agenda setting is simply the process by which that scarce attention gets allocated.

Like all organizations, governments have a limited total capacity to direct attention at policy-relevant aspects of the environment. Organizations are able to postpone to some extent this reckoning by parallel processing and the creation of specialized departments and agencies. The congressional committee system is a good example of this ability of policymaking bodies to off-load demands, allowing them to be examined more thoroughly and protecting the chamber from information overload. If the chamber defers to the committee, then the limits of attention have in effect been circumvented.

Circumvented, but not avoided. Any controversial topic being considered for serious policy action must have some debate in the chamber; otherwise, representative government ceases to have meaning. Even routine votes take time. Because of the limits on the serial processing capacity of the chamber, there are limits on the ability of the chamber to utilize the parallel processing capacity of its committee system. This is known as a "span of control" problem in public administration, but it is intimately related to the attentional capacity of the supervising body. Devolving important decisions to organizational subunits requires that one supervise and monitor those units. Thus, there are limits to how much can be done even with extensive division of labor. Further, the creation of more and more specialized subunits creates other costs, as organizational missions may not correspond to the needs of the larger body, or as the nature of the problem evolves in ways that require coordination across specialized but unrelated subunits. So there are real costs

and limits to parallel processing in organizations. We substitute the span-of-control problem, for serial processing capacity, as the limiting feature in organizational decision making. In any case, central leadership has limited attention, and these bounds can be stretched but not eliminated.

We mention the congressional committee system here only as an example; the process is quite general. The mayor of a large city devolves responsibility to his executive departments; the president devolves matters to his cabinet. Each cabinet secretary or department head similarly devolves decision-making authority to relevant subunits, and so on. But at some point, these parallel decision-making capabilities reach their limits, and major, overarching, cross-cutting decisions need to be made, affecting more than just one of these subunits. And at a minimum, the political leaders need to check to ensure that the administrative agents are acting according to their preferences. In sum, attention matters. And attention is limited.

We treat the agenda-setting stage in great detail here because setting the agenda is a complex task in organizations but is much simpler for individuals. But this still takes us only through the first stage of the process. The next stage is to determine how an issue is to be understood, or defined.

Problem Definition

There is a rich literature in political science on how political problems are defined (Rochefort and Cobb 1994; Stone 1997). While vigorous debate continues in the area, there is no disagreement that general cultural experiences and understandings often constrain how a problem is defined (Cobb and Ross 1997). Similarly, there is recognition among many studying political decision making that arguments can matter. New arguments occasionally break through the previously accepted wisdom about how a problem is to be viewed (Hinich and Munger 1994; B. D. Jones 1994; Riker 1996). In any case, whether they are determined by individuals behaving strategically, mandated by institutional rules, or affected by changing cultural mores, problems come to be defined, and these problem definitions can change over time. As in the discussion above relating to how individuals characterize problems once they've focused on them, organizations must reach some view of the nature of the problem. Different actors may promote different issue definitions, but having a sense of what the issue is about is an inherent next stage in any decision-making process. For government to adopt a new policy to address, as in our previous example, the issue of poverty, it must reach some conclusion, even a tentative one, on how it defines the issue of poverty. Otherwise, the potential solutions cannot be assessed.

Proposal and Debate

Once a problem is defined, proposals for addressing it must be generated. There is no paucity of sources for proposals, including interest groups, bureaucratic agencies, universities and think tanks, and experiences with past policy actions. Policymaking leaves a residue of appropriations, rules and regulations, and new organizations to implement new programs. These all become part of the immediate policymaking environment that legislatures and executives must at some point attend to. In particular, they become sources for proposed solutions for new problems. Bureaucracies are storehouses of previously implemented solutions generally encoded in decision rules.

General cultural understandings can influence proposal generation. For example, in the United States there is a general suspicion of government regulation as a mechanism for solving problems, and a taste for even indirect and subsidized private-sector solutions over direct governmental control. But sometimes other cultural values can conflict even with such a general one as this; take the example of public education. Because of the historical tradition of public education in the United States, the proponents of privatization have had the uphill fight in this area. Private-sector solutions are often preferred by Americans as a general concept, but not in all areas; why does one value sometimes trump another? Past practices have trumped general cultural views on government, making it very difficult for educational reformers to achieve traction, even though privatization of services and smaller government correspond to widely held cultural values. Neither cultural values nor policy inheritances uniquely determine policy proposals; both matter. In any case, the linkage between problems and solutions at the collective level is not straightforward. There are often multiple viable solutions to a given problem, and as John Kingdon (1995) has written, many political actors are more interested in making sure that "their" solution is adopted than in what problem it might be supposed to address. The third stage of a collective decision, then, proposals and debate, centers on the linkages between problems, however defined, and available policy solutions.

Collective Choice

By the time a legislature or other decision-making body votes on a proposition, a process of recognition, problem definition, and proposal generation has already occurred. In collective choice, some rule must be in force to decide the winner among alternatives. These rules generally must involve some

arbitrariness, and no rule is completely neutral in its effects. The French eighteenth-century mathematician Condorcet showed that no single voting rule works best, except in the simplest of circumstances, and that work was rediscovered in the 1950s by Kenneth Arrow and others. By a wide margin, however, more arbitrariness can creep into the process in the recognition, problem-definition, and proposal-generation stages than in the choice stage.

Political scientists have studied in great detail the mechanisms of collective choice: voting rules, amendment procedures, and parliamentary mechanisms have clear importance in affecting outcomes. While these studies have yielded great payoffs in understanding collective choice, they have come at the cost of neglecting the earlier stages of the decision-making process. The final stage of a decision is no more determinative of the final outcome or any more prone to manipulation and strategic behavior than the earlier stages. In fact, with the multistage view of the process of decision making, we simply want to bring the reader's attention to the many uncertainties that may affect a final choice even before the alternatives are presented for debate. Others have shown that the outcomes of formal legislative debate can be strongly affected not just by preferences but also by agenda control, the presentation of alternatives, and voting rules. As important as they are, these dynamics relate only to the last stage of the process we lay out here.

We reiterate that organizations are made up of individuals, so it should be no surprise that many of the cognitive limitations we've noted affecting decision making at the individual level should also affect that among organizations. Formal organizations allow humans to extend their capacities—in effect, to avoid some of the limits in information processing and problem solving imposed by human cognitive architecture. In fact, the great merit of organizations is the division of labor that they make possible. This in turn allows the organization to enjoy the collective contributions of hundreds or thousands of individuals, obviously with greater capacity simultaneously to attend to multiple issues than any single individual. On the other hand, organizations fall prey to the same cognitive and emotional limitations that individuals do in their problem-solving activities (Jones 2001:151). Because humans are the "building blocks" of organizations, the connection between individual information-processing and organizational information-processing is not metaphorical; it is causal.

We have laid out a model of decision making based on the somewhat arbitrary division of the process into four stages. Our use of stages is not meant to imply that each decision necessarily progresses from one stage to the next; often these processes are merged or come out of order. But the four stages are logical requirements for a final decision to be made. We have presented them

as stages for clarity of exposition. These four stages apply to both individuals and, with some differences, to organizations, including governments. Let us consider now how decisions are made in sequence; in fact, this is where the most important implications of the model become clear.

The Dynamics of Choice

Choice dynamics implies information processing. Some issues are automatically reconsidered periodically, but in many cases we have some flexibility. We need not reconsider an issue unless there is some reason to do so—when there is new information about the issue. This alone gives a strong status quo bias to decision making, but there are several other aspects of human and organizational behavior that make the time trace of decision making highly inefficient.

Proportionality

Before we turn to our dynamic behavioral model, we ask how this process of reconsidering decisions across time would work in a fully rational decision-making system, that is, one hypothetically not affected by human cognitive limits. This hypothetical kind of system would be fully efficient, although uncertainty would still have to be factored into the system. There would be constant monitoring of the inputs coming in from the environment; and decisions would be adjusted in proportion to changes in the environment. Problems would be defined in direct proportion to their severities, and solutions assigned according to their efficiencies in solving the problem. This would be a fully *proportionate* process: the size of any change in response would be equal in proportion to the size of any change in the incoming signal from the environment. The movement among issues would be seamless, and any responses would be delayed only because of the costs of searching for new information and imposing a new solution. No additional status quo bias would exist.

This proportionality standard will serve as a marker from which to judge policy change in the upcoming empirical chapters of this book. We can compare the inefficiencies that stem from the operation of cognitive capacities and organizational aspects with this rational, proportionate adjustment process. The formal requirements for supermajorities inherent in U.S. institutions also add inefficiencies in comparison to a fully proportionate system, but not necessarily in comparison to a majoritarian system based on bound-

edly rational actors. Majorities may overreact even more than American institutions underreact.

Inefficiencies Based on Attention and Identification with the Previous Decision

The process of attention allocation is fundamentally inefficient, in that it adds friction to the translation of informational signals into outputs. As a direct consequence, decision makers tend to respond disproportionately to new information. We show in this section how this inefficiency is unavoidable and that it is exacerbated by other aspects of human nature that add even more inefficiency to the translation of inputs into outputs.

Generally, any given decision maker (or organization) deals with many different issues almost simultaneously, as one issue bleeds into the next. Attention can be directed at only one problem at a time, but decision makers must have some mechanism for shifting attention and effort among multiple problems. So real-world decision makers often juggle multiple problems as well as multiple characterizations of each of several problems. The difficulty in handling multiple streams of information via the serial processing capacity of short-term memory led one student of human cognition to refer to the human brain as the "master juggler" (Wills 1993:268–69).

Shifting attention from topic to topic tends to be episodic, disjoint, and somewhat jarring. One minute one is watching a soccer game on TV; the next minute one realizes that one forgot to buy Mom's birthday gift. Government leaders deal one minute with a foreign policy crisis, the next with educational attainment among twelve-year-olds. Academic department heads deal one minute with research grants from the faculty, and the next with a plagiarism case. Shifting from topic to topic, and even back to a topic that has previously already been considered, can be anything but incremental.

But most of the time choice is incremental. Consider a decision maker dealing for a second time with an issue that has previously been addressed. In most situations it doesn't cross his or her mind to attend to the issue—it is "off the radar screen," as the saying goes. So most decisions are repeated through time with no conscious evaluation of why the policy or behavior is continued. One cannot make a decision without directing attention to it. But one can certainly allow the status quo to continue without much thought, and we do this all the time.

If an issue is explicitly considered, the first reaction of a decision maker might be, Is there any reason to change the way I have dealt with this in the past? If not, then repeat the previous decision. That is, we expect little reason

to think that a decision maker, when dealing with a recurring issue, would change his or her decision in the absence of some threshold of unanticipated new problems or new information. So in dealing with a recurring issue, the first decision rule might be something like: if no crisis looms, or if no major new problems have emerged, then the previous choice, the status quo policy, is justified and should be repeated. In the case of an individual, it means that the issue is simply not considered further. In the case of an organization, it means that the parallel processing units within the organization (that is, specialized agencies) continue to deal with it. Leadership need not intervene. The subsystems continue to operate.

A threshold is a value for a problem-space attribute that implies policy action when it is exceeded. In a perfectly rational, full-information situation, one would reevaluate a standing decision when the improvement from reevaluation exceeded the costs of search for a new solution, and that would result in some positive threshold before it would be worth the trouble to reconsider. But reconsidering requires attention and conscious thought, both of which are scarce and must be allocated in serial fashion—that is, when we are thinking about one problem, we cannot be thinking simultaneously about another. As a consequence, a behavioral model of decision making incorporating serial processing results in a larger threshold than does a full-information rational model. The situation must be more dire in the behavioral model, and that generally evokes emotion.

Directly because of the constraints of serial processing, people and organizations have much higher thresholds for working on a problem than would be the case in the absence of this cognitive facet. But there are other elements that cause previous decisions, status quo biases, and thresholds to loom much larger in a behavioral model of choice. These include, most importantly, an emotional attachment to the prevailing way of doing things—identification—but may also involve vested interests and simple indolence. Different institutions and different individuals may be more or less efficient in the sense of having a low threshold for reconsidering old issues, but there is necessarily some bias to the system because of the scarcity of attention. We prioritize attention to those issues that seem to require it most strongly.

Inefficiencies Based in Difficulties in Entertaining New Issue Characterizations

"Do I need to pay attention to this issue now?" Often, the answer to that question is no. In this case, the status quo understanding, issue definition, solu-

tions, and choices remain the same by default. What if the answer is yes? This implies that something about the status quo policy or choice currently in place is worth reconsidering. Now, it could be a relatively simple matter of periodic revisitation, a routine reconsideration of the issue according to some timetable set in advance. In this case, the choice may be very simple and quickly made in favor of continuing the status quo. Or it could be that a simple change in some indicator has become apparent, and an adjustment to the policy is needed, but no fundamental rethinking is called for; this also may constitute a large proportion of choice situations.

But if things are considerably out of kilter, it may be necessary to consider a fresh characterization of the issue. New information may cause the individual to give greater weight to dimensions previously given less consideration; for example, when buying a second car after having first bought a red sports car, one might decide to be more practical. Similar choices made sequentially over time need not always be made with the same weights for each of the dimensions of evaluation. We can assign different weights to the various dimensions of choice, even completely ignore some of them, at different times if we face the same or a similar choice repeatedly over time. For organizations, new issue characterizations are often associated with the entry of new participants or a change in leadership. In governments, elections and other personnel changes can lead even an ongoing organization to reconsider and reevaluate issue characterizations.

In sum, there may be many causes for the decision maker to reevaluate a status quo policy. But the first step in the process is to pay attention to the issue. At this point, once the agenda has been set so that attention will be paid to this issue again, several things can happen. Previous decisions can be evaluated and concluded to have been made appropriately or to require only minor adjustments. But looking back at the stages of the model presented above, it is clear that several other options are possible: the issue definition may have changed; the mix of available solutions may have been altered; the preferences or the identities of the decision makers may have changed. There is often nothing more than an incremental adjustment, at best, however, unless a new characterization of the issue is adopted. Further, the very fact that the issue passed the first test, that it requires attention, may imply that the previous decision was based on a faulty issue definition. So when an issue reemerges on the agenda, one may expect some reevaluation of how it should best be characterized.

Inefficiencies in Choosing Solutions

Once attention is directed at an issue and the issue has been characterized, the search for solutions occurs. In facing any issue, people naturally consider whether the issue is similar to one they have considered in the past. Generally speaking, in forging solutions to problems, humans draw upon two resources: the previously encoded or learned responses to problems from memory and the search for solutions that have not been used before. This is known as the "preparation–deliberation trade-off" (Newell 1990). Being able to use previously learned solutions presupposes being able to classify problems and deciding when a new problem is "sufficiently similar" to understood ones that a previously learned solution will work. Using previous solutions is efficient, in the sense of not requiring further search, but it runs the risk of being inappropriate or downright wrong. The key is to know whether a previously chosen solution remains appropriate for the new issue; is the current issue really similar to an issue that may have been dealt with in the past? Or does it just appear similar at first glance?

Often, people become emotionally attached to favored solutions beyond their direct utility. Herbert Simon (1947) referred to this phenomenon as "identification with the means." This emotional association in effect "locks in" previous ways of doing things, making adoption of a new solution more difficult and less "smooth" than it otherwise would be. One major instance of this phenomenon in politics is ideology. People identify with an ideological position—"I am a conservative"—and this identification affects how they prioritize problems, construct problem spaces, and organize solutions. Changing these perspectives in a committed ideologue is difficult indeed. But cognitive lock-ins need not be limited to ideological issues. Many public policies are administered by professionals with a strong identification with the means. That is, forest rangers often have a professional identification with a certain way of managing the forests; social workers often believe in a certain way in providing welfare services. Foreign Service officers often differ from Army Rangers in their views on how to conduct foreign relations. These professional identifications often make professionals resistant to changing issue definitions or to considering or adopting new solutions to old problems, even when it may be clear to others that the status quo policies are failing. Individuals and organizations may not be readily willing to abandon their old ways of thinking. Professional identities, training, and knowledge can lead to identification with the means just as much as ideology can.

In humans, in organizations, and in public bureaucracies, there is great friction, or resistance to change, far beyond what can be explained through

rational search costs. Attention, when focused on an issue, tends to stay there. During the time attention is directed at a given issue, a certain set of issue definitions, policy proposals, and choices may be justified. When change does occur, it can be dramatic, because the friction that leads to so little change much of the time has to be overcome before any serious change is possible. It takes a lot to overcome the cognitive and organizational frictions that encourage replication of the status quo.

When faced with a decision similar to a decision one has already made in the past, remembering the past decision is likely one's first heuristic shortcut. If it seemed to have worked, and if the current situation indeed appears similar to the previous one, then why not repeat the previous decision? It seems the most logical course of action. But what is the reason for reconsidering this previous decision in the first place? Issues can recur on a personal agenda for reasons that either are routine or indicate a need to rethink previous decisions, since apparently they did not work out. But one may have a tendency to muddle through, implementing old decision rules as long as they seem to work tolerably well. In sum, it may take a high threshold before one decides that muddling through is not the best option; when this occurs, then a more fundamental rethinking can occur. The resulting distribution of decisions may show the characteristic shape of adhering the great majority of the time to a strong status quo bias but occasionally involving dramatic innovations.

Among organizations similar processes go on, but they are accentuated by established organizational missions. Organizations do not simply give up their old ways of thinking about problems. Bureaucratic entities come to identify with their established ways of doing things. Sunk costs and organizational structures matter. Now, these established ways of doing things are not fully immutable. At some point, even the most hidebound bureaucracies can modernize. The point here is simply that organizations, probably more than individuals, will tend first to look for reasons why it may be appropriate to consider any new decision situation sufficiently similar to previous ones that status quo policies can be used to muddle through tolerably well. And this is not a bad approach in most cases. The same cognitive processes that are apparent among individuals also work for organizations, but these are accentuated by the fact that in many organizations employees have professional identities, if not jobs and entire self-justifications, at stake. Just as we did with individuals we would therefore expect organizations to exhibit a pattern of favoring status quo policies unless and until sufficient and substantial pressure builds up to demonstrate that these are no longer feasible. At that point, past some threshold, more fundamental restructuring and new problem definitions can come into play. Therefore, we may expect a distribution of outcomes similar to what we described for individuals above: extreme allegiance to the status quo most of the time, with occasional bursts of innovation.

Policy Inheritances and Path Dependency

Notions of organizational sunk costs and tendencies to repeat past decisions are nothing new in the study of public policy. Rose and Davies (1994) term the tendency to rely on past decisions "policy inheritances." Policies today are not made in a vacuum; they are built on previous policy decisions, which exert a heavy hand on future commitments. The general phenomenon of policies reproducing themselves through time is known as path dependency (Pierson 2000). Once a path is chosen, it tends to be followed. Moving off the path can be difficult.

It is not immediately evident why policies at one time should be so heavily influenced by policies at a previous time. Policies are designed to effect objectives; so one explanation is that the conditions that gave rise to the policies in the first place are still present. Because conditions are constant, policies stay in place. But if the conditions are the same, why continue the policies if they have not affected them? Moreover, empirical analyses of many policy commitments show that one cannot explain them easily from conditions or lagged conditions (that is, those conditions present in the past) alone. An explicit consideration of earlier policy commitments must be part of the explanation of current policy commitments. This is particularly true of government budgets.

Why is this adjustment for previous policy commitments necessary? Perhaps policies work, and because they work, they are continued. The problem here is that many would argue that policies in place for a very long time don't work very well. A vigorous debate over welfare reform in the United States illuminated both the weaknesses and strengths of the system, but the continuance of the system for many years indicates that policy inheritances go far beyond the successes of the policy. Because policy commitments represent past political victories by interest groups, and these groups fight to keep their previous victories in place, an interest-group explanation might be the key. But empirical studies of policy subsystems indicate that, much of the time, policy activity occurs in low-conflict situations. Even when conflict occurs in policy subsystems, it settles into routine channels in which participants learn from each other (Sabatier and Jenkins-Smith 1993). Continual interest-group activity to protect past gains is not vigorous enough to explain policy stability.

Another oft-noted reason for the difficulty in shifting policy direction

stems from continuity of participation in key governmental positions. After all, the American system of separation of powers and different electoral cycles for the president, the House, and the Senate makes wholesale changes in government officials relatively rare. But enacting change often requires the involvement of a diverse range of policymakers. Many of these, including those in important gatekeeping positions, typically were involved in creating the earlier policy or at least in administering it. They often have a sense of ownership in the status quo policy, and convincing them to admit that their previously favored policy is now outdated or is no longer the best policy, and perhaps was a mistake in the first place, may not be an easy task. Naturally, they resist admitting past mistakes, and changing a policy in the absence of dramatic evidence of changing circumstances often comes close to admitting that the previous policy was a failure. Not all involved in implementing or enacting the previous policy will want to do that, and many of those people will still be involved in the policy at the next go-round.

Policy inheritances must be understood as organizational phenomena. New policies put in place new agencies to implement them. These new agencies and programs acquire a life of their own, as agency personnel identify with their new mission and interest-group activity centers in the new agency. Most importantly, the major political combatants abandon their attentiveness to the policy arena, treating it as a policy settlement that has solved the problem (or at least provided a satisfactory compromise for the time being). New organizations are created, and they are part of the current policy environment.

Disproportionate Information-Processing

These cognitive and organizational facets lead to a model of decision making that stresses disproportionality in response to incoming information. Generally, people do not respond in proportion to the strength of the information signals they receive from the environment, nor do the organizations they inhabit, and this is because of their cognitive architectures. Mathematician Benoit Mandelbrot put it this way: "Man tends to react either by overestimation or neglect" (1997: 280; see also Mandelbrot 1999). Similarly, governments are disproportionate information-processors. Sometimes they underrespond, not attending to the problem; at other times they overrespond. Some of this characteristic pattern of disproportionate information-processing can be accounted for by decision costs: the fact that in American political institutions "supermajority" constitutional requirements limit quick action. But much of

the disproportionality comes from the process of collective allocation of attention. The roots of disproportionality are in the cognitive architecture of humans as well as in constitutional rules or institutional procedures.

Often, disproportionality plays out in policymaking as a pattern of overlooking clues in plain sight and then overreacting when attention is directed at the previously obvious clues. We need not look far for examples of systematic underappreciation of some rising policy problem and then an overreaction to that same problem. Reports from commissions studying the response of government to the events of September 11, 2001, indicate that American government officials understated or underattended to the issue of terrorism on our shores, and of course subsequent to those events many government agencies rushed to make terrorism a major priority. Proportionality would have implied a smoother process. Even given the "noise" in signal processing, it is clear that the Bush administration in its early months underappreciated the terrorist threat, even as the intelligence officials responsible for the area were very concerned (Clarke 2004).

But what agency, much less one that does not have a particular mission to focus on terrorism, would overcome its own status quo biases to make this a new priority? The National Security Council had difficulty in appreciating the nonstate nature of the al-Qaida threat, believing that the resources of a nation-state would be necessary to accomplish a major terrorist attack. Shifting attention requires a major impetus and an associated problem redefinition, and some general intelligence about possible threats would not be enough. The natural tendency is to underemphasize new threats, new ways of thinking of things, new ways to organize public bureaucracies, until and unless some significant threshold of urgency is crossed. At that point, major changes can occur. While the 9/11 terrorism example is an extreme case of such a thing, similar patterns of overresistance, then overreaction, are general characteristics of government. Crises seem necessary to drive change.

Why Thresholds Are Not the Whole Story

We've laid out a model of attention shifting and argued that this leads to severe disproportionality in policymaking. Threshold effects are an important part of this story. One might think that all disproportionality could be understood in terms of thresholds. We could assume that each problem is indexed by a measure of severity (the information), and each measure has a threshold that triggers government action. Attention would shift to a problem if the indicator exceeds its threshold. In a behavioral model such as the one we have developed here, thresholds would be much larger than in a pure

rational-information model, but they might be assumed to operate similarly even if at different levels.

There are major differences, however. The first is the tendency of humans to overreact with "alarmed discovery" when a clue in plain sight is recognized. In our behavioral model, thresholds don't cause proportionality; they compound disprorportionality. Thresholds in human decision making do not work like thermostats. A thermostat keeps a room's temperature constant by turning on the heat when the temperature drops below a threshold, and turns it off when it rises above a second threshold. The range is quite narrow, so that a person would not notice the minor differences in temperature. Human decision makers, however, often hold to a prior decision far beyond its utility, because attention is directed elsewhere, or because beliefs or political ideologies are so strong that reevaluating them would be quite painful psychologically. When they are forced to change, they can be so far "behind the curve" that major adjustments are required, leading not to a smooth adjustment to events but to disjoint shifts that themselves can disrupt the system.

Second, the same facets of belief and ideology that usually lead to a strong status quo bias can lead in some circumstances to overreaction. Ideologies and beliefs, when strongly held, can motivate people to take action they would not take under calmer analysis. Third, communication matters and can account for behavior in collectives that is unimaginable in noncommunicating aggregates of people. People talking to one another can become "irrationally exuberant" (Shiller 2000) or simply follow the crowd in a cascading reaction to a minor change.

Two other well-known mechanisms undermine a pure threshold model. The first is the now-classic garbage can model. In that model, attention is triggered as much by policy entrepreneurs as by any agreed-upon threshold. The George W. Bush administration's push to attack Iraq for "weapons of mass destruction" is a case in point. It is at least the case that the threshold value for attention and action was pushed much lower after the terrorist attacks of September 11. But this sort of contingency goes much deeper. Could one imagine President Gore, or President Bradley, or President McCain, or President Buchanan, or President Nader attacking Iraq in the face of such a severe threat from al-Qaida? While one can never be certain of such "counterfactuals," certainly the probabilities would have been vastly different. In any case, as we noted above, attention to a given issue does not always tell us much about what solution will be adopted.

The second mechanism is agenda crowding. If at one point in time many issues clamor for attention on the agenda, while at another fewer issues are present (for whatever reason), then threshold values are likely to be affected accordingly. With a limited agenda-processing capacity, all other things being equal, thresholds will be lower for the case where fewer other issues are already on the agenda. Where the agenda is already full, it will be that much harder for a new issue to merit attention. Since the current "crowdedness" of the agenda is likely unrelated to the severity of any particular other problem, we can't conceive of the thresholds we describe here as fixed; they depend on the current state of affairs and can be higher or lower depending on other unrelated factors. But they always exist; they are never zero.

The most important way in which a simple threshold model is insufficient to capture the degree of discontinuity that we describe is the existence of interactions among the stages of our behavioral decision-making model. Attention to any given issue may be related to threshold effects (these may be variable thresholds, as noted above), but the model has four stages, and the decisions made in the subsequent three stages may all reinforce the disjoint nature of the process. As we noted with the case of the war in Iraq, the emergence of the issue of terrorism on the international agenda on September 11, 2001, did not determine the nature of the subsequent policies. In fact, different governments around the world have responded differently than ours, and there is little reason to suspect that another leader would have chosen the policies that President Bush followed. So the rise of a new issue is just the first step; the issue must then be characterized; solutions must be evaluated, and choices must be made. Each of these four stages is subject to interactive effects, because previous decisions at each stage can be discredited when the issue is forced again to the agenda. So disjointedness is greater than in a simple threshold model.

In sum, a strong status quo bias exists in human and organizational decision-making processes. This bias stems from a variety of cognitive and emotional mechanisms, including the friction of attention allocation, the unwillingness to sacrifice a comfortable characterization of an issue, emotional identification with a particular solution, and simple familiarity with and confidence in a particular solution. But the resulting path dependency is not inevitable—it does not have to go on forever—and when it collapses it may cascade into destructive waves of change. So disproportionate information-processing does not imply a generalized threshold effect that delays a response until problem severity reaches a critical level (whatever that critical level might be). It also means that path dependency can be broken in a wave of overreaction, either because political leaders are playing "catch up" to deteriorating indicators of a situation or because some other mechanism has resulted in a collective focus on a previously ignored problem.

Fortunately, methods are available to study policy processes for such com-

plexities. The qualitative case study has been the tool of choice in policy studies, perhaps in large part because of the implicit recognition of these kinds of overwhelming complexities. We rely much more heavily in this book on stochastic process methods, which simply incorporate the contingencies and uncertainties into the approach, as we make clear in chapter 4.

Conclusions

This chapter has laid out a model of decision making, first at the individual level, next at the collective level, and finally in dynamic terms, as we move from one decision to the next. This process is not smooth. In fact, the disjoint nature of attention shifting as one moves from one choice to the next is one of the fundamental characteristics of the decision-making process that determines the nature of policy change.

Change tends to be either feast or famine. There is an extreme allegiance to the status quo simply because we are so overloaded with choice opportunities, problems, and complex issues that we cannot deal with any but a small fraction of the ones that probably deserve some attention. While this allegiance to the status quo may be ideological, it does not have to be. A powerful status quo bias would exist even in the absence of ideology, because it is based in human cognition and then exacerbated in organizational settings by missions and bureaucratic procedures. Coupled with famines where little change takes place come the feasts: policies can change quite dramatically, because once we decide to focus on them, we may fundamentally reevaluate not only our choice, but indeed our understanding of the issue, our weighting of the relevant dimensions of the issue, our consideration of potential solutions, and our goals in addressing the issue in the first place. Similarly, within organizations, if an issue is pushed up high onto the political agenda, typically it is because the status quo policies have been shown to be inadequate for some reason, at least in the perception of some relevant actors. So look out!

In the remaining chapters of this book, we will demonstrate the feast-or-famine nature of policy change. Here we have tried to start out with a simple explanation of the root causes of these processes: the bottlenecks of human cognitive architectures and the behavior of organizations constructed from human raw material that are so obvious in politics. The dynamics of policymaking come from how political systems process information. Understanding how information is processed in the political system allows us to understand how policies are chosen, reified, and occasionally dramatically revised.

3

The Intrusion of New Information

The things Congress does best are nothing and overreacting.

—Tom Korologos

New information carries with it the potential to shock, to disrupt, and to destabilize as it intrudes into the policy process. Indeed, the model we laid out in the previous chapter implies that either information is underappreciated by being ignored or interpreted in a benign fashion, or it stimulates overreaction, ushering in a period of "alarmed discovery" (Downs 1972). This chapter is about how a political system reacts to new information. We address two key questions: When is a change in the environment, an informational signal, recognized as relevant to a policy problem? If it is, how is the signal interpreted?

Underlying these two questions are two related processes for the recognition and interpretation of new information. We term these *issue intrusion* and *attribute intrusion*, the former to denote reaction to new or previously overlooked information, and the latter to denote the process of issue redefinition as people grapple with the meaning of this information. Issue intrusion, concerning the detection of signals in the environment, addresses the first stage of figure 2.1. To study it we develop what we call the implicit index model of attention (Jones 2001:179–84). In monitoring the environment, people must juggle numerous sources of information of varying reliability and relevance. Somehow they must combine the messages from these various sources into something relevant to action (or inaction). We refer to the process of combination as implicit index construction because its construction and use is rarely recognized or admitted explicitly. Rather, like an informal set of