Jason A. Frank and John Tamborrino, Editors

VOCATIONS of

POLITICAL THEORY

MARK B. BROWN

8 // CONCEPTIONS OF SCIENCE

IN POLITICAL THEORY

A Tale of Cloaks and Daggers

The increasing prominence of interdisciplinary research has challenged many of the familiar boundaries between political theory and other academic fields. Scholars calling themselves political theorists publish in outlets with little or no explicit connection to academic political theory, and authors from a wide variety of disciplines produce works of central importance for the field. One boundary has remained remarkably stable, however, and has played a central role in shaping the professional identity of political theory— the boundary between science and politics. This ancient conceptual boundary has been used since the nineteenth century to justify a disciplinary boundary between the humanities on one side and the natural and social sciences on the other. The science-politics boundary often sets the terms for debate on different approaches to the study of politics. It manifests itself most clearly in the current relationship between political theory and the natural sciences. The rigidity of this conceptual and disciplinary boundary contrasts markedly with the pervasive, if largely unacknowledged, practical collaborations between natural scientists and a wide range of social and political actors. These collaborations produce an increasing array of scientific and technological artifacts—computerized workplaces, genetically engineered foods, global warming—that are intimately bound up with political life. Although political theorists have formulated important critiques of concepts such as "scientific rationality" and "the technological society," they have often neglected the political dimensions of concrete scientific and technological artifacts. Political theorists, I argue, will have difficulty engaging the politics of these artifacts until they find ways of reconceiving the boundary between science and politics. This essay draws on the writings of Sheldon Wolin to discuss one way that contemporary political theorists have thought about science and politics, and then considers the implications of the alternatives posed by recent science and technology studies, focusing on the work of Bruno Latour.[1]

Concerning the attitude of social and political theorists toward the natural sciences, Latour provocatively remarks, "Either they respected them and tried to emulate them on their own territory; or they despised them and tried to be as immune as possible from them."[2] Within contemporary political science, proponents of behavioralism and rational choice have long seen themselves as emulators of the natural sciences. While few political theorists have "despised" the sciences, many have subscribed to conceptions of science and technology as either antipolitical, apolitical, or prepolitical.[3] These conceptions generally build upon the ancient Greek division between instrumental action (technē) and communicative action (praxis), often assuming that genuine politics is primarily concerned with the latter.[4] As students of the field have often noted, efforts to erect a wall between political theory and "positivist" approaches in social and natural science have usually assumed that positivist philosophy of science accurately portrays scientific practice.[5] What has gone relatively unnoticed is that this implicit acceptance of the positivist image of science has persisted alongside endorsements of postpositivist conceptions of science as an interpretive, value-laden, practical activity. Despite their frequent assumption of a positivist view of science, political theorists have found in the postpositivist theories of Thomas Kuhn, Paul Feyerabend, and others a potent weapon in their struggles against the disciplinary ascendance of scientific approaches to political inquiry.

In short, contemporary political theory's relationship with science has been a cloak-and-dagger affair in which theorists have defended themselves against the criticisms of social and natural scientists with the claim that political inquiry is *essentially* different from science (the cloak), while simultaneously drawing on postpositivism to attack science for being less objective than it claims to be (the dagger). Political theorists have used the cloak to shield themselves from natural and social scientists, and the dagger to denounce the scientists' claims to superiority. Contemporary theorists have said, in effect, "Science and political theory are categorically different—and besides that, science is just as subjective as political theory!"

These claims do not *necessarily* conflict with each other, of course, and some scholars have elaborated theories of science that apply the dagger only to scientific method and the cloak to the resulting scientific knowledge. Karl Popper, for example, argued that while the process of scientific discovery may include subjective elements, it is still possible to provide objective justifications of scientific knowledge.[6] While this is not a logically contradictory

conception of science, it assumes a categorical division between the context and content of science that has become untenable in light of recent work in science and technology studies. Moreover, when political theorists have drawn on theories of science to argue for a particular conception of their field, they have often applied both the cloak and the dagger arguments indiscriminately to science as a whole. This has involved theorists in the logical contradiction of claiming that science both is and is not categorically—i.e., essentially, ontologically—different from political theory.

One might forgive the contradiction that inheres in the cloak-and-dagger strategy toward science because it has been quite effective at defending political theory from (what often appears to be) the methodological imperialism of behavioralism, rational choice, and other methods that seek to imitate the natural sciences. However, this strategy has also had deleterious consequences for political theory. Political theorists' use of the cloak, I contend, has supported a stultifying methodological relativism that implicitly endorses the positivist image of scientific method, even while it rejects the application of this method to the study of politics. The cloak thus isolates political theory from the sciences, discouraging study of the political significance of scientific practices and findings. By the same token, political theorists have tended to use the postpositivist dagger merely to debunk the alleged objectivity of the natural and social sciences, often failing to explore the full implications of postpositivism. The dagger thus provides, ironically, a rationale for the cloak, insofar as it reveals the hypocrisy of the sciences' claims to objectivity, thus increasing political theorists' sense of alienation from the sciences. Postpositivist theories of science need to be seen not as rhetorical tools for academic turf battles, but as resources for illuminating the politically constitutive role of scientific practices.

I cannot determine how many contemporary political theorists write about science in the manner suggested, especially since what identifies a person as a "political theorist" is itself controversial. But the notion of a cloak-and-dagger strategy toward science can be used to raise important questions about how political theorists understand their vocation. The next section of this essay elaborates the cloak-and-dagger conceptions of science by associating each with a particular interpretation of Kuhn's *The Structure of Scientific Revolutions*.[7] The third section draws on examples from Wolin's writings to illustrate how some political theorists have employed these two conceptions of science. The fourth and fifth sections consider Latour's theory of scientific

practice and its implications for political theory. Despite significant flaws, Latour's conception of science provides the resources for developing new relations between political theory and the natural and social sciences that might dispense with the problems created by the cloak-and-dagger strategy.

SCIENCE AS THEORY AND PRACTICE

In a 1968 essay, "Paradigms and Political Theories," and in his widely influential essay of a year later, "Political Theory as a Vocation," Wolin explores the implications of Kuhn's *Structure of Scientific Revolutions* for political theory.[8] As is well known, Kuhn argues that the history of science is characterized by a succession of "paradigms." Glossing over the many controversies surrounding this term, in Kuhn it generally refers to the explicit or implicit theories, methods, and standards of practice that guide and provide the means of evaluating scientific research. The vast majority of scientific activity, what Kuhn calls "normal science," aims to solve the puzzles posed by a particular paradigm. Every once in a while, however, the gradual accumulation of anomalous observations that do not quite fit the categories of an existing paradigm, accompanied by the development of new theories, together make up what Kuhn calls "revolutionary" science. Scientists working under the existing paradigm withhold professional sanction from those pursuing revolutionary science and use various means to enforce the existing paradigm. But if the revolutionary scientists acquire sufficient means of persuasion, their efforts lead to a "paradigm shift." Through a process that blends rational argument with psychological and sociological factors, a scientific discipline adopts the concepts and criteria of the new paradigm, which are largely incommensurable with those of the old.

Kuhn's book received widespread attention on account of its challenge to many of the basic views shared by most philosophers of science, including such rivals as Karl Popper and Rudolf Carnap.[9] Philosophy of science had long provided an intellectual justification for the social prestige of the natural sciences, and Kuhn's book was seen by many as a challenge to the widely assumed superiority of scientific modes of thought. Against reigning doctrine, which can be loosely labeled "positivist," Kuhn argued that science is not cumulative, does not follow a unified method, and can be understood only within a particular historical context. He also suggested that the history

of scientific practice does not support most philosophers' assumption of a sharp distinction between observation and theory, or between discovery and justification.

As Joseph Rouse and others have noted, philosophers of science have usually interpreted Kuhn's book in terms of their assumption that science is primarily concerned with the truth of theories.[10] While scientists may engage in all sorts of activities, *real* science aims to articulate theories that provide the single best representations of natural phenomena. This assumption has led some philosophers of science to accuse Kuhn of describing theory choice as a fundamentally irrational matter of "mob psychology."[11]

The problem with this reading is that it assumes the very split between scientific theory and natural phenomena—what John Dewey called the "spectator theory of knowledge"—that Kuhn seeks to challenge. For Kuhn, in contrast to both Feyerabend and Popper, normal scientific activity, while perhaps ultimately aimed at discovering truth, is dominated by the goal of creating and manipulating phenomena.[12] With the exception of a few naturally occurring regularities (e.g., planetary motion, the tides, or certain behaviors among animals), nature is too complex and undifferentiated to present scientists with isolated phenomena ready for observation. The study of natural phenomena, therefore, goes hand in hand with their generation and standardization in the laboratory.[13] Articulating a paradigm thus requires a close interaction between theoretical and experimental work. Paradigms are, according to Kuhn, "accepted examples of scientific practice—examples which include law, theory, application, and instrumentation together."[14] Scientific facts are not only "theory-laden," but laden with skills and instruments as well. According to this reading, Kuhn's notion of a paradigm is best understood not as a theory shared by a scientific community, but as shared practices of research that may or may not be guided by theory.[15]

Against common misunderstandings, this emphasis on scientists' need to create the phenomena they study does not imply the philosophical idealist view that the world exists only in people's minds. While scientists make laboratory phenomena, nature sets limits on what they can make. The world is really "out there," but there is in principle always more than one theory that could effectively represent it. Neither individual genius nor nature alone determines the theories scientists adopt. The view that a constructivist epistemology implies an idealist ontology incorrectly assumes that knowing is something individuals can do by themselves.[16]

These two different readings of Kuhn—science as theory versus science as practice—loosely correspond to the cloak versus dagger conceptions of science discussed above. According to the cloak, scientists theorize about nature and nonscientists theorize about politics. According to the dagger, theorists of both nature and politics engage in practices that draw on many of the same intellectual and practical resources. Admittedly, it is easier to read Kuhn as a theorist of scientific practice from a contemporary perspective than it would have been when *Structure* was first published. Nevertheless, both interpretations are supported by Kuhn's text. Kuhn shares the interest of contemporary science studies in the practical dimensions of science, but he also adopts the positivists' concern with determining essential "demarcation criteria" that formally distinguish scientific from nonscientific theories. Within recent science studies, in contrast, the search for reliable demarcation criteria has been largely replaced by the study of how such criteria become established through social and scientific practices.[17] Before exploring the notion of science as practice in more detail, I want to examine how Wolin's treatment of the relationship between science and political theory draws on both these conceptions of science, with problematic results.

SHELDON WOLIN'S TWO SCIENCES

In each of the essays cited above, Wolin suggests an analogy between Kuhn's notion of revolutionary science and the practice of political theory, on the one hand, and between normal science and behavioralist political science on the other. Behavioralism, Wolin argues, fulfills many of Kuhn's requirements for a paradigm. Wolin's analogy has been criticized on a variety of grounds.[18] As far as I can tell, however, none of Wolin's critics has noted that he alternates between two different conceptions of science.

In both essays, Wolin uses Kuhn's critique of the spectator theory of knowledge to attack the boundary so dear to the behavioralists between the "hard" sciences and "soft" forms of inquiry like political theory. Wielding the postpositivist dagger, Wolin notes with evident pleasure, "Kuhn's analysis may produce some anxieties in the political scientist who had believed that scientific theories were, in some simple sense, symbolic representations of reality."[19] He drives the point home by considering how Kuhn would respond to political scientists who insist that nature imposes at least *some* limits on

the range of potentially acceptable scientific paradigms: "His answer suggests that 'nature' does not constitute an obvious limit at all."[20] Wolin thus challenges the behavioralists' assumption that scientific knowledge simply mirrors nature.

Wolin reinforces his attack on the pretensions of behavioralism by explicitly pointing out the many similarities between political theory and the natural sciences. Going beyond the common assertion that scientific facts are always "theory-laden," Wolin argues that the behavioralist mentality

poses a threat not only to so-called normative or traditional political theory, but to the scientific imagination as well. It threatens the meditative culture that nourishes all creativity. That culture is the source of the qualities crucial to theorizing: playfulness, concern, the juxtaposition of contraries, and astonishment at the variety and subtle interconnection of things. These same qualities are not confined to the creation of theories, but are at work when the mind is playing over the factual world as well.[21]

Similarly, Wolin claims that Kuhn's notion of a paradigm "invites us to consider Plato, Aristotle, Machiavelli, Hobbes, Locke, and Marx as the counterparts in political theory to Galileo, Harvey, Newton, Laplace, Faraday, and Einstein."[22] Both natural scientists and political theorists proposed new methods and criteria for understanding and interacting with the world. By showing that great scientists and political theorists share many skills and goals, Wolin undercuts the behavioralists' claims to have developed a superior method of studying politics.

Yet right alongside these efforts to reveal the similarities between political theory and natural science, Wolin draws a cloak around his vocation by invoking the familiar categorical division between science and politics. Having acknowledged the many capacities that natural scientists share with political theorists, he effectively contradicts himself by suggesting that in the case of natural science these capacities remain "extra-scientific."[23] Wolin then draws a parallel division between behavioralist political science and political theory. He writes, "The antithesis between political wisdom and political science basically concerns two different forms of knowledge."[24] Wolin defines "political wisdom" as analogous to Michael Polanyi's concept of "tacit knowledge," which is "suggestive and illuminative rather than explicit and determinative."[25] The notion of tacit knowledge then appears at the heart of Wolin's

argument that political theory provides a form of knowledge categorically different from those of both natural and political science. Science's form of "methodistic truth," Wolin writes, can be "economical, replicable, and easily packaged," but "theoretical truth cannot, because its foundation in tacit political knowledge shapes it towards what is politically appropriate rather than towards what is scientifically operational."[26] Wolin does not acknowledge the irony in defending the positivist boundary between science and nonscience with a concept that Polanyi had used to challenge positivism![27]

Similarly, although Wolin humbles the behavioralists by highlighting the practical dimensions of science, thereby casting doubt on the sciences' objectivity, when he wants to defend the distinctiveness of political theory he endorses a theory-centered conception of science as a mirror of nature. Wolin repeatedly insists, for example, that whereas scientists change their theories to fit the world, political theorists (ought to try to) change the world to fit their theories.[28] "Although the scientist surely may claim for his theories the daring, beauty, and imaginativeness that are claimed for other forms of endeavor, he will concede that at some point his theory must submit to confirmation by the world."[29] This statement neglects the implications of Kuhn's claim that although scientists do look to the world for "confirmation," what confirmation means is specific to particular practical contexts. In characterizing the difference between science and nonscience in terms of whether priority is accorded to theory or to the world, Wolin assumes the spectator theory of knowledge challenged by Kuhn's conception of science as practice.

In sum, Wolin pursues a dual-track strategy against the behavioralists, drawing on two different interpretations of Kuhn to simultaneously challenge and endorse a categorical division between the methods of political theory and those of natural and political science. One might make the objection, noted above, that Wolin does not in fact employ two conceptions of science, but simply acknowledges a distinction between the subjective methods of individual scientists and the objective knowledge produced by science as a whole. Wolin does not consistently draw this distinction in his writings, however, nor does he explore the implications of this understanding of science for political theory.

My point is not that Wolin misunderstood Kuhn's theory of science. For one thing, as I suggested above, the conflicting interpretations of *Structure* can be traced in large part to the book's own ambiguities. Moreover, Wolin's essays need to be read in light of the widespread attacks then being made on

political theory as an academic discipline. Wolin's appeal to two different conceptions of science allowed him to open up questions about the role of conventions in political science and to challenge behavioralist efforts to dominate the profession.[30] Indeed, thanks in part to Wolin's efforts, the number of articles, books, and conference panels devoted to political theory today is greater than ever before.[31] Sheer activity is no guarantee of institutional stability, but it seems that in contrast to the 1960s, political theory today holds a relatively secure spot in the American academy. Given this breathing room, political theorists have an opportunity to explore less problematic ways of challenging the continuing dominance of positivist approaches to the study of politics. It is therefore unfortunate that the cloak-and-dagger strategy evident in Wolin's essays of thirty years ago also appears in some of his more recent publications.

In an essay on Horkheimer and Adorno, for example, where he writes eloquently about the threats that instrumental reason poses for democracy, Wolin equates instrumental reason—reason in the service of calculation, self-interest, and efficiency rather than democracy, truth, or the good life— with modern technology and "the practice of positivist science."[32] Wolin does not consider whether either instrumentalism or positivism provides an adequate theory of scientific practice. This allows him to draw the familiar cloak around political theory, defending a conception of political reason categorically opposed to the alleged instrumentalism of science and technology: "The recognition of context is political reason honoring its debts. Instrumental reason, in the form of technology, is impatient with context and strives to be independent."[33] At the same time, Wolin does not forget the postpositivist dagger, remarking briefly, "It is, however, a special mark of those who practice instrumental reason that they are largely unaware of how it has been socially constituted, especially in its scientific form."[34] Wolin does not discuss the implications of this crucial point.

Similarly, in another essay, Wolin notes his continuing support for postpositivist theories of science.[35] This endorsement is accompanied, however, by references to "the technological thesis" of corporate and global capitalism in a "technologically driven society."[36] While these phrases certainly describe many people's perception of contemporary society, they also perpetuate the mistaken notion that technology is an autonomous social force rather than the product of political values and decisions. Wolin thus contradicts decades of research in the sociology of science and technology, despite his endorse-

ment in the same essay of the Kuhnian conception of science that inspired much of this research.

Wolin's cloak-and-dagger strategy toward science is not his alone, of course, and it is not difficult to find examples in the writings of other prominent theorists.[37] At this point, however, one might rightfully ask: What exactly is wrong with the cloak-and-dagger strategy? If it proved rhetorically effective in the battle against behavioralism, why should we abandon it now when faced with the imperialist ambitions of rational choice?

One problem created by the cloak-and-dagger strategy lies in its restriction of political theorists' analyses of science and technology to questions of ontology, ideology, or the general character of modernity.[38] Contemporary political theorists have only rarely addressed the political dimensions of laboratory research or technological innovation, not to mention the mundane material objects of everyday life. In addressing the issue of political subjectivity, for example, a theme eliciting some of the field's most creative recent work, political theorists have usually restricted their attention to relations among subjects or subject positions. The relationship between subjectivity and the objectivity of science and technology rarely enters the picture. Few political theorists have shown interest in the possibility that "who we are is just as much at issue in the natural sciences as in those inquiries that make us directly into an object of study."[39]

The cloak-and-dagger strategy is also bound up with an academic politics of denunciation that has limited political theorists' explorations of postpositivist theories of science. Political theorists have primarily drawn on postpositivist insights to debunk the assumptions, methods, and conclusions of their scientistic colleagues—often quite effectively, as the discussion of Wolin's essays indicates. But like the toxic waste shipped to Third World countries that comes back on imported fruit, the effective attacks on behavioralism in the 1960s did not prevent positivist conceptions of science from later reasserting themselves in the form of rational choice. While the denunciations of positivism have helped save political theory from disciplinary annihilation, they have often presupposed, and hence strengthened, the very conception of science they attack. Indeed, in some respects, the estrangement of political theory from the sciences has gotten worse. As Wolin notes, "Yesterday's animosities, as well its areas of mutual concern, are today's indifferences."[40] While there have been some collaborative efforts, the relationship between political theory and political science today is frequently one

of mutual suspicion and avoidance.[41] Political theory's relationship with the natural sciences is even more distant. In the following section, I suggest that political theorists can both deepen their critique of positivist social science and establish more productive relations with the natural sciences by extending the postpositivist concern with scientific practice.

BRUNO LATOUR'S ANTHROPOLOGY OF SCIENCE

One way of conceiving science as practice that might help political theorists move beyond the cloak-and-dagger strategy appears in recent science and technology studies. The work of Bruno Latour holds particular interest for political theorists, because he is among those attempting to develop an explicitly political, rather than sociological or linguistic, conception of the natural sciences. Much of Latour's work is addressed to the urgent question of how societies can better deal with those "hybrids" of science and society—such as AIDS, air pollution, or the ozone hole—that lie at the center of so many political controversies. He is also concerned, however, with the politics inhering in the most mundane daily artifacts, such as automobiles, buildings, or clocks.[42]

Latour's method for pursuing these concerns emerges from his attempt to understand "science in action," *before* facts become accepted as true. This requires above all that the study of science begin with, without remaining confined to, the practical perspective of scientists themselves. Latour thus contrasts his method with the "social realist" approach he associates with the Edinburgh and Bath schools of science studies.[43] Whereas most philosophers of science have been "natural realists," reducing scientific knowledge to a mirror of nature, Latour argues that social realists simply take the reverse approach, reducing science to a product of social structures and interests. Rejecting both social and natural realism, Latour argues for the view held by the scientists he studies: an "agnostic symmetric position" on the ontological question of what "really" makes up both nature and society. If scientists were either natural or social realists, he argues, if they believed scientific knowledge to be determined by either nature or society, they would not engage in the various practices of making knowledge; "they would just wait."[44] Latour also wants to avoid social and natural realism because they tend to force scholarship into endless debates on the essential qualities of nature or soci-

ety, often forgetting the hybrid artifacts that are the ostensible topic of study. Nature and society, Latour argues, are not the *causes* of scientific knowledge, but the *consequences* of the activities of scientists and their allies. "We do not need to attach our explanations to the two pure forms known as the Object or Subject/Society, because these are, on the contrary, partial and purified results of the central practice that is our sole concern. The explanations we seek will indeed obtain Nature and Society, but only as a final outcome, not as a beginning."[45] Latour thus concentrates his efforts on tracing the concrete relations in which particular hybrid artifacts participate.

More specifically, Latour argues that both objective scientific facts and subjective free citizens are abstractions constructed through a dual process of "purification" and "mediation." In the mediation process, human and nonhuman "actants" establish alliances with other actants that support the abstract subject or object they seek to construct. Establishing a fact, as Kuhn showed, requires the support of the relevant scientific community. Latour goes beyond Kuhn, however, in arguing that establishing a fact also requires the support of many nonscientists. Technological inventions and scientific discoveries do not simply diffuse through the world on their own power, nor does the genius of those who initiated them suffice to establish their objectivity.

Latour has caused a lot of confusion with his actant concept.[46] Despite some misleading rhetorical flourishes, Latour uses the actant as a methodological rather than ontological concept. Unlike the "ecocentrist" thinkers with whom he is often identified, Latour does not seek a resolution of questions concerning the degree to which nonhuman entities have will or agency. Rather, he aims to evoke the perspective of science-in-the-making, prior to the establishment of a scientific fact. Latour uses the actant concept to acknowledge nature's independent influence on the construction of scientific knowledge, thus avoiding social realism, without falling back into the natural realist claim that scientific knowledge simply mirrors nature.

In his study of Louis Pasteur's discovery of the microbe, for example, Latour shows how only the implicit cooperation of a broad range of allies could socially establish Pasteur's discovery.[47] The transformation of "disease" from an individual affliction managed according to ad hoc local practices into a societal problem subject to scientific control relied upon civil servants and epidemiologists who collected and evaluated public health data. Recorders and epidemiologists were also needed to document the effects of Pasteur's

techniques once their use had become widespread. Most important, Pasteur needed the support of the public hygiene movement to promote his ideas and techniques. Finally, Pasteur needed the "support" of the microbes themselves—i.e., he had to learn how to control them. He thus developed laboratory techniques for isolating microbes from their natural environments, allowing him to first study their behavior and then, once he had gotten them to "cooperate," control them in the world outside.

In contrast to Pasteur's success at forming alliances with civil servants, epidemiologists, hygienists, and microbes, private physicians long remained unconvinced by Pasteur's claims. They disputed the same evidence the hygienists considered indisputable. Because physicians worked in private settings with the idiosyncratic symptoms of individual patients, the indiscriminate application of laboratory vaccines to entire populations contradicted their professional interests and training. It was not until the Pasteurians had succeeded in redefining the physician's social role, from patient's confidant to guarantor of public health, that the physicians also adopted Pasteur's ideas. They did so on their own terms, however, focusing on those bits of knowledge and technique, such as the use of preventative serums, that they could mold to their clinical practices.

The alliances that establish scientific facts are eventually concealed, Latour argues, by what he calls the process of purification. The contingent victory of a hybrid alliance is recast as the heroic achievement of a scientific genius, such as Pasteur, who is portrayed as unlocking the secrets of Nature. "As long as controversies are rife, Nature is never used as the final arbiter since no one knows what she is and says. But *once the controversy is settled*, Nature is the ultimate referee."[48] The result is a scientific or technological artifact that would not exist but for the network of relations between social subjects and natural objects, but which, as it enters the circulation of daily life, is unmistakably an object and not a subject.

For Latour, then, facts, machines, and other purified constructs become established only gradually, and only insofar as they can continuously enlist the necessary alliances over time. If there is a shift in the chain of alliances, the artifact's self-evident objectivity is *practically deconstructed*. If the artifact happens to be a free citizen, such deconstruction can happen just as readily to the artifact's subjectivity. We can thus talk about the dehumanization or "objectification" of human subjects as the flip side of the "subjectification" of "objectification" of human subjects as the flip side of the "subjectification" of "objectification" of the alliances that

support a particular claim. For Latour, subjectivity and objectivity, politics and science, must be treated in tandem, as the endpoints of a continuum along which artifacts are established and maintained. This methodological postulate does not assume there are no differences between science and politics, only that the differences are practical rather than ontological.

The most important difference between politicians and natural scientists is that scientists have laboratories. By reducing the infinitely complex outside world to purified and manageable forms—figures, formulas, chemical stocks, laboratory-bred animals, etc.—scientists can gain control over things to a degree that nonscientists never can. Scientists can then practice manipulating the things brought in from outside, making as many mistakes as they wish. Social scientists also rely on the manipulation of standardized forms, as in the collection and analysis of statistics. But natural scientists have far greater freedom in this regard. Although political scientists can play with voting statistics as much as they like, they cannot produce or manipulate standardized human subjects in a laboratory.[49] By manipulating things in the lab, natural scientists learn to predict events. Predicting events outside the lab, however, requires extending the conditions of the laboratory itself. As Ian Hacking puts it, "Few things that work in the laboratory work very well in a thoroughly unmodified world—in a world which has not been bent toward the laboratory."[50]

In the first dramatic public trial of Pasteur's vaccine, for example, where he vaccinated half of the sheep at a farm in Pouilly-le-Fort, Pasteur had to first convince the farmers to provide laboratory-like conditions. The vaccinated and unvaccinated animals had to be marked and separated from each other; the animals' temperatures had to be measured and recorded daily; control groups had to be established. This export of the lab to the farm was a delicate affair: too many changes and the public would no longer perceive the trial as a "real world" application; too few and Pasteur would not be able to detect the vaccine's effects. More generally, Pasteur's knowledge of how to control microbes did not simply diffuse through an unchanged society. The breweries, hospitals, and milk-processing plants that wanted to control microbes and eliminate infectious diseases had to adopt many of the same techniques and apparatuses that Pasteur had used in his lab. This is where the "disciplinary power" of the sciences becomes effective, as explored by Michel Foucault.[51]

Latour often exaggerates his claims, and his account of scientific fact-

making has important shortcomings.[52] Nonetheless, he has produced one of the most creative and provocative theories of science and politics currently on offer. Lacking the space to explore Latour's limitations in detail, I want to examine the implications for political theory of Latour's basic claim that the boundary between science and politics is always the product of negotiations in local contexts. This notion is not Latour's alone, but has become a central tenet of research on "boundary work" in recent science studies.[53] Unlike research on the conceptual logic of science and technology, studies of boundary work assign the task of demarcating science from nonscience to social actors rather than academics. The notion of boundary work does not imply that boundaries between science and politics are infinitely flexible. Indeed, it is widely acknowledged that scientists can establish boundaries around new facts only by means of old facts. These old facts become increasingly stable as new facts are built upon them. Although the boundaries between science and nonscience are *in principle* always open to challenge, in practice they often prove quite stable. The notion of boundary work suggests a number of ways political theorists might avoid the cloak-and-dagger strategy in their thinking about both natural and social science.

TOWARD NEW RELATIONS WITH THE SCIENCES

Latour's theory of science holds at least four implications for political theory: (1) a conception of universality that obviates the cloak-and-dagger strategy; (2) a need to integrate empirical research into conceptual analyses of science and politics; (3) a rejection of an academic politics of denunciation; and (4) an understanding of scientific practice as a potential site of political activity.

First, Latour's conception of science suggests a way of understanding scientific universals that works against the cloak-and-dagger strategy toward science. It seems clear that moving beyond this two-part strategy will require some way of acknowledging the best arguments for each part. The above discussion has presented a case for the claim that boundaries between science and politics can be determined only with reference to local practices rather than categorically (the dagger). It is undeniable, however, that natural science has generated knowledge of far wider applicability and social authority than other types of inquiry (the best argument, I think, for the cloak). As the above account suggests, Latour integrates these two claims by explaining sci-

entific universality in terms of networks of relations. The Newtonian gravitational constant, for example, like the existence of Pasteur's microbe, can be verified "everywhere," but only by extending the networks of scientific instruments and social practices required for measuring and interpreting its effects.[54] At the same time, however, the gravitational constant has been verified so many times that to contest it has become practically impossible. But this is a question of what practice can achieve, not what Nature has revealed. Some might see this as a distinction without a difference, but it could make a lot of difference for political theory. If political theorists come to see how science can be simultaneously local and universal, they will have little need to alternate between the contradictory poles of the cloak-and-dagger strategy.

Second, Latour's conception of science implies that political theorists who want to understand the relationship between science and politics will need to either conduct or, more likely, draw upon empirical studies of scientific practice. As Latour puts it, the relational networks that produce our conceptions of science and citizenship "must be followed through and through, from the hot events that spawned the objects to the progressive cool-down that transforms them into essences of Nature and Society."[55] Political theorists have always used the work of historians, journalists, novelists, and others who concern themselves with the details of concrete events. Those interested in studying the politics of science need only extend their range of sources to include accounts of concrete scientific practices.

A third implication of Latour's work for political theory lies in his rejection of an academic politics of denunciation. Political theorists' use of postpositivism to debunk scientific methods as socially or historically "relative" has served theorists well in defending the professional status of their field, but it has also contributed to their isolation from the rest of political science, and from the natural sciences as well. According to Latour, methodological relativism only goes halfway. It denies that different fields of inquiry can be measured against a set of universally valid criteria—say, the ability to formulate falsifiable hypotheses—but it assumes that if there were a standard of measurement, it would be the one defended by the positivists. It thus accepts the positivists' terms of debate and ends up isolating each field within its own disciplinary dogmas. Latour calls this position "absolute relativism," and contrasts it with "relativist relativism."[56] The latter view acknowledges that any standard of measurement relies on a relational network. New modes of relation get haggled out all the time among different subfields of the humanities

and natural and social sciences. Relations across the science-politics boundary, in contrast, have remained relatively fixed for a long time. If political theory is to establish less antagonistic modes of relation with political science, it must first articulate new ways of relating to the natural sciences, extending interdisciplinarity to those disciplines traditionally associated with the study and manipulation of nature.

Finally, Latour's theory of science suggests what may be a very problematic extension of political theorists' conception of politics itself. Is there a parallel between the behavioralists' attempt to reduce politics to a science and what appears to be Latour's effort to make all science political? Does viewing science as a potential site of politics threaten to contribute to what Wolin called the "sublimation of politics," emptying "the political" of determinate meaning and making impossible its earlier association with matters of general concern?[57] And without a determinate meaning of the political, how can political theorists develop a coherent conception of their vocation? These are serious questions, and I cannot address them here except to suggest that they assume two things: that political theorists are at liberty to determine their own conception of the political, and that a concern with local practices precludes attention to general public issues.

In *Politics and Vision*, Wolin characterized political theory as "a continuing form of discourse concerning what is political," but he also claimed that "the boundaries and substance of the subject-matter of political philosophy are determined to a large extent by the practices of existing societies."[58] This claim suggests that it is not due to "overtheoretization" that science has become increasingly political, as Wolin's essay in this volume would imply, but due to the insinuation into political life of an increasing array of hybrid artifacts. As Langdon Winner argues, "No longer will it suffice to seem ignorant or surprised as new technical devices are woven into the social settings one cares about—computers in schools, agile technologies in the workplace, Web browsers in the living room, or surveillance cameras in the mall."[59] Addressing oneself to the political dimensions of these hybrid artifacts does not entail a boundless notion of the political, nor an embrace of "politics" as the pursuit of private advantage. Nor does it imply a rejection of Wolin's concept of the political as a realm of deliberative and authoritative decisionmaking regarding matters of general concern.[60] The point is not that one can find politics *within* science, although one certainly can, but that many scientific practices have become intertwined with matters of concern to the political

community as a whole. And while scientists do not make politically authoritative decisions, their professional authority often supports, and is supported by, those who do. Many hybrid practices that once belonged only to "science" now straddle the science-politics boundary, or move back and forth across it. Without a distinct concept of the political, political theory would indeed lose any sense of disciplinary identity. But the specific content of this concept can change. Political theorists can play a role in shifting the boundaries of the political, but they must also accommodate themselves to the changes brought about by concrete practices, including those of natural science.

Finally, Wolin is right to criticize the view, which he associates with postmodernism, that the only universal today is constant change. As discussed above, actants do produce universally true facts, as well as, if less frequently, free citizens. But such universals are best understood as the more-or-less vulnerable products of local practices. Scientific facts are universal not *in spite of* being constructed through local practices, but *insofar as* they are so constructed. One task for political theory is to illuminate the connections between these local practices and the universal facts they produce. By opening up the local construction of scientific facts to critical examination, political theorists can help citizens respond to the interactions between scientific practices and matters of general concern.

NOTES

Many people provided helpful comments on earlier versions of this essay. I would especially like to thank Benjamin Barber, Mark Button, Peter Euben, Jason Frank, David Guston, Timothy Kaufman-Osborn, Jill Locke, and John Tambornino.

1. For an overview of science and technology studies, see Sheila Jasanoff, Gerald E. Markle, James C. Petersen, and Trevor Pinch, eds., *Handbook of Science and Technology Studies* (Thousand Oaks, Calif.: Sage Publications, 1995).

2. Bruno Latour, "The Impact of Science Studies on Political Philosophy," *Science, Technology, and Human Values* 16 (Winter 1991): 6.

3. Simplifying greatly, these three conceptions of science and technology might be loosely identified with Herbert Marcuse, Jürgen Habermas, and Hannah Arendt, respectively.

4. On the problematic implications of this division, see Mary G. Dietz, "'The Slow Boring of Hard Boards': Methodical Thinking and the Work of Politics," *American Political Science Review* 88, no. 4 (1994): 873–86.

5. Following what I take to be general usage, I use the term "positivist" to refer

very broadly to any method of inquiry that purports to employ logically given procedures for producing objective knowledge that mirrors the external world. While this neglects important distinctions between empiricism and logical positivism, and between behavioralism and rational choice, it highlights their shared aspirations. On political theorists' assumption of the positivist conception of natural science, see John G. Gunnell, "Realizing Theory: The Philosophy of Science Revisited," *Journal of Politics* 57, no. 4 (1995): 924; Jeffrey C. Isaac, "After Empiricism: The Realist Alternative," in *Idioms of Inquiry: Critique and Renewal in Political Science,* ed. Terrence Ball (Albany: State University of New York Press, 1987), 190, 198; Richard Ashcraft, "One Step Backward, Two Steps Forward: Reflections upon Contemporary Political Theory," in *What Should Political Theory Be Now?* ed. John S. Nelson (Albany: State University of New York Press, 1983), 518–22.

6. Karl Popper, "Normal Science and Its Dangers," in *Criticism and the Growth of Knowledge,* ed. Imre Lakatos and Alan Musgrave (Cambridge: Cambridge University Press, 1970), 56–57. On the use of this argument by behavioralists to "co-opt" Kuhn, see David M. Ricci, *The Tragedy of Political Science: Politics, Scholarship, Democracy* (New Haven, Conn.: Yale University Press, 1984), 199–201.

7. Thomas S. Kuhn, *The Structure of Scientific Revolutions,* 2d ed. (Chicago: University of Chicago Press, 1962, 1970).

8. Sheldon S. Wolin, "Paradigms and Political Theories," in *Politics and Experience: Essays Presented to Professor Michael Oakeshott on the Occasion of His Retirement,* ed. Preston King and B. C. Parekh (Cambridge: Cambridge University Press, 1968), 125–52; "Political Theory as a Vocation," *American Political Science Review* 63, no. 4 (1969): 1062–82.

9. See Ian Hacking, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science* (Cambridge: Cambridge University Press, 1983), 1–17. For a discussion of why Kuhn "took" in the 1960s, see also Tracy B. Strong, *The Idea of Political Theory: Reflections on the Self in Political Time and Space* (Notre Dame, Ind.: University of Notre Dame Press, 1990), 7–11.

10. Joseph Rouse, "Kuhn and Scientific Practices," *Configurations* 6, no. 1 (1998): 33–50; *Knowledge and Power: Toward a Political Philosophy of Science* (Ithaca, N.Y.: Cornell University Press, 1987), chap. 2.

11. Imre Lakatos, "Falsification and the Methodology of Scientific Research Programs," in *Criticism and the Growth of Knowledge,* ed. Lakatos and Musgrave, 93, 178.

12. Phenomena are here identified not with the Kantian notion of sense experience, but with the more limited notion of observable natural regularities. On this point see Helen Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton: Princeton University Press, 1990), 32–37.

13. See Hacking, *Representing and Intervening,* chap. 13.

14. Kuhn, *Structure of Scientific Revolutions,* 10; see also 26.

15. Rouse, "Kuhn and Scientific Practices," 35.

16. Hacking, *Representing and Intervening,* 220–32, 262–75; David Bloor, "Idealism and the Sociology of Knowledge," *Social Studies of Science* 26 (1996): 839–56.

17. See Thomas F. Gieryn, "Boundaries of Science," in *Handbook of Science and Technology Studies*, ed. Jasanoff et al., 393–443.

18. See Richard J. Bernstein, *The Restructuring of Social and Political Theory* (Philadelphia: University of Pennsylvania Press, 1976), 99–106; John S. Nelson, "Once More on Kuhn," *Political Methodology* 1 (Spring 1974): 73–104; J. J. Smolicz, "The Amorphous Paradigms: A Critique of Sheldon Wolin's 'Paradigms and Political Theories,'" *Politics* 6 (November 1971): 178–87.

19. Wolin, "Paradigms and Political Theories," 138.

20. Ibid., 138–39.

21. Wolin, "Political Theory as a Vocation," 1073.

22. Wolin, "Paradigms and Political Theories," 140.

23. Wolin, "Political Theory as a Vocation," 1072, 1073.

24. Ibid., 1070.

25. Ibid. See Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (Chicago: University of Chicago Press, 1958).

26. Wolin, "Political Theory as a Vocation," 1071.

27. One might note that while Polanyi criticized the positivist conception of science and inspired later social studies of science, his notion that scientists rely on "tacit knowledge" also serves to insulate science from interference by outsiders who lack such knowledge.

28. Wolin, "Political Theory as a Vocation," 1079, 1080; "Paradigms and Political Theories," 144.

29. Wolin, "Political Theory as a Vocation," 1081.

30. See Sheldon S. Wolin, "History and Theory: Methodism Redivivus," in *Tradition, Interpretation, and Science: Political Theory in the American Academy*, ed. John S. Nelson (Albany: State University of New York Press, 1986), 62.

31. Both the vibrancy of contemporary political theory and, incidentally, its lack of attention to scientific practices are highlighted in Iris Marion Young, "Political Theory: An Overview," and Bhikhu Parekh, "Political Theory: Traditions in Political Philosophy," in *A New Handbook of Political Science*, ed. Robert E. Goodin and Hans-Dieter Klingemann (New York: Oxford University Press, 1996), 479–502, 503–30.

32. Sheldon S. Wolin, "Reason in Exile: Critical Theory and Technological Society," in *Technology in the Western Political Tradition*, ed. Arthur M. Melzer, Jerry Weinberger, and M. Richard Zinman (Ithaca, N.Y.: Cornell University Press, 1993), 173.

33. Ibid., 186.

34. Ibid., 173.

35. Sheldon S. Wolin, "Political Theory: From Vocation to Invocation," this volume.

36. Ibid.

37. See, for example, Chantal Mouffe, *The Return of the Political* (London: Verso, 1993), 14; Benjamin R. Barber, *The Conquest of Politics: Liberal Philosophy in Democratic Times* (Princeton: Princeton University Press, 1988), 16. A similar critique

of Charles Taylor's conception of natural science is made in Clifford Geertz, "The Strange Estrangement: Taylor and the Natural Sciences," in *Philosophy in an Age of Pluralism: The Philosophy of Charles Taylor in Question*, ed. James Tully (Cambridge: Cambridge University Press, 1994), 83–95. See also Strong, *The Idea of Political Theory*, chap. 3, which presents an account of the relationship between the scientific and political communities in some ways very similar to the one argued here (74–75). Ultimately, however, Strong seems to remain within a Kuhnian internalist account of the "normal" scientific community as essentially separate from the political community (102–5).

38. See, for example, Melzer, Weinberger, and Zinman, eds., *Technology in the Western Political Tradition*. In his introduction to this volume, Leon R. Kass rightly argues that technology must be understood as more than a collection of material artifacts, but like most contributors to the volume he largely ignores the material dimension and restricts his concerns to technology understood as "the disposition to rational mastery" (5). See also George Kateb, "Technology and Philosophy," *Social Research* 54 (Fall 1997): 1225–46. Kateb rightly questions the common equation of "the technological project" with "anger, alienation, resentment" (1245), but he appears uninterested in what he calls the "common sense" understanding of technology as problem solving. He focuses instead on the truly "philosophical" questions that "add depth": those basic passions that have "called forth" the "much larger and rather mysterious project" of modern technology (1125–27).

39. Rouse, *Knowledge and Power*, 183. There are exceptions, of course, many inspired by feminism, environmentalism, pragmatism, or Marxism. See, for example, Donna J. Haraway, *Modest_Witness40@Second_Millennium.FemaleMan©_Meets_OncoMouse.Feminism and Technoscience* (New York: Routledge, 1997); Timothy Kaufman-Osborn, *Creatures of Prometheus: Gender and the Politics of Technology* (Lanham, Md.: Rowman and Littlefield Publishers, Inc., 1997); Richard E. Sclove, *Democracy and Technology* (New York: Guilford Press, 1995); Langdon Winner, *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1986). Kaufman-Osborn offers some helpful speculations on the reasons underlying contemporary political theory's lack of interest in the politically constitutive role of technological artifacts (21–25).

40. Wolin, "Political Theory: From Vocation to Invocation," this volume. Moreover, as Geertz points out, the failure to forge thoughtful linkages across the boundary between science and politics lends credence to New Age efforts at achieving a vague synthesis through such fantasies as Zen physics or parapsychology ("The Strange Estrangement," 95).

41. See Joseph V. Brogan, "A Mirror of Enlightenment: The Rational Choice Debate," *Review of Politics* 58 (Fall 1996): 793–806; James Johnson, "Is Talk Really Cheap? Prompting Conversation between Critical Theory and Rational Choice," *American Political Science Review* 87 (March 1993): 74–86.

42. Bruno Latour, "Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts," in *Shaping Technology/Building Society: Studies in Sociotechni-*

cal Change, ed. Wiebe Bijker and John Law (Cambridge, Mass.: MIT Press, 1992), 225–58.

43. Latour's criticisms of "social realism" are much contested. See David Bloor, "Anti-Latour," *Studies in the History and Philosophy of Science* 30 (March 1999): 81–112; Bruno Latour, "For David Bloor . . . And Beyond: A Reply to David Bloor's 'Anti-Latour,'" ibid., 113–29; H. M. Collins and Steven Yearly, "Epistemological Chicken," in *Science as Practice and Culture*, ed. Andrew Pickering (Chicago: University of Chicago Press, 1992), 301–26.

44. Bruno Latour and Michel Callon, "Don't Throw the Baby Out with the Bath School! A Reply to Collins and Yearly," in *Science as Practice and Culture*, ed. Pickering, 353.

45. Bruno Latour, *We Have Never Been Modern*, trans. Catherine Porter (Cambridge, Mass.: Harvard University Press, 1993), 79. See also Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Cambridge, Mass.: Harvard University Press, 1987), 96–100, 141–44.

46. For the charge that Latour anthropomorphizes nature, see Simon Schaffer, "The Eighteenth Brumaire of Bruno Latour," *Studies in the History and Philosophy of Science* 22 (1991): 174–92. For a defense, see Latour and Callon, "Don't Throw the Baby Out with the Bath School!" 356.

47. Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan and John Law (Cambridge, Mass.: Harvard University Press, 1988).

48. Latour, *Science in Action*, 97 (italics in original); see also 128–32; and *We Have Never Been Modern*, 10–11, 39–43.

49. For an account of the relationship between social and natural science that draws on Latour, see Rouse, *Knowledge and Power*, chap. 6.

50. Ian Hacking, "The Self-Vindication of the Laboratory Sciences," in *Science as Practice and Culture*, ed. Pickering, 59. See also Bruno Latour, "Give Me a Laboratory and I Will Raise the World," in *Science Observed*, ed. Karin D. Knorr-Cetina and Michael Mulkay (London: Sage, 1983), 141–70.

51. On the relationship between Foucault's notion of power and natural scientific practice, see Rouse, *Knowledge and Power*, chap. 7.

52. Some have found an untenable voluntarism in Latour's insistence on seeing social interests as a consequence rather than a cause of scientific fact-making. That is, Latour appears to ignore the possibility that scientists' interests can be understood as products of past social processes without necessarily reifying those processes. Similarly, Latour's account of fact-making alliances appears to assume that scientists are rational egoists, thus neglecting the cooperative dimensions of scientific inquiry. See James Robert Brown, "Latour's Prosaic Science," *Canadian Journal of Philosophy* 21 (1991): 245–61; Steven Shapin, "Following Scientists Around," *Social Studies of Science* 18 (1988): 533–50. For related criticisms of science and technology studies as a whole, which has often assumed a liberal pluralist conception of politics, see Langdon Winner, "Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology," *Science, Technology, and Human Values* 18, no. 3 (1993): 62–78.

53. See Gieryn, "Boundaries of Science"; Simon Shackley and Brian Wynne, "Representing Uncertainty in Global Change Science and Policy: Boundary-Ordering Devices and Authority," *Science, Technology, and Human Values* 21 (Summer 1996): 275–302.

54. Latour, *We Have Never Been Modern*, 119.

55. Ibid., 135.

56. Ibid., 111–14; see also 43–46; and Bruno Latour, "A Few Steps toward an Anthropology of the Iconoclastic Gesture," *Science in Context* 10 (1997): 63–83. Latour's rejection of denunciation is more fully discussed in Robert Koch, "The Case of Latour," *Configurations* 3 (1995): 319–47, esp. 338–47.

57. Sheldon S. Wolin, *Politics and Vision: Continuity and Innovation in Western Political Thought* (Boston: Little, Brown and Company, 1960), chap. 10; "Political Theory: From Vocation to Invocation," this volume.

58. Wolin, *Politics and Vision*, 4, 6.

59. Langdon Winner, "Technology Today: Utopia or Dystopia?" *Social Research* 64 (Fall 1997): 1012.

60. Wolin, *Politics and Vision*, 6–10.