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KNOWLEDGE AND THE POLITICAL

BRUNO LATOUR'S POLITICAL EPISTEMOLOGY

Duncan Kennedy

Why bring Bruno Latour into a conversation about “Classical Reception and the Political”? Latour’s name is most closely connected with science studies, particularly the “ethnographical” study *Laboratory Life* he published with Steve Woolgar, and *Science in Action*, in which he developed the “actor-network theory” that is now so closely associated with his work. Science, he argues, is not to be understood in the abstract (capital S), but as a diverse set of practices that depends for its success on the development, and maintenance, of complex networks of forces. Thus, it is not sufficient to explain the success of Pasteur’s germ theory in terms of its being “true” rather than “false” (an ex post facto theorization; see Kennedy 2002, 26–27). It did not spring fully armed from Pasteur’s brain, to be embraced spontaneously by a grateful public. As the jacket blurb on Latour’s *The Pasteurization of France* (1988) puts it:

Although every town in France has a street named for Pasteur, was he alone able to stop people from spitting, persuade them to dig drains, influence them to undergo vaccination? Pasteur’s success depended upon a whole network of forces, including the public hygiene movement, the medical profession (both military physicians and private practitioners), and colonial interests.

Politics has thus never been far from Latour’s thoughts, and perhaps now dominates them. Nowadays you are as likely to find him talking about Colin Powell addressing the United Nations as of Pasteur at his laboratory bench. A recent enterprise is an exhibition organized in 2005 with Peter Weibel in the Zentrum für Kunst und Medientechnologie in Karlsruhe entitled “Making Things Public: Atmospheres of Democracy.”¹ Latour’s engagement with politics should come as no

surprise. The sociological affiliations of the science studies from which his work emerged had an overtly political agenda. “Questions of epistemology are also questions of social order” was the slogan of the “strong programme” associated with the Edinburgh school of science studies in the 1970s and 1980s, as Latour himself has noted (1993, 15–16). The intersection of knowledge and politics that Steven Shapin and Simon Schaffer explored in their *Leviathan and the Air-Pump*, what they present as the complementary programs of Hobbes and Boyle, remains a key reference point in Latour’s thought. Plato’s appropriation of mathematical formalism, as traced in Reviel Netz’s *The Shaping of Deduction in Greek Mathematics*, has become another.² Knowledge is never a given, but is shaped (and can be reshaped) in its reception, as Latour’s own readings of Plato demonstrate. For Latour, then, knowledge and the political go hand in hand: any shift in epistemology obliges us to rethink politics, and vice versa. From the perspective of science studies, Latour reads Plato and other texts in accordance with a “political epistemology” that in its reconfiguration of the “classic” realism of traditional science resonates with reception studies in their critique of the positivism of traditional philology (see Martindale, xiii). Both science studies and reception studies seek to understand how knowledges are *made* and *deployed* historically, and are hostile to idealizations both of knowledge and politics. Latour’s work provides an opportunity to see how the interests of these disciplines intersect.

In his Web site’s description of “Making Things Public,” Latour says, “We live in rather discouraging times as far as political life is concerned. This is why it might be a good occasion to rethink what politics is about” (2008a). The exhibition’s title is significant: if the “political” appeals etymologically to a discourse that roots itself in the Greek *polis*, what now needs to be retrieved is that it is also a discourse that circulates around “things.” Again, etymology provides a convenient point of entry: “It turns out that the oldest meaning of the English word for ‘thing’ is precisely an assembly made around disputed matters of concern.” Etymologically, “thing,” in the Latin form *res*, also underlies “realism,” but at the very heart of Latour’s work lies a challenge to a current orthodoxy, political and epistemological, that has coalesced around that term. So, politics is

not a sphere, a profession, and occupation only but mainly a concern for things which are brought to the attention of a public. The public is not given once and for all, it's not the people to be represented by its elected officials. In the formulations of the great American pragmatists Walter Lippmann and John Dewey, the public is to be made for each new issue, each new matter of concern. . . . So the question we wish to raise is: "What would happen if politics was made to turn around disputed things?" As soon as [we] ask this question we realize that there are many other types of assemblies which are not political in the usual sense, but which gather a public around things: scientific laboratories, technical projects, supermarkets, financial arenas, churches and the disputed questions of natural resources like rivers, landscapes, animals, temperature and air.

"Things" are recognized as such by virtue of being *in dispute*. Latour suggests, however, that political philosophy has "often been the victim of a strong object-avoidance tendency" (2005a, 15).³ Just as Latour eschews an idealized "Science" (capital letter, singular) in favor of "sciences" (lowercase, plural), so he eschews the "Political" in favor of "politics." A recent book is entitled *Politics of Nature*: the absence of the definite article is significant. The first move we need to make under Latour's guidance, therefore, is to put some distance between ourselves and the rubric "Knowledge and the Political."

First, a crucial methodological statement. "All great books in science studies," Latour remarks, "pertain to 'political epistemology,' that is, they don't extend politics to science, nor science to politics. Instead they try to understand where the difference comes from and how the distribution of skills among the different domains has been adjudicated." The point is not to take the context as an explanation for the science, but to show "how any specific science elaborates its own highly specific way of being related to a context" (2008b, 449). So, Shapin and Schaffer do not set out to explain "science" *in terms of* "politics" or a social "context," as though these were clearly demarcated natural kinds:

We have not referred to politics as something that happens solely outside of science and which can, so to speak, press in upon it. The experimental community [set up by Boyle] vigorously developed and deployed such boundary-speech, and we have sought to situate such speech historically and to explain why these conventionalised ways of talking developed. What we cannot do if we want to be serious about the historical

nature of our inquiry is to use such actors' speech unthinkingly as an explanatory resource. The language that transports politics outside of science is precisely what we need to understand and explain. (342)

Boyle, they argue, invents the experimental method so as to distinguish *matters of fact* from the *interpretation* of fact (76), and Hobbes "the language according to which Power equals Knowledge, an equation that is at the root of the entire modern Realpolitik" (Latour 1993, 26); between them, Boyle and Hobbes create what Latour calls the "settlement" that underlies the modern "constitution" (13–15). But for Latour, Shapin and Schaffer do not go far enough: while they

take great care to use the expression "scientific fact" not as a resource but rather as a historical and political invention, they take no such precautions where political language is concerned. They use the words "power," "interest" and "politics" in all innocence. . . . If nature and epistemology are not made up of transhistorical entities, then neither are history and sociology—unless one adopts some authors' asymmetrical posture and agrees to be simultaneously constructivist where nature is concerned and realist where society is concerned. (27)

Society and the social need to be subjected to the same scrutiny as nature has been in science studies. As "Society" and "Nature" are, for Latour, constructs,⁴ so are other words, their meanings historically contingent and emergent phenomena. Latour's distinctive take on political epistemology lies in his reappraisal of "realism":

While the German Reich has given us two world wars, the German language has provided us with the word *Realpolitik* to describe a positive materialist, no-nonsense, interest only, matter-of-fact way of dealing with naked power relations. Although this "reality," at the time of Bismarck, might have appeared as a welcome change after the crude idealisms it aimed to replace, it strikes us now as deeply *unrealistic*. In general, to invoke "realism" when talking about politics is something one should not do without trembling and shaking. The beautiful word "reality" has been damned by the too many crimes committed in its name. (2005a, 14)

The scare quotes around "reality" and "realism" alert us to the appropriation of these words, and to the potentiality for their meanings to shift over time and circumstance. Close scrutiny of "realism," Latour suggests, has to be the focus of a current "political epistemology."

Latour's own work is one of the most important strands in the current reevaluation of scientific realism, and thus of how we think of

“reality.” A feature of this critique of the “classic” realism of the nineteenth and twentieth centuries is a renewed interest in experiment, which is seen as epistemologically a central issue.⁵ This reevaluation distances itself from the “God’s-eye view” version of realism, which would, for example, see Pasteur as “discovering” a Truth that was always there, “outside history,” so as to see scientists as operating “within history,” trying things out, inventing procedures and painstakingly constructing “facts” (etymologically, things they have made). Latour draws on Shapin and Schaffer’s analysis of Boyle’s experiments with the air pump to suggest that Boyle invented the empirical style still in use today, and draws attention to three salient features easily overlooked if viewed in terms of classic realism. First, the rejection of “the certainties of apodeictic reasoning in favour of a doxa”:

Instead of seeking to ground his work in logic, mathematics or rhetoric, Boyle relied on a parajudicial metaphor: credible, trustworthy, well-to-do witnesses gathered at the scene of the action can attest to the existence of a fact, the matter of fact, even if they do not know its true nature. . . . Boyle did not seek these gentlemen’s opinion, but rather their observation of a phenomenon produced artificially in the closed and protected space of a laboratory. (Latour 1993, 18)

This shifts the emphasis from the *truth* of the fact to its *reliability*. Second, these facts are, precisely, constructed:

Ironically, the key question of the constructivists—are facts thoroughly constructed in the laboratory?—is precisely the question that Boyle raised and resolved. Yes, the facts are indeed constructed in the new installation of the laboratory and through the artificial intermediary of the air pump. . . . But are the facts that have been constructed by man artificial for that reason? No: for Boyle . . . extends God’s “constructivism” to man. God knows things because He creates them. . . . We know the nature of the facts because we have developed them in circumstances that are under our complete control. (18)

Third, the limitations of these facts must be observed; they don’t “tell” us about anything other than themselves:

Our weakness becomes a strength, provided that we limit knowledge to the instrumentalized nature of the facts and leave aside the interpretation of causes. Once again, Boyle turns a flaw—we produce only matters of fact that are created in laboratories and have only local value—into a decisive advantage: these facts will never be modified, whatever may happen elsewhere in theory, metaphysics, religion, politics or logic. (18)

Knowledge in the abstract gives way to know-how: scientists are seen as skilled practitioners rather than figures with privileged access to impersonal, objective, transcendent truths or laws.

Furthermore, in this critique of realism, experimentation is not seen as theory-driven in the Popperian sense, in which an experiment is performed in order to test a certain hypothesis. Hans-Jörg Rheinberger develops the notion of “experimental systems,” which he describes as “systems of manipulation designed to give unknown answers to questions that the experimenters themselves are not yet clearly able to ask. . . . They are not simply experimental devices that generate answers; experimental systems are vehicles for materializing questions” (28). The objects of scientific research Rheinberger calls “epistemic things”:

They are material entities or processes—physical structures, chemical reactions, biological functions—that constitute the objects of enquiry. As epistemic objects, they present themselves in a characteristic, irreducible vagueness. This vagueness is inevitable because, paradoxically, epistemic things embody what one does not yet know. (28)

As a result, he says, “wholly explicit knowledge is simply unthinkable” (78). Rheinberger’s constructivizing vision places us within history, where what we experience most intensely as “things” embody what we do not yet know, and *as such* can be claimed to be “real.” So long as an epistemic thing remains, as he puts it, “pregnant with the future,” it retains its claim to “reality.” But that sense of “reality” associated with some thing can fade, as some other thing of increasing urgency starts to command our curiosity and attention. Likewise, texts (or other objects of reception) become—or cease to be—“matters of concern” that attract to themselves “an interested public” no less than the phenomena (e.g., dreams, atoms, monsters, tuberculosis) that come into being and pass away as objects of scientific study, the “biographies” of which historians of science are now writing (see Daston). From the perspective of reception studies, the effort to understand those texts involves recognition of why they become, or cease to be, matters of concern for their different reading communities over time.

This shifting sense of “reality” emerges also from another perspective. Issues of realism and representation are intimately connected, but the connection can be differently configured to different effect (see

Kennedy 2002, 34–36). Classic realism dreams of eliding representation so as to bring us into direct contact with reality, delivering to us secure knowledge of the nature of things and unmediated truth. Critiques of this version of realism characteristically ask us to focus on representation. Latour concentrates on the immensely complex network of mediations on which our sense of reality is constructed: institutions, items of equipment, pictures, and not least lots of pieces of paper filled with words, figures, and diagrams. Rather than our representations mirroring a prior Reality (singular), this network of representations *produces* the realities (plural) we experience, and fresh modes of representation can produce new realities. Immense labor goes into constructing those networks, and into maintaining them, for it is only in their maintenance that our sense of “reality” remains relatively stable; and it is in the production of fresh networks that our sense of “reality” alters.

That such mediation is inevitable means that due attention must always be paid to the quality control of the representations we make of disputed “things”: facts are manufactured (whether by the scientist in the laboratory or the philologist in the library), and we want them to be reliable. But the term “representation” has another important usage, in the legal and political sphere, the ways in which the legitimate people are gathered together around some issue. That these senses of the term may be connected is not part of the way we currently organize our thoughts, but Latour insists that in any account of realism, “the same degree of attention be given to the two aspects of what it is to represent an issue” (2005a, 16). Historically, Latour would trace this divorce in the uses of “representation” back to the activities of Boyle and Hobbes:

Boyle is not simply creating a scientific discourse while Hobbes is doing the same for politics; Boyle is creating a political discourse from which politics is excluded, while Hobbes is imagining a scientific politics from which experimental science has to be excluded. In other words, they are inventing our modern world, a world in which the representation of things through the intermediary of the laboratory is forever disassociated from the representation of citizens through the intermediary of the social contract. . . . The word “representation” is the same, but the controversy between Hobbes and Boyle renders any likeness between the two senses of the word unthinkable. (Latour 1993, 27)

Latour offers in illustration the speech Colin Powell gave to the United Nations on Iraqi weapons of mass destruction in February 2003. The matter at issue needed to be adequately represented in both senses of the term. “No doubt,” Latour says, “the first half of the representation—namely the assembly of legitimate speakers and listeners—was well taken care of. All those sitting around the UN Security Council horse shoe table had a right to be there. But the same can’t be said of the second half, namely the representation of the facts of the matter presented by the Secretary of State.” He cites Powell’s words on the occasion: “My colleagues, every statement I make today is backed up by sources, solid sources. *These are not assertions*. What we are giving you are *facts* and conclusions based on solid intelligence.” Powell’s strong distinction between “facts” and “assertions,” Latour says, cannot be sustained: “It would imply, on the one hand, that there would be matters-of-fact which some enlightened people would have unmediated access to. On the other hand, disputable assertions would be practically worthless, useful only insofar as they could feed the passions of interested crowds” (Latour 2005a, 18–19; emphases Latour’s). But facts are not unmediated; they must be adequately represented. Information is never simply communicated. In its representation, it undergoes, in Latour’s term, “translation.” Against the background of a transcendent Knowledge or Science, that is uncomfortable, not to say heretical; but from “within history,” it is inevitable and the challenge we must confront.

From this perspective on realism, the “things” we most vividly experience as real are not those we feel we definitively know, but are precisely things in dispute and of pressing concern. That concern may be pursued in any assembly of the interested parties; and the “things” of concern are not simply those of scientific investigation but any that press upon us as “real”—in their vagueness or incompleteness. We have no unmediated access to the “true” meaning of texts: they are “epistemic things” in Rheinberger’s sense that they embody what we do not yet know, and it is that sense of lack that compels the attention of their interested publics, who must “represent” them—in both senses of the term. The study of past receptions cannot lay claim to a transcendental Truth or Method, as it is made under the shadow—not simply of powerful past appropriations (such as Plato’s of mathematics) we struggle to identify and understand, and which may not be as

settled as they seem, but of future receptions yet to take place (see Kennedy 2006).

The partial knowledge of which this reconfigured realism speaks cannot but be embroiled in politics, but that politics may be acted out as much in laboratories and libraries as in parliaments and congresses. Moreover, these “things” are not to be envisaged as inert. Though “non-humans,” they are for Latour nonetheless “actors,” exhibiting behaviors that are not wholly controlled by our knowledge of them. They are part of the multiple networks of associations that make up the social for us. For Latour, this is what it means to become a “realist” in politics, and he suggests that “we might be more connected to each other by our worries, our matters of concern, the issues we care for, than by any other set of values, opinions, attitudes or principles” (2005a, 14). Each thing (and that thing might be climate change, the repairs to your apartment, the Islamic veil, the text that challenges you) “gathers around itself a different assembly of relevant parties,” and the pressure of things that concern the parties involved may require them to come to a prompt conclusion about what action they are to take, what priorities to set:

Each object triggers new occasions to passionately differ and dispute. Each object may also offer new ways of achieving closure without having to agree on much else. In other words, matters in dispute—taken as so many issues—bound all of us in ways that map out a public space profoundly different from what is usually recognized under the label of “the political.” (15)

An assembly convened around such matters of concern, when there cannot be appeal to self-evident Truth, must have the procedures to move toward some kind of closure. One way of achieving closure is, as Powell did, to invoke force. If appeals to unmediated truth are no longer to be entertained, that does not signal a collapse into chaos, for competing assertions must strive to construct representations that *inform* and *persuade*. Facts, however reliably attested, do not speak for themselves but need their representatives. The procedures for representing the thing at issue have, Latour says, several old names: “eloquence, or more pejoratively, rhetoric, or even more derogatory, sophistry. And yet these are the labels that we might need to rescue from the dustbin of history” (18–19).

As we have seen, Latour regards the controversies of Hobbes and Boyle as a decisive historical moment. Plato's representation of the sophists is another. The key text for him is the *Gorgias*, and in an extended reading in *Pandora's Hope* (1999, 216–65) he seeks to recuperate political arts from Socrates' contempt for them.⁶ He attempts systematically to re-present, that is to re-contextualize in a positive manner, the negative constructions of political activity that the Platonic Socrates presents, negative constructions that, for all the surface tensions in the dialogue, the Platonic Callicles is eager to collude with: "The fight between Might and Right is rigged like a game of catch, and hides the *settlement* between Callicles and Socrates, each agreeing to serve as the other's foil" (234). Once more, politics is inextricably bound up with knowledge: one of Socrates' put-downs is that Callicles neglects the study of geometry (*geometrias gar ameleis* [Plato *Gorgias* 508a]), and so has no idea of fair shares or just deserts.

Geometry as a form of idealized knowledge thus holds a privileged position in Platonic thought. Latour suggests that what Shapin and Schaffer did for the origin of experimental science, Netz's book on Greek mathematics does for the development of formalism and the process of deduction—a process now so naturalized it is taken for granted. What Netz does "is to transport us back in time to where there was no geometry, no apodeictic reasoning, no deduction, and to when each of those practices had to be devised from scratch without relying on any precedent" (Latour 2008b, 443). Netz argues that these practices arise out of the development of two specific intellectual technologies. Again, note the emphasis on modes of representation:

I will argue that the two main tools for the shaping of deduction were the diagram, on the one hand, and the mathematical language on the other hand. Diagrams—in the specific way they are used in Greek mathematics—are the Greek mathematical way of tapping human visual cognitive resources. Greek mathematical language is a way of tapping human linguistic resources. . . . But note that there is nothing universal about the precise shape of such cognitive methods. They are not neural; they are a historical construct. (Netz, 6–7; cited by Latour 2008b, 443)

It is through the scrupulous development of these technologies that the mathematicians found themselves able to track equivalences and transitive relations through successive stages in a way not possible in

the messy empirical world. They were thus able to construct a specific style of reasoning that could *convince* rather than *persuade*, and so to create within their own mathematical discourse a distinction between demonstration and rhetoric, between *apo-deixis* and *epi-deixis*. Latour emphasizes that Netz does not say that these terms were different from the start and so represent some natural distinction, but rather explores where and why they began to diverge (see further Latour 2008b, 449).

Netz portrays Greek mathematics as a tremendously austere and culturally marginalized activity. The mathematicians themselves kept it strictly compartmentalized from broader discussions, focusing rigorously on formal demonstration and eschewing any discourse on content: “When doing mathematics, one does nothing else” (214).⁷ Marginalized it might have remained had it not come to the notice of the Platonic-Aristotelian tradition. Latour comments:

Philosophy did not carefully limit itself to forms, as geometers did . . . but instead claimed to be talking about *contents*: the Good Life, the proper way of searching for Truth, the Laws of the City, etc. It is as though Plato extracted no more than a style of conviction from geometry and added to it a totally unrelated content; it is as though the type of persuasion mathematicians obtained at great pains (because they limited themselves to forms) could nonetheless be reached, at almost no demonstrative cost, by philosophers with regards to what they saw as the only relevant content! A mimicry of mathematics, just sufficient to boot the Sophists out of philosophy. (Latour 2008b, 445–46)

For all the bitterness of the confrontation between Socrates and Callicles, what they agree on (at least in Plato’s representation) is for Latour much more important than what divides them. Although Socrates presents Callicles as a “lover” of the *demos* (*Gorgias* 513c; cf. 481d–482a), they share a contempt for the crowd. Socrates makes a virtue of being what Latour terms an “agoraphobic”:

I’m no politician, Polus. In fact, last year I was on the Council, thanks to the lottery, and when it was the turn of my tribe to form the executive committee and I had to put an issue to the vote, I made a fool of myself by not knowing the procedure for this. . . . My expertise is restricted to producing just a single witness in support of my ideas—the person with whom I’m carrying on the discussion—and I pay no attention to large numbers of people; I only know how to ask for a single person’s vote, and I can’t even begin to address people in large groups. (*Gorgias* 473e–474a)

Latour's response to this is robust: "Tough luck, because 'addressing large numbers' and 'paying attention' to what they mean, think, and desire is exactly what is being debated under the despised label 'rhetoric'" (1999, 238). When Socrates distinguishes between transcendent knowledge (the example is geometry) and know-how (the example is cooking), the Sophists don't protest, because they share the same aristocratic contempt for practical know-how. In asserting his superiority, Callicles is swift to appeal to nature's law and natural right. Latour remarks:

What is beyond question for both Socrates and the straw Sophists is that some expert knowledge is necessary, either to make the people of Athens behave in the right way or to keep them at bay and shut their mouths. They no longer consider the obvious solution to the problem besetting the agora. . . . although it is still present in the dialogue, at least as a negative template: the assembled Body Politic, in order to make decisions, *cannot* rely on expert knowledge alone, given the constraints of number, totality, urgency, and priority that politics imposes. Reaching a decision *without* appealing to a natural impersonal law in the hands of experts requires a disseminated knowledge as multifarious as the multitude itself. *The knowledge of the whole needs the whole, not the few.* But that would be a scandal for Callicles and for Socrates, a scandal whose name has been the same at all periods: democracy. (228–29; emphases Latour's)

In his demands for transcendent knowledge and absolute distinctions between good and bad, Socrates asks of rhetoric what it cannot deliver, while simultaneously occluding the task of rhetoric in the democratic context: the means to enable the people, in the absence of certain knowledge, in relative ignorance of the consequences, in the face of the urgency of the moment, to move to a collective decision, a task figures such as Themistocles or Pericles (criticized by Socrates in the dialogue) sought to undertake. But Socrates shows little understanding of what it is to *represent* the people:

I am not talking here about the modern notion of representation that will come much later, and that will itself be infused with rationalist definitions, but about a completely ad hoc sort of activity that is neither transcendent nor immanent but more closely resembles a fermentation through which the people brews itself toward a decision—never exactly in accordance with itself, and never led or commanded or directed from above. (247)

Socrates and Callicles, in their respective appeals to Right and Might, offer two different but parallel ways to shortcut this politics and impose a closure, the former through an appeal to Knowledge and Reason that sets up the notion of a transcendent Nature and Science, the latter through an appeal to Force or Power that sets up the notion of a transcendent Society and the Social. Latour remarks that it has taken years of conditioning to laugh with the Socrates of this dialogue as he outmaneuvers his opponents and tramples on politics, but “there is no reason to laugh because the contempt for politicians is still today what creates the widest consensus in academic circles” (245). Latour (2004, 10–18) relates this academic hauteur to the spell that Plato’s myth of the Cave in the *Republic* continues to cast, with its distinction between true Knowledge and the social world: the Philosopher/Scientist “once equipped with laws not made by human hands that he has just contemplated because he has succeeded in freeing himself from the prison of the social world, can go back into the Cave so as to bring order to it with incontestable findings that will silence the endless chatter of the ignorant mob” (10–11). Latour’s “political epistemology” dissolves the absolute distinction between outside and inside the Cave, and that between *apo-deixis* (“showing from” the object, and so object-orientated) and *epi-deixis* (“showing in front of,” and so audience-orientated, to inform and explain). It provides a methodological *aide-mémoire* for the study of receptions, past and present, one’s own as well as others’: the representation of some “thing” is bound up with its representation *to* and *for*.

Notes

1. The exhibition catalogue (Latour and Weibel) includes an introduction by Latour (2005a).

2. Latour begins his review of Netz: “This is, without contest, the most important book of science studies to appear since Shapin and Schaffer’s *Leviathan and the Air-Pump*” (2008b, 441).

3. Latour excludes the pragmatists, whose name is derived from the Greek *pragma*, “thing” or “matter.”

4. “‘Society’ and ‘Nature’ do not describe domains of reality, but are two *collectors* that were invented together, largely for polemical reasons, in the 17th century” (Latour 2005b, 110); “‘nature’—that blend of Greek politics, French Cartesianism, and American parks” (2004, 5).

5. Key texts, apart from Latour and Woolgar and Latour 1987 are Hacking; Jardine; and Rheinberger. For further analysis of these issues, see Kennedy 2002, 1–63.
6. Latour acknowledges a wide-ranging debt to Cassin.
7. Compare also Netz: “The lettered diagram supplies a universe of discourse. Speaking of their diagrams, Greek mathematicians need not speak about their ontological principles. . . . There is a certain single-mindedness about Greek mathematics, a deliberate choice to do mathematics and nothing else” (57). Recall the similar epistemological modesty of Boyle’s experiments.

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