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SYSTEM EFFECTS REVISITED

Robert Jervis

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ABSTRACT: *System effects often stand in the way of attempts to come up with simple explanations of politics. Systems are often characterized by nonlinearities, where an effect is more than the sum of the effects of the actions taken by multiple actors. Another system effect is feedback, where the effect of actions is to amplify the problem the actions are intended to solve. There may also be indirect effects, where an incidental aspect of an action becomes more important (to other actors) than the primary intention; contingencies, such that an effect is not inevitable but depends on idiosyncratic or even anti-strategic initial actions; interaction effects, where the behavior of an actor changes the environment of action, so that other actors do not respond as anticipated; and unintended consequences, where the long-term or secondary effects of an action differ from the intended effect. Each of these system effects can frustrate scholarly attempts to understand political behavior using simple models of action, and, even more, can frustrate the attempts of political decision makers to predict the effects of their actions.*

At the risk of discouraging sales of my other books, I must confess that *System Effects: Complexity in Political and Social Life* (Princeton University Press, 1997) is my favorite. It is not so much that I enjoyed writing it more than I did the others (although it was a particular pleasure to be able to read almost anything and claim it was research) as that I think its ideas and approach make a greater contribution to understanding our political and social world. Yet it has had less influence on the study of political science and international politics than most of my other work.[1]

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System Effects is highly relevant to public policy, but it rarely comes up in my discussions with officials in Washington, unlike my work on signaling, perception, the security dilemma, and nuclear deterrence. The main exceptions are two conferences sponsored by the armed forces. Perhaps contrary to popular belief, military officers tend to be intellectually sophisticated; the range of problems they have to deal with, the diversity of fields of knowledge on which they draw, their stress on the importance of what they call "situational awareness," and their knowledge that they operate in complex environments, make them more open to new ideas—both good and bad—than their civilian counterparts in the foreign-policy apparatus.

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Between Disciplines

Thus, I am particularly gratified that distinguished scholars in different fields have accepted the invitation to write about the phenomena I discussed, just as I have been pleased by the fact that colleagues in economics, sociology, and biology have found *System Effects* relevant to their work and that it has found its way into the curriculum of at least one medical school.

There may be a connection between this wider interest in the book and, in contrast, the paucity of political-science research building on it—stemming, on the one hand, from the nature of academic disciplines and, on the other, from the fact that system effects are both pervasive and elusive.

However, I do not fault my political-science colleagues for failing to explicitly use *System Effects*. I have not written major follow-up studies, as Richard Posner (2012) points out, partly because world politics after September 11, 2001 has taken much of my attention, and partly because I have not found the next steps along the path from *System Effects* to be clear. As Andrea Jones-Rooy and Scott Page (2012) note, new tools, especially mathematical ones, have been developed to elucidate some of these phenomena, but they are not fully compatible with my research style. The failing is not mine alone, however, which indicates that something broader is at work.

Although political science has seen some network analysis and agent-based modeling, the highly mathematical work that is now so important in the discipline has not led many scholars into these areas. Part of the

reason, pointed out by Nuno Monteiro (2012), is that in recent years political science has moved away from theories and has stressed the testing of propositions, often quite narrow ones. Relatedly, while its concern with causation is not incompatible with my book's focus on mechanisms, the discipline's desire to pin down causation by eliminating selection effects, reciprocal causation, and endogeneity, while admirably heightening rigor of expression and testing, leads to a downplaying of the importance of these phenomena not—or not only—as threats to causal inference but as fundamental forces operating in the world. Indeed, as Monteiro notes, the book questions the utility of causation in many contexts. He is too kind to point out, however, that I was—and remain —less than consistent about how much traditional notions of causation can be maintained.

The study of system effects hasn't been integrated into political science and policy research for other reasons: It does not fit the standard categories of political science; it requires interdisciplinary research; and the whole enterprise is one of high risk. Thus, several private and public foundations declined the opportunity to support this work, partly because it was not clear where it would lead. These problems mean that I cannot in good conscience urge students to adopt this approach for their dissertations, and this generates a malign form of positive feedback, since much of the best and freshest research comes at the dissertation stage.

The fact that system effects such as nonlinearities, feedbacks, indirect effects, contingencies, interaction effects, and unintended consequences are not unique to the political realm is another reason why they are not at the center of the discipline's research agenda. On the flip side, the interdisciplinarity of *System Effects* makes it useful to people outside my own field. Indeed, while some of the chapters discuss problems and the literature in political science, the basic framework and concluding chapters (which I view as the most important ones) could not have been written without knowledge of ecology, evolutionary theory, psychology, and game theory (especially the way it was done by Thomas Schelling [1960 and 1978])—but they could have been written without knowledge of political science.

The pervasive but non-obvious nature of system effects also explains why they are worth thinking about. Let me give just three examples. The ideas of interconnections and indirect effects illuminate how the introduction of cell phones in India contributed to the spread of AIDS:

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They allowed prostitutes to make their own arrangements with clients, thereby enabling them to move out of brothels. Brothels, however, had been good sites for enforcing the use of condoms (Harris 2012). The Arab-Israeli conflict provides two other examples, the first of which shows both that some actors can try to make use of indirect effects and that others' behavior may depend on their not being aware of this. One reason that Israel and the United States were taken by surprise when Egypt launched the 1973 October War was that, realizing that the Arab countries could not re-take the territories lost in 1967, they thought the danger of war was quite low. They did not understand, however, that Egypt's Sadat was counting on using a military conflict, not for conquest, but to show the world that the status quo was not stable and that other powers needed to become involved. The final example shows that game-theory thinking can bring to the surface the fact that actors usually try to anticipate how others will behave, knowing that the others are doing likewise (although of course they may not do so accurately, as Israel did not in 1973). In November 2012, Israel's Iron Dome missile-defense system performed admirably in protecting against rockets fired from Gaza, but by doing so may have allowed the Palestinians to attack with relative safety. That is, without these defenses, Israel almost surely would have responded to the attacks with a ground invasion, something Hamas very much wanted to avoid, and so it might not have launched anything like the barrage that it did had Israel remained undefended.

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Between Micro and Macro

A strength and a weakness of *System Effects* is that it is in-between on a number of dimensions. Most obviously, it explicates how action is situated within an interconnected and interactive system. But although I was influenced by systems theories in International Relations, including the most influential book in the field, Kenneth Waltz's *Theory of International Politics* (1979), I was not seeking to be as abstract and parsimonious as that book was. In fact, my book could be seen as anti-theoretical, not in the sense of abandoning abstractions, but rather in questioning the utility of a unified overarching theory. But I also was not engaged in either proposition testing or in developing detailed case studies. Rather, the point was to elaborate and draw attention to a wide

variety of processes and mechanisms that characterize systems across diverse realms.

Similarly, the processes I examined fall between the macro and the micro, and are often connected. I tried to maintain strong micro foundations, avoid teleology and functionalism, and, like the collection of Schelling's essays (1978) that so strongly influenced me, sought to see how micro motives lead to macro behavior. They rarely do so through simple additivity or aggregation, but it is nevertheless vital to trace the links that are involved at the individual level. Often, of course, the result is not something the individual actors favored or foresaw. For example, many of the diagnoses of the 2008 financial crisis pointed a finger at cognitive pathologies on the part of the main players, whose behavior not only brought harm to the entire economy, but ended up destroying many of their own careers and at least some of their fortunes. But the pathology was collective, not individual, and the much-ridiculed saying of one of the leading participants got it exactly right: "As long as the music is playing, you've got to get up and dance."[2] That is, each financial institution had strong incentives to engage in risky behavior, not only to produce high yields for the individuals and institutions, but because if they did not do so they would have lost their customers. Some people may have been irrational, but overall it was the collective outcome rather than the individual calculations that was so.

The Problem of Prediction

This example also brings up a third way in which system effects fall in-between. As Philip E. Tetlock, Michael C. Horowitz, and Richard Herrmann (2012) note, my approach has an ambiguous stance toward prediction. On the one hand, the fact that the links between individual actions and resultant outcomes can often be traced means that an omniscient observer should have been able to find them, or at least estimate their probabilities, ahead of time. On the other hand, we don't have access to omniscient observers. Many people realized that there was a housing bubble, but it was hard to discern the more detailed interconnections among the investment instruments, how they ended up pervading an entire financial system, and the ways in which the failure of one institution would bring down others. Psychological biases may have played a role, as those involved did not want to face the tradeoff

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between short-run profits and the health of their institutions (and their own careers) over the long run, but it was hard to know that this was a disaster waiting to happen, let alone to predict the exact timing of it—especially because it depended in part on what everyone else believed.

Prediction is often—but not always—easier when elements are not so interconnected. Even when they are, I agree with Jones-Rooy and Page and with Tetlock, Horowitz, and Herrmann that a sensitivity to the importance and prevalence of system effects does help us predict, except, of course, that there are often many such effects at work. To put this another way, thinking of system effects reminds analysts and policy-makers that there always will be knock-on effects, indirect results, and second-order consequences. Sometimes observers and participants can anticipate them (although what happens can be affected by whether other actors anticipate them). Even when they cannot do so with any specificity, understanding the kind of ramifications that are likely will aid them in diagnosing the situation and prepare them politically and psychologically to deal with it. Those who think that action, even—or especially—strong and decisive action, will put an end to things are not only almost always wrong, but will be unable to understand what is happening and respond appropriately.

Now let me turn to some more specific system effects.

Evolution and Chronology

We are all familiar with the basic principles of evolution of change through natural selection. Of course there is much more to it than that. Darwin himself also stressed sexual selection (where the choices of one or both partners can depend on the characteristics of a desirable mate, which can be different from characteristics that have the greatest survival value), and recent research has reinvigorated arguments about whether selection operates at the level of the gene, the individual, or the group.

Fascinating as these arguments are, more relevant here is that the common idea of actors (and their offspring) changing to adapt to a static environment is misleading. In both the natural and social world, actors shape the environment just as they are shaped by it, often in ways they do not appreciate. This is obvious in the study of ecology, where the growth or decline of any one kind of plant or animal affects many others, and indeed can alter the soil, topography, and even the local climate. I cannot

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resist re-using a quote from *System Effects*: In describing the East African plains, a Maasai explained that "cows grow trees, elephants grow grasslands" (Western 1993, 54; also see Bescheta 2003). By eating grass, cows clear the land so that trees can sprout; elephants eat leaves and destroy trees, opening the way for grasses to thrive.

Multiple actors and environments often are involved, but we can also see co-evolution at work between two actors. Each is, in effect, the other's environment, and over time each changes it in a way that alters, if not its own behavior, then at least the results of its behavior. Although this can be apparent in retrospect when we trace the reactions of both parties to something that happened long before, the connections and processes often are obscure and indeed will appear only if one is looking for them.

A nice if disputable example is provided by Sergei Khrushchev's account of his father's behavior in the early 1960s. The Americans thought of the loss of one of their U-2 spy planes over the Soviet Union in 1960 as an unfortunate incident that, in the grander scheme of things, mattered relatively little. And when American observers and policy makers came to interpret Khrushchev's behavior in the subsequent years, they rarely mentioned this episode. They were wrong, according to Sergei, who argues that Khrushchev's outrage at the spying "would be reflected in the harshness of Father's position in the Vienna summit in 1961 and would also largely determine Soviet conduct during the deployment of Soviet missiles in Cuba [when he routinely used deception]. Father's wounds never healed. The deception on the part of his 'friend' General Eisenhower, who had gone on walks with him at Camp David and agreed that nothing was more terrible then war, struck Father to the heart" (Khrushchev 2000, 390). Of course this account is suspect in being exculpatory, and Khrushchev had used deception, bluff, and belligerent bargaining tactics before. But I do not think that we can entirely discount the possibly that the continuation of the U-2 flights after Camp David altered Khrushchev's outlook and behavior. Despite Eisenhower's reservations about authorizing these flights because he feared the consequences for American-Soviet relations, after the incident happened, neither he nor, even more, the members of the Kennedy administration understood that Khrushchev's perceived environment had changed and that he might act differently.

More generally, Lawrence Freedman (2004; also see Lieberman 2012) correctly notes that longitudinal studies of deterrence are extremely

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useful, but remain underdeveloped. In some cases failure at one point stems from early deterrent successes that increased the adversary's grievances. In others a subtle hint of retaliation may suffice because previous incidents have led the challenger to expect the state to stand firm. More broadly, such interactions can be seen as variants of the spiral model and the security dilemma, in which conflict is heightened by each side's attempt to increase its security, with the result that both become less secure (Jervis 1976; Booth and Wheeler 2008; Tang 2010). Each side's actions alter the environment in which the other operates, in this case to malign ends. At a certain point, furthermore, the changes induced in each side by both the other side and the interaction itself may penetrate so deeply into its perceptions, preferences, values, and domestic institutions that the hostility may become irreversible. Changes in the environment can produce fundamental changes in the agents.

The mutual molding at work is easy to overlook, especially when we focus on one actor alone. Thus it is often argued that President Nixon could have gained the same dismal settlement eventually reached in Vietnam four years earlier, saving 15-20,000 American lives and probably ten times as many Vietnamese. But one does not have to approve of Nixon's policy to see that this analysis is too simple in several ways. With the extra time, the North Vietnamese dropped the demand that the U.S. overthrow the Thiêu-Kỳ regime. And had it not been for Watergate, the threat of renewed bombing might have been sufficient to deter the North Vietnamese invasion that sealed the fate of the South in the spring of 1975. More importantly for systems arguments, the environment in 1973, when the agreement was signed, was very different from that which Nixon confronted when he was inaugurated in 1969, during a period of high tension. Four years later, a Soviet-American détente had been achieved and Sino-American relations had undergone a sea change. The landscape in which Nixon operated had thus drastically altered, and the defeat in Vietnam had much less impact than it would have had earlier. Furthermore, it is at least arguable that Nixon's continuation of the Vietnam struggle contributed both to détente and to the opening to China. Although this is far from certain, the very tensions created by the war—including the sharp escalation in the spring of 1972, when Nixon mined North Vietnamese harbors—gave the Soviets incentives to seek common ground elsewhere. For Nixon's part, the war gave him additional reasons to show that he was not a warmonger. And the tensions between the Soviet Union and China made the latter more

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willing to reach understandings with the United States, while defenders of the president's policy would argue that his continuing support for his South Vietnamese ally gave Chinese leaders reassurance that he would stand by them as well. Thus, it is quite possible that the new environment that Nixon faced in 1973 was created at least in part by his policies. This was not the way he expected things to work out, as the interactions were complicated and he was strongly driven by his pre-existing (and incorrect) views of how the war in Vietnam and relations with the Soviet Union might interrelate. But the effect was nevertheless important.

Much of Nixon's policy toward the USSR similarly reveals each side changing the other in ways that were consequential and unforeseen. At the start, Nixon and Kissinger believed that they could end the Vietnam War through linkage—i.e., they told the Soviet Union that they would enter arms-control negotiations only after the Soviets put pressure on North Vietnam. This was a dismal failure, because the assumptions that the Soviets had this kind of leverage and that they cared much more about arms control than did the Americans were incorrect. What happened instead was that step by step, without fully realizing it, the American leaders were drawn into trying to end the war in other ways and to entering arms-control negotiations which, although not reaching the original American goal of warding off the vulnerability of American land-based missiles, helped produce much better relations with the USSR. This change increased Chinese incentives to establish ties with the United States and also created a world in which China and the USSR saw that their interests would be better served by peace rather than war in Vietnam. So in the end there *was* a form of linkage, but one very different than Nixon and Kissinger had believed would operate.

The path to the important agreements over Berlin and Germany was similar in that the steps taken by each player (crucially including both East and West Germany, although I put them aside here) changed the other's perceptions and incentives, which in turn meant that each state faced a different environment, with the whole process representing co-evolution. We know less about the Soviet side of the story, but it is clear that when Nixon and Kissinger came into office they saw Berlin not as an opportunity to remove a fundamental source of friction, but as an annoying if minor problem brought about by assertive West German actions and a dangerous response by East Germany and the USSR (Department of State 2007). Any new agreement, they believed, would

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rest on the credibility of American threats and so could not provide any greater security than the status quo. In fact, thanks in part to the skill of West German leaders, the East Germans and Soviets became open to significant guarantees and the American probes produced a willingness to compromise that, much to the surprise of Nixon and Kissinger, led them into quite a different place than they were in before. Indeed, their lack of full comprehension of what was happening may have smoothed the way because, far from proclaiming the agreements as the enormous American victory that they proved to be, they played down their importance, which facilitated Soviet and East German willingness not only to sign, but subsequently to deepen relations with the West in a way that helped undermine the Soviet empire. As an added bonus, the United States stumbled on another form of linkage: the Soviet interest in having West Germany ratify the relevant treaties contributed to its willingness to go ahead with the summit in the spring of 1972, despite the American bombing of North Vietnam and the mining of its harbors.

Causation is not absent here, but is complex as it works through multiple links, ones that were not foreseen by the participants and that can be hard to trace in retrospect (such that even if I were to expand my previous analysis with much greater historical detail, it would still be easy to dispute). Each actor is changing in varying ways and degrees as it responds to the other, and with enough elements in motion, seeking the separate importance of each may be not only difficult, but misguided. As Monteiro (2012) notes, I strongly endorse Garrett Hardin's (1963, 73) statement that "in a system you cannot do just one thing," as actions both ramify and play out through the interaction with what others do, either simultaneously or in response.

This also raises difficulties for the comparative method at the heart of much standard social science. We seek causation by comparing situations that are the same on all dimensions except for one to see if the latter makes a difference. Thus, IR scholars often look at multiple confrontations between two countries or alliances and ask why the outcome varies. Why, for example, were a series of crises in the early twentieth century resolved peacefully while that of July 1914 led to war? Why did the Soviet Union maintain its overall policy in the face of containment for 40 years and then switch to conciliation and concessions—indeed unilateral ones? The obvious line of inquiry is to look at what was different in the later interactions. Whether we do this through case studies or statistical analysis, we usually treat the instances of interaction that we are

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comparing as though they were independent of each other. But, as indicated by the previous analysis (and many other historical accounts), more than one thing may have changed, as earlier incidents altered actors' perceptions and calculations, and sometimes their basic preferences and values.

Causation is difficult to establish by comparisons that treat the cases as separate. When a policy fails several times and then succeeds (or succeeds in a series of cases and then fails), observers are prone to attribute causation to whatever differences in the policies they can find. But it may also be that the earlier applications of a policy had changed either the situation or the other actors (or both) in a way that led to a different outcome. Thus, while defenders of President Reagan argue that the fall of the Soviet Union was largely attributable to his more vigorous and confrontational policy, others claim—correctly, I believe, although proof one way or the other is beyond us—that the differences in American policy over time mattered much less than the steady pressure that, much as George Kennan had foreseen at the start, accelerated the decay within the USSR and undermined confidence in the system at all levels of society. At the other end of the political spectrum, the argument that the Cold War ended because of "New Thinking" on the Soviet side does not appreciate the extent to which these intellectual trends were the product of the failure of the Soviet system to produce favorable results internally or externally, which, in turn, is partly explained by Western containment policy. The comparative method would focus on what seems to be new in the late 1980s, but this would neglect the changes that had been produced by the policies and interactions over the previous years.

Perhaps more often, the repetition of a successful policy can lead to failure. Too many antibiotics lead through natural selection to the spread of resistant strains. When one side coerces the other into backing down in a series of confrontations, the growth of the other's incentives to stand firm the next time may cause the policy to work out very differently than it did before.

Indirect Effects and Unintended Consequences

To say that in a system we cannot do just one thing implies, *inter alia*, that any action will have second-order or knock-on effects. We often think

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of these as subsidiary in the sense that they are smaller or less important than the initial effect, and we also often assume that it is the latter that is what the actor intends. But neither of these statements is necessarily correct. As actions ramify through a system, the effects can grow more rather than less powerful. The introduction or removal of a species always produces multiple knock-on effects, few of which could have been predicted ahead of time. In medicine, the "side effects" are often tolerable and smaller than the main therapeutic ones, or else the medicine would not be prescribed. But the body acts in complex ways, and in a small but not insignificant number of cases the side effects become dominant. Occasionally, of course, they can be benign, but more often they cause harm, with severe consequences and even death being possible.

We (both observers and actors) often lose sight of indirect effects because they are, well, indirect, and therefore harder to see. Yet they can be more important than the direct ones. Thus in the 2012 presidential election, as in almost all others, the vice-presidential candidates did not matter—or rather, they did not matter directly. But by nominating Paul Ryan, Mitt Romney recast the contest as a choice between two quite different economic worldviews rather than as a referendum on Obama's performance in office, and this may have been very consequential. More complexly, the collapse of a pyramid scheme in Albania in 1977 led to rioting and the looting of government buildings, including arsenals. Many of these weapons found their way across the border into Kosovo, fueling the growth of the Kosovo Liberation Army, whose increased activities precipitated a Serbian crackdown, the resulting NATO war, the expulsion of Kosovars, and the eventual independence of the country.

At least some of the discussion of positive feedback, tipping points, and path dependence can be seen as representing the power of second-order effects (Schelling 1978, chs. 4–5; Page 2006; Jones-Rooy and Page 2012). Actors sometimes try for "bank shots" in which the desired outcome occurs only after several intermediate steps. But unlike pool or billiards, in social systems human calculations, perceptions, and expectations are involved.

In relatively simple cases, people follow the Chinese adage, "kill the chicken to impress the monkey": they act against a fairly weak adversary to show stronger adversaries that, if needed, they will act against them too. Kissinger (1979, ch. 21) was very explicit that the American "tilt"

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against India in the crisis that led to East Pakistan becoming Bangladesh in 1971 was motivated not by the justice of the case or even the direct American interests, which were minimal, but by the felt need to show China, with which the United States was trying to build a relationship (implicitly aimed at the Soviet Union), that America would not abandon its allies or allow countries supported by the USSR to prevail. Most scholars ridicule this behavior as immoral pseudo-realism that had no basis in how countries actually behaved, but a definitive judgment must await the openings of the Chinese archives, since at this point we have little evidence about how China interpreted the American behavior, let alone how it might have viewed a different American policy.

Even more infamously, one of the standard (if debatable) explanations for why the United States fought in Vietnam was that a succession of presidents believed that not to do so would lead both allies and adversaries to conclude that the United States would not stand by its other interests and commitments. Schelling (1960) argues that a state can prevail in a dispute by committing itself to prevailing. The heart of his case is the "interdependence of commitments"—i.e., the belief that going back on one's word in one instance will undercut the credibility of one's other promises. Although the large and important topic of the perceived and actual role of reputation is beyond my scope here, it clearly is implicated in indirect effects.[3]

Much may depend on whether others believe that the state is seeking indirect effects. If the monkey thinks that you have killed the chicken to impress it, will it be as impressed? Does the message carried by the act depend at least in part on others believing that it was carried out for its own sake and that no message was intended? If observers believe that a state believes that a reputation for characteristics like honesty or toughness is very valuable, then shouldn't it discount the behavior that seems to display such attributes?

To return to the example of Vietnam, costly as the fighting was to the United States, it was vastly cheaper than having to fight for Western Europe or allowing the Continent to be dominated by the USSR. So a United States that was resolved enough to suffer significant costs, but not resolved enough to engage in a fight that would run high risks of escalating to nuclear war, could rationally choose to wage war in Vietnam. However, a Soviet Union that understood this reasoning would be less impressed with the implications of the Vietnam

commitment, which in turn would mean that sticking to that commitment would not have had the desired indirect effect.

This is a crucial way in which systems composed of humans differ from those in the physical world or even those composed of animals. System effects are common in the former case, as the "butterfly effect" on climate and studies of ecology shows. And when animals either clash or cooperate, they either must judge what others are likely to do or must be hard-wired by evolution to behave as though this is what they are doing. Humans carry this a step further, however, in knowing that others are trying to guess how they are guessing what the others will do. (In principle, infinite regresses are possible, but most people stop the process after a few steps.) Expectations of indirect effects can have varied and multiple consequences. In some cases, actors will refrain from taking an action whose immediate effect is desired, on the ground that what will eventually occur is not good. Self-control leads us to (try to) limit our indulgences because we know what will follow. In a slightly less straightforward way, a person's belief that a substance is addictive or that he is particularly susceptible to addiction will inhibit initially pleasurable encounters. This process is more dynamic than the previous one because taking the substance or engaging in the behavior changes the person in a way that makes further use and abuse harder to resist.

An interesting international case illustrates the role of changing knowledge and of a greater number of steps. According to the "spill-over" theory, European regional integration developed as small moves in that direction, intended for only limited objectives, induced pressures for more far-reaching integration as various groups in the participating states turned their lobbying attention to the supra-national authorities in the belief that further diminutions of national sovereignty were needed to further their interests (Haas 1958). This effect was unknown and unintended by most of the actors, and it was the great virtue of the research to have uncovered it. The effect of this knowledge was also interesting, however. I am told that when researchers asked leaders in Central America why they had not undertaken limited measures to integrate their economies, they replied that thanks to the research on Europe, they knew where such efforts would take them, and because they did not want to go that far they would not take any steps at all. (The irony here is that the researchers who studied European integration approved of it and hoped that it would be replicated elsewhere.) In other cases, actors may have to act despite being unable to stop foreseen but

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undesired indirect effects. When pondering whether the United States had to enter World War I, Woodrow Wilson worried that if it did, it would mean the end of the domestic reforms that he had favored. This not only turned out to be the case, but Wilson himself came to espouse suppression of dissent, contradicting his previous principles.

The question of whether actors expect indirect effects is important to the debate about institutions between institutionalists and realists in international relations. Institutionalists emphasize that institutions can facilitate cooperation. Realists, at least defensive realists, have no trouble with this emphasis (Jervis 1999). For them, institutions are one of many tools of statecraft, including cooperation, that can be used to further state interests. What gives realists trouble is institutionalists' central claim: that establishing an institution sets in motion processes that eventually alter actors' incentives, expectations, and even values in a way they did not seek or foresee, giving the institution much greater autonomy than it had at the start. This is what is meant by the argument that "institutions have a life of their own," affecting actors in unexpected ways, as was the case with regional integration.

Similarly, analysts who focus only on the obvious, immediate aims of actors' behavior will often be misled. From the mid-1950s to the mid-1970s a great many diverse actions were designed to prevent West Germany from acquiring nuclear weapons, although this was not the immediate or obvious point of the behavior. For example, one (but only one) of Khrushchev's reasons for triggering the Berlin Crisis in 1958 was to force Germany's allies to maintain its non-nuclear status. And one of the reasons that Great Britain pressured India not to develop nuclear weapons in the mid-1960s was that if it did, it would make "the prospect for the successful conclusion of a non-proliferation agreement preventing West Germany from acquiring nuclear weapons . . . almost impossible" (Schrafstetter 2001, 94). A similar motive played a contributing role in LBJ's Vietnam policies, as he thought that defeat in Southeast Asia might lead India and Japan to pursue nuclear weapons, which would increase the likelihood that West Germany would do so (Gavin 2004, 123).

More generally, changes in relations between two actors can have great impact on the system by changing the power of third parties. For both the United States and China, gaining leverage over the USSR was one of the main motives for their rapprochement, and was possibly the main motive. The other side of this coin is that increased frictions between two countries open a space for others to exert greater influence.

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Sometimes third parties egg the other two on in order to achieve this result (Crawford 2011), but it often occurs inadvertently, as when Germany was the main beneficiary of the rift between France and Britain created by the latter's occupation of Egypt in 1882. Here, events made Bismarck's skills unnecessary, but they were crucial in managing the complex arrangements within Europe. In this endeavor he was a master of using indirect effects, as when he pointed out to British leaders in 1887 that if they patched up their differences with Russia, this would menace Austria-Hungary and compel it to "seek an understanding with Russia at any price. The result would be a new Three Emperors League," which would not be in the British interest (Rich 1965, 213). By marshaling others' threats to Russia and holding out to it the possibility of limited gains, he was able to maintain decent relations with it while simultaneously supporting its adversary, Austria-Hungary, and to bring a form of stability to the restless system. By contrast, Bismarck's successors believed both that Russia would always be hostile to Germany and that the divisions between Germany's many potential and actual opponents were so deep that a simpler policy could bring security. They went astray because of their inability to see the second-order consequences of their moves, which among other things provided strong incentives for Russia to come to terms first with France (despite the great ideological gulf between them) and then with Great Britain (despite—or rather, partly because of—their dangerous conflicts in Asia). "By casting Russia adrift, the Germans . . . lost perhaps their most effective lever for" gaining British support (ibid., 223). The new Triple Entente among Russia, France, and Britain was also more attractive to Italy, which had previously leaned toward Germany. Another indirect effect was even more important: Germany became much more dependent on Austria-Hungary, itself now more vulnerable to the increased activities and subversion of Russia and its Serbian client.

Sometimes one actor foresees important indirect effects that are invisible to others. When Ronald Reagan announced his plans for missile defense (the Strategic Defense Initiative or SDI), he was thinking only of protecting the United States and, more idealistically, of paving the way for the abolition of nuclear weapons. But India perceived a threat from how others would respond to SDI. China would be likely to increase its nuclear forces, which would menace India even if they were not initially targeted at it; and China might then sell its older and less useful missiles to Pakistan. In addition, the increased Soviet fear of the

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United States could make it less willing to support India (Tellis 2006, 118–23; also see Kennedy 2011).

It is hard even in retrospect to determine whether the world was so interconnected that indirect effects would have dominated. Obviously, it was much harder at the time. The Cold War, at least on the American side, was built on the premise of interconnection—the domino theory being the most prominent form of the underlying belief (see, e.g., Jervis and Snyder 1991). This belief displayed itself in calculations small as well as large. In July 1961, National Security Council staffer Robert Komer argued for stepping up support for the South Vietnamese government in order to "have a major anti-Communist victory . . . in the six months before the Berlin Crisis is likely to get really hot. Few things would be better calculated to show Moscow and Peiping that we mean business" (Gibbons 1986, 57). Some of the current debates about dealing with terrorism similarly center on the extent of interconnections of varying kinds. Will attacks on "militants" dissuade others or will it enrage their relatives and fellow countrymen, encouraging them to become militants themselves? Will punishing one set of terrorists or dismantling their network deter and discourage others? Each of these possible indirect effects requires opposing policies, although unfortunately both of them could operate. Of course it is also possible that neither interconnection is significant and that the direct effects are far more important. But how the United States and others will act depends in part on which (if any) of these effects is subjectively expected, and what will happen will depend in large part on how the world is objectively arranged.

More broadly, those who favor a general American foreign policy of limited engagement believe that important interconnections are implicated only in those parts of the world that are sites of important intrinsic American interests. The United States can—and should—abstain from intervention, at least with military force, in all but a few areas. Just as America did not need to fight in Vietnam in order to protect Germany, so it can permit unrest and unpleasant regimes in countries like Syria without fear of contagion or other knock-on effects that would significantly harm the United States. Others believe that globalization is not a cliché, that it is largely accurate to say that we are in one world, and that the world order cannot be neatly divided geographically or functionally. Disturbances will ramify, even if the exact pathways and timing cannot be predicted, and for the United States to fail to lead will be to sacrifice not only important values, but political and economic

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interests as well. Those who hold this view differ on issues like how much the United States should rely on military instruments, how (and how much) it should accommodate others, and whether international institutions are traps or valuable instruments. But they agree that perturbations cannot be easily contained.

To take just one example, here is how one analyst describes the likely consequences of the United States assenting to many of China's claims in its region (admittedly, a fairly large perturbation in itself):

> A China unchecked by a U.S. presence in the region might not engage in outright conquest, but it would be well situated to enforce claims over disputed territories and resources. Freed from having to defend against perceived threats along its maritime periphery, China could project military power further afield to advance its interests in the Indian Ocean, the Middle East, and Africa. Within China's expanding sphere of influence, U.S. firms could find their access to their markets, products, and natural resources constricted by trade arrangements dictated by Beijing. The prospects for political reform in the countries along China's periphery would also be diminished as long as the CCP [Chinese Communist Party] remained in control. And from its secure Asian base, Beijing could offer aid and comfort to authoritarian regimes in other regions. (Friedberg 2012, 51)

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Interactions and Complexity

Much of *System Effects* concerns interactions and the fact that the impact of variables often is not additive. Knowing how A alone would influence C and how B alone would influence C is not enough to tell us what will happen if both A and B are present. Because Jones-Rooy and Page (2012) use China to illustrate their discussion, let me do so as well.

Most predictions about Sino-American relations take, as driving forces, factors like the strength of the Chinese economy and how democratic its politics will become. But these predictions neglect interactions and, unhelpfully, treat economic and political factors as independent of each other and of Sino-American relations.

The status of the Chinese political system and its economic growth rate affect each other, although scholars debate the ways in which this is true. But most would agree that a sharply slackening rate of growth would reduce internal stability and put great pressure on the political system, especially because the Chinese regime no longer relies on

ideology for support and so must deliver the economic goods. Were this to become problematic, the regime might seek bolstering by stirring up nationalism, which could both increase the chance of international conflict and, at least in the short run, inhibit democracy. Economic growth could allow the regime to continue more or less as it is now, although if growth involved the development of independent power centers, it could undermine the current autocracy in the long run. Conversely, politics can affect growth rates, although academic theories about what kind of political system best supports a thriving economy have changed drastically over the years, and the answer may vary with changing circumstances. At one point, rational authoritarianism was seen as useful in providing stability, increasing investment, and containing demands that could throttle growth. Now democracy and the diffusion of political power are seen as more propitious. But in either case, the basic point is that we need to look at how these factors interact.

Not only do they influence each other, but the way they affect Sino-American relations is not additive. Indeed, the sign as well of the magnitude of the impact of one variable can depend on the state of the other. To take the most obvious example, the growth of the Chinese economy could have a strongly positive effect on Sino-American relations if China is becoming more democratic, but a negative effect if it remains authoritarian. Conversely, a democratic China that was struggling economically might have incentives to pursue a belligerent foreign policy, while if it were democratic and strong it would be more likely to seek a calm international environment.

Furthermore, the state of Sino-American relations influences economic and political developments in China, as well as being influenced by them, although here, too, exactly how and how much is subject to debate. It is likely, though, that extreme Sino-American tensions would make the rise of democracy less likely. Bad relations would also slow economic growth, at least if the United States limited Chinese access to its markets. Whether American policy could facilitate the growth of democracy in China is much less certain, and even more so is what specific policies would have this or the opposite effect. Some urge a vigorous American sponsorship of democracy, perhaps even linking concessions on political and economic issues to progress on this dimension, as Reagan did with Gorbachev. On the other hand, it is often argued that for the United States to associate itself with democratic

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movements would be to discredit them by making them appear to be pawns of the United States and "un-Chinese" if not anti-Chinese.

Implications for Retrospective Scholarship and Prospective Action

Interconnections and interactions are what make a system a system, and their operation means that looking at factors one at a time misleads us. The standard comparative method often misses the dynamics at work and ignores the ways in which earlier events and their interpretations undermine the assumption that the cases being compared are independent of each other. Interaction and the reciprocal influence of factors makes causation even more complex and problematic for scholars than it otherwise is (Jervis 2013), but scholars have the luxury of trying to sort out causation after actions have already been taken and their effects have occurred. It is much more difficult for people to predict how their actions will work their way through the system. As I noted, Bismarck was outstanding in this regard, although it is not clear how he would have needed to adjust his policies had others been as adept as he was. On the other hand, many of the successes of Henry Kissinger, who studied Bismarck, were the unintended consequences of his failure to understand how others would react.

Although I closed my book with a discussion of how understanding system effects can lead actors to take advantage of them, I would not want to claim that this is always possible. We should always ask of an action, "What will follow, and how will we and others react and change?" But we should also realize the limits to our ability to answer, or at least to do so correctly.

As Posner (2012) and Tetlock et al. (2012) note, an awareness of all these dynamics can lead to delay in the hope that additional information or analysis will clarify the situation—or may even lead to paralysis. But it also can be liberating. Perhaps the knowledge that the consequences of our actions, both personal and political, cannot be fully calculated can lead us to be more willing to do what we think is ethically correct. Being realistic about the limits of our ability to know how we can reach desired ends can make us freer to act on our ideals. When it is not possible to see around the bend, to use Jones-Rooy and Page's phrase, perhaps it is better not to try.

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Posner is also certainly correct that, unlike other forms of "complexity theory," mine proposes no specific analytical method. I wish I could, but instead, less ambitiously, I am trying to develop a way of looking at the world. Although focusing on the need to trace how forces work themselves through a system, on the difficulty of doing this well, and on the unintended consequences of doing it badly may seem to undermine prospects for either full understanding or sensible action, I hope it is not too pretentious to borrow the phrase with which Darwin closed the *Origin of Species*: "There is grandeur in this view of life."

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NOTES

1. John Gaddis (2002) has written a book that parallels mine about how history is to be understood, and I do not think it has had much impact on his colleagues either.
2. Charles O. Prince, former Citigroup chief, quoted in "Citi Chief on Buyouts: 'We're Still Dancing,'" 10 July 2007, http://dealbook.nytimes.com/2007/07/10/citi-chiefon-buyout-loans-were-still-dancing/
3. Both the reputation for living up to one's signals and the reputation for behaving in certain ways are involved (Jervis [1970] 1989).

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