

# Politicizing science: Conceptions of politics in science and technology studies

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## Abstract

This essay examines five ideal–typical conceptions of politics in science and technology studies. Rather than evaluating these conceptions with reference to a single standard, the essay shows how different conceptions of politics serve distinct purposes: normative critique, two approaches to empirical description, and two views of democracy. I discuss each conception of politics with respect to how well it fulfills its apparent primary purpose, as well as its implications for the purpose of studying a key issue in contemporary democratic societies: the politicization of science. In this respect, the essay goes beyond classifying different conceptions of politics and also recommends the fifth conception as especially conducive to understanding and shaping the processes whereby science becomes a site or object of political activity. The essay also employs several analytical distinctions to help clarify the differences among conceptions of politics: between science as ‘political’ (adjective) and science as a site of ‘politics’ (noun), between spatial-conceptions and activity-conceptions of politics, between latent conflicts and actual conflicts, and between politics and power. The essay also makes the methodological argument that the politics of science and technology is best studied with concepts and methods that facilitate dialogue between actors and analysts. The main goal, however, is not to defend a particular view of politics, but to promote conversation on the conceptions of politics that animate research in social studies of science and technology.

## Keywords

political theory, politicization, politics, research methods, science and technology studies

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## Introduction

Questions of politics have long been part of science and technology studies (STS), and several publications have reviewed and assessed some of the different conceptions of politics apparent in the field (De Vries, 2007; Durant, 2010, 2011; Gomart and Hajer, 2003; Kusch, 2007; Latour, 2003, 2007; Papadopoulos, 2010; Pestre, 2004, 2008; Thorpe, 2008).<sup>1</sup> But as some commentators have pointed out (De Vries, 2007; Marres and Lezaun, 2011: 497), most STS scholars have devoted far more conceptual scrutiny to science and technology than to politics or democracy. Of course, unlike most political theorists, STS scholars have carefully studied how science and technology become intertwined with politics. And there have been periodic discussions about whether and in what sense STS itself is or should be political (Richards and Ashmore, 1996; Sismondo, 2008; Woodhouse et al., 2002). STS scholars have also examined concepts closely related to politics, such as power and authority (Barnes, 1988; Law, 1991a), publics (Marres, 2007), and public engagement (Wynne, 2007). But there has been little explicit discussion of what either STS scholars or the actors they study actually mean by ‘politics’ or ‘political’. Is politics best understood as a certain kind of activity or as a particular sphere of life? Does politics involve exercising power? Expressing collective will? Promoting the common good? Contesting established routines? All of the above? Something else entirely? Most importantly, what is at stake in calling something ‘political’?

Practically, politics cannot be separated from its various cultural and material articulations. But analytically, it is worth asking what conceptions of politics are at work in STS research. Politics is an ‘essentially contested’ concept (Connolly, 1993: 10–41; Gallie, 1956), in the sense that any shared assumptions about its meaning tend to be relatively local, temporary, and unstable. Conceptions of politics are internally complex and comprise multiple elements (power, conflict, agency, etc.), and proponents of different conceptions of politics tend to emphasize different elements and conceive them in different ways. Some elements they might not share at all, but they generally share at least some elements or ‘family resemblances’, or else they would not each call their different conceptions ‘politics’ (Wittgenstein, 1958: 32). Conceptions of politics also derive their meaning from how they relate to other concepts, including ‘science’ and ‘technology’, which are also open to interpretation. Moreover, conceptions of politics are shaped by history and culture (Jasanoff, 2005), and some non-Western cultures have no word or concept that exactly corresponds to the English word ‘politics’ (Freedon and Vincent, 2013).

Given these features of the concept, there is no definitive or neutral answer to the question, ‘What in fact *is* politics?’ (De Vries, 2007: 788, original emphasis). A conception of politics is not ‘a transcript of reality’, but a tool that we can assess with regard to how well it serves a particular purpose (James, 1907/1981: 30). For example, a scholar interested in studying radical social movements might find inspiration in Rancière’s (1999) account of politics as the disruption of dominant sensibilities and struggle for recognition by subordinate groups. Someone studying government science policy might consult Weber’s (1994) view of politics as the passionate, responsible, often tragic competition to acquire and exercise institutional power (pp. 364–369). The meaning of politics is not a problem that can be solved, but a site of ongoing contestation.

Commentators have thus often noted that calling something 'political' is itself a political act. Carl Schmitt (1932/1996) notoriously argued that defining the boundaries of 'the political' is the existential task of an authoritarian state leader (pp. 29–32, 66–67). In a democracy, in contrast, the boundaries and practices of politics require democratic legitimacy, which arguably depends on both normative justification and popular acceptance. Analysts may offer justifications for conceiving of a particular scientific institution or artifact as a site of politics, but democratic legitimacy depends on such justifications becoming publicly accepted. Understood in this spirit, theoretical inquiry into the meaning of politics can inform and enrich practical efforts to redefine what counts as politics in particular contexts.

Attending to one's conception of politics also has methodological benefits for empirical research (De Vries, 2007: 784; Hay, 2007: 71; Leftwich, 2004). Different conceptions of politics emphasize different factors and levels of analysis, thus directing one's attention to some questions rather than others. Of course in many contexts leaving one's conception of politics vague or unspecified may have few consequences, or it may actually facilitate communication among those who would otherwise get bogged down in definitional disputes. Nonetheless, some scholars have found it useful to reflect on what people mean by saying that science is 'political' or a site of 'politics'.

Some accounts distinguish between acceptable and unacceptable *degrees* of politicization. They often frame the issue in Goldilocks' terms: science requires neither too much nor too little politics, but an unspecified amount that is somehow just right. For example, Pielke (2007) writes that the politicization of both science and policy is unavoidable but should not be 'taken to such an extreme' that it becomes 'pathological' (pp. 33, 137); Barry (2001) says that 'there can be an *excess* of politics' (p. 7, original emphasis); Forsyth argues that Collins et al. (2010) 'underpoliticize the production of facts' (Forsyth, 2011: 318); Collins et al. (2011) write that their case studies 'point in the direction of less politics and less lay opinion rather than more' (p. 341). Other scholars have sought to classify different *kinds* of politics within science. Shapin and Schaffer (1985), for example, distinguish three ways that science is political: (1) the scientific community is a political community; (2) science plays a role in politics outside the laboratory; (3) there is a conditional relationship between the polity of scientists and the wider polity (p. 332). Similarly, Latour (2007), Nahuis and Van Lente (2008), and Papadopoulos (2010) each identify five ways that science is political, and Bijker (2006) finds no fewer than seven ways that technology is political. These taxonomies show that science can be political in different ways, but most of these authors (with some exceptions, discussed later) do not offer a generic conception of politics or specify the 'family resemblances' that allow us to see the different kinds of politics within science as instances of a spectrum of related phenomena. They show different ways that science is political, but not what it means for science to be political.

The next section sketches a few distinctions that may help clarify the differences among different conceptions of politics. The rest of the essay examines five ideal-typical conceptions of politics in STS with regard to their apparent primary purposes: normative critique, two approaches to empirical description, and two views of democracy. Most of my examples focus on the politics of science, with occasional references to technology, but the discussion applies generally to technoscience. In addition to the analytical task of

examining the purposes served by different conceptions of politics, the essay takes up the normative task of arguing that the last of the five conceptions is especially promising for studying the politicization of science in democratic societies. My main goal, however, is not to persuade readers to adopt any particular view of politics, but rather to promote conversation on the conceptions of politics that animate research in social studies of science and technology.

## Concepts and methods

It is worth distinguishing between the noun 'politics' and the adjective 'political'. (This essay does not address the nominalized adjective 'the political' (Schmitt, 1932/1996), an esoteric concept of intense interest in contemporary political theory, which some STS scholars (Barry, 2001) use to specify the foundational conditions of ordinary politics.) In this essay, I use the noun 'politics' to designate particular kinds of activities. Another common meaning appears when people use the noun 'politics' to designate the political causes and consequences of technical artifacts. This is the sense implied by Winner's (1986) question, 'Do artifacts have politics?' Well established artifacts may 'have politics' and thus be deemed 'political' in this sense, without currently being sites or objects of 'politics' in the sense of political activity.

Turning now to the adjective 'political', English speakers use it in at least three distinct ways:

1. to designate an activity as a *mode* of engaging in politics, such as 'political deliberation' or 'political protest';
2. to designate an institution as a *site or object* of politics, such as when we say that a business, household, or laboratory has become 'political'; and
3. to designate something as having *origins, implications, or effects* associated with politics, such as a 'political ideology', 'political identity', or 'political interest'.

When people say that science is 'political', it is often not clear which of these different meanings of the word they have in mind. In this essay, I argue that *sociotechnical practices and institutions may have political origins, implications, or effects, and thus be political, without necessarily being a mode, site, or object of politics*. Just as something may be edible though nobody is eating it, something may be political though it is not (at the moment) a mode, site, or object of politics. Structural forces, dominant ideologies, disciplinary knowledges, large-scale emergent phenomena, unintended outcomes, established facts and artifacts, and even the fabled butterfly effect can all be understood as *political*, insofar as they have political origins, implications, and effects, but that alone does not make them into modes, sites, or objects of *politics*. Not everything political is politics.

In addition to these matters of terminology, it also seems useful to distinguish three questions: *What* is politics? *Where* do you find it? *How* do you study it? The first two questions correspond to a view of politics-as-activity (what) and politics-as-sphere (where), which historically have been two of the most common ways of conceiving politics, as meticulously documented by Palonen (2006a, 2006b; see also Leftwich, 2004: 13–14). These two conceptions have often been intertwined in both theory and practice.

People have often located political activities within some kind of political sphere, and they have sometimes associated political spheres with a particular conception of political activity. Nonetheless, it is useful to distinguish these conceptions analytically.

The notion of politics-as-sphere draws on various spatial metaphors, including space, terrain, realm, domain, field, sector, zone, system, or subsystem, as well as theatrical metaphors of arena, stage, or scene (Palonen, 2006a: 54–61). During the 19th century, sphere-conceptions played a key role in the functional differentiation of politics from economics, law, religion, science, morals, administration, and so on. Commentators long tried to provide definitive substantive accounts of the spatial boundaries of politics, often equating politics with either the public sphere or the modern state. Most scholars today, in contrast, acknowledge the proliferation of ‘subpolitics’ within businesses, laboratories, households, and other diverse locations, often largely independent of the state (Beck, 1997). Indeed, the very notion of a fixed or distinct political sphere has become increasingly implausible, but spatial modes of conceiving politics persist. In the following, therefore, I use the term ‘spatial-conception’ for modes of conceiving politics that reflect a continuation of the basic logic of the sphere-conception, despite the widespread rejection of efforts to confine politics to a particular sphere. A spatial-conception appears in the notion that someone is ‘in politics’ (Palonen, 2006a: 45), and conversely, it appears in the claim that politics can be ‘inscribed in’ technical artifacts (Latour, 1992; Winner, 1986). Similarly, the debate over Collins and Evans’s (2002) ‘Problem of Extension’ (p. 237; Jasanoff, 2003; Wynne, 2003) focused on the spatial question of ‘how far’ public participation should extend into technical decision making, rather than what kinds of activities such participation might involve. A spatial-conception of politics, taken by itself, does not specify any distinctive features of politics, only where they might be found (Palonen, 2006a: 13–15).

The conceptual tradition of politics-as-activity, in contrast, does address the *what* question, and it emphasizes the temporal and contingent dimensions of politics, as well as the role of individual and collective agency. Indeed, many scholars today avoid asking ‘what *is* politics?’, as that tends to elicit a universalist response, and instead they ask pragmatically, ‘what are we *doing* when we do politics?’ (see Palonen, 2006b: 21). Palonen (2006a, 2006b: 18–20) identifies several different topoi in commentary on the distinguishing features of political activity: irregularity, judgment, policy, deliberation, commitment, contestation, possibility, situation, and play or game. A generic activity-conception appears in Winner’s (1986) definition of politics as ‘arrangements of power and authority in human associations as well as the activities that take place within those arrangements’ (p. 22). Pielke (2007) offers a more specific activity-conception of politics as ‘bargaining, negotiation, and compromise in pursuit of desired ends’ (p. 22). The activity-conception of politics is especially important for studying *politicization*, which I conceive here not in the everyday pejorative sense, but rather as a process whereby people persistently and effectively challenge established practices and institutions, thus transforming them into sites or objects of politics (Palonen, 2003: 181–184, 2006b: 292).

That brings us to the third question: *how* do we study the politics of science? One can distinguish three ideal–typical approaches, usually combined in practice but with different emphases: conceptual, empirical, and dialogical. Scholars who take a more conceptual or theoretical approach, emphasizing the role of analysts, offer normative claims

about the politics of science, ranging from broad generalizations to utopian ideals (Kitcher, 2011). This approach has been widely criticized in STS, but as I show in the following, some STS scholars implicitly adopt an analyst-focused approach when discussing politics.

When making explicit methodological arguments, many STS scholars advocate micro-level, actor-focused approaches, arguing that conceptual distinctions should be allowed to 'emerge' from empirical study, and that actors, rather than analysts, should determine what counts as 'science' or 'politics' in particular contexts (Latour, 2005b: 23; Latour and Woolgar, 1979/1986: 27–33, 37–39). Researchers using the methods of grounded theory, ethnomethodology, and actor–network theory (ANT) rightly aim to avoid imposing fixed categories onto the actors they study. But as several commentators have noted (Fuller, 2006: 30, 49–52; Jensen, 2014; Pestre, 2004: 355; Radder, 1996: 96–97, 172–73), STS scholars often go further and suggest that empirical researchers should try to entirely avoid pre-existing concepts and theories. Irwin (2008), for example, notes 'a characteristic methodological preference within STS to "follow the actors" rather than make categorical judgments in advance' (p. 584). Such formulations suggest an unfortunate dichotomy between conceptual and empirical research. Similarly, some STS scholars dismiss what they misleadingly call 'a priori' theory or philosophy (Bonneuil and Levidow, 2012: 81; Gomart and Hajer, 2003: 56; Jasanoff, 2005: 250). Such dismissals may be motivated by valid concerns about the shortcomings of foundationalist epistemology, moralistic philosophy, or functionalist sociology, but most social and political theory is actually not independent of experience, as the term 'a priori' suggests.<sup>2</sup> Moreover, actor-focused approaches to studying politics generally begin with at least some minimal conception, often implicit, of what politics is or does and where to find it.

Finally, a dialogical approach, also advocated by many STS scholars, explicitly promotes conversation (either literal or metaphorical) between actors and analysts, and between conceptual and empirical research (Barry, 2013: 11; Collins, 2008: 103; Collins and Evans, 2002: 240, 2007: 7; Gad and Jensen, 2010: 64; Gomart and Hajer, 2003: 35; Jensen, 2014; Latour, 2013: 46; Marres, 2007: 765; Pels, 2003: 148; Pestre, 2004: 360; Radder, 2006: 156–162; Wyatt and Balmer, 2007; Wynne, 2007: 101). According to a dialogical approach, analysts attempt to articulate and justify the conceptions of politics they bring to their empirical investigations, while remaining ready to be surprised or challenged by the actors they study. Analysts might begin with actors' assessments of whether science has been politicized, but they also draw on existing concepts and theories to evaluate and challenge the actors' assessments. Such concepts and theories are best understood as partial and provisional, but they do not emerge solely from any particular empirical inquiry itself. After all, political activities are often not immediately evident as such. A person may be lying in the street because she is injured or because she is protesting the government. Therefore, identifying when someone is engaged in politics requires locating concrete activities within an interpretive context, a context that includes both actors and analysts with both established and emerging conceptions of politics.

## Five conceptions of politics

The remainder of this essay examines five conceptions of politics in STS (Table 1). As ideal–typical constructions, these conceptions are not meant to correspond to the views

**Table 1.** Approaches to the study of politics in STS.

Primary purpose	Slogan	Conception of politics	Image of politics	Who determines what counts as politics
1. Critique of scientism	Science is essentially political	Unspecified	Spatial	Analyst
2. Description of scientific practice	Science is politics by other means	Strategic alliance building	Activity	Analyst
3. Description of boundary-work	Science is contingently political	Unspecified	Spatial	Actor
4. Democracy as collective world making: material democracy	Science generates 'matters of concern'	Posthuman, hybrid construction of a common world ('cosmopolitics')	Spatial	Analyst
5. Democracy as collective self-governance: representative democracy	Science may become a site of politics	Purposeful activities that aim for collectively binding decisions in a context of power and conflict	Activity	Actor–Analyst Dialog

of particular authors, nor do they necessarily exclude each other in practice. I discuss each conception with respect to how well it fulfills its apparent primary purpose, taking into account the context within which it emerged, as well as its implications for the purpose that most concerns me: understanding and shaping the politicization of science in democratic societies. For this particular purpose, I argue, the fifth conception seems most promising. In this respect, the essay illustrates a dialogical approach, combining empirical research on STS publications with conceptual and normative studies on the meaning of politics.

### *Critique of scientism: science is essentially political*

According to the traditional 'modern' view, science is essentially nonpolitical. That view never adequately described scientific practice, and decades of research in STS and other fields have rendered it implausible. More common today is the suggestion that science is political or, more emphatically, that science is inevitably, intrinsically, or 'essentially' political (Blume, 1974: 1; Frickel and Moore, 2006: 3).<sup>3</sup> Collins and Evans (2002), for example, assert that STS has established that 'politics is "intrinsic" to science', even though they also argue that 'extrinsic' political influences on science should be resisted or at least not publicly endorsed (p. 245, p. 286 note 27; Collins and Evans, 2007: 125–126). For Jasanoff (2004), 'The making of science is also *political*' (p. 21), and STS itself is '*political* to the core' (Jasanoff, 1996: 409, original emphases). Latour (2007) notes that the slogan 'everything is political' is so broad as to be 'meaningless' (p. 812), and he calls it 'depoliticizing' (p. 819) because it creates an excess of citizen worries and thus

invites cynicism and passivity. But he also asserts, 'In the end, yes, "everything is (cosmo)political" but not at all in the same way' (p. 818) (see also Harman, 2009: 89). Similar claims appear frequently in STS (Bijker, 2006: 682; Kleinman, 2005: 10; Nisbet and Lewenstein, 2002: 360).

The claim that science is 'essentially political' reflects a spatial-conception of politics. Although some who claim that science is essentially political suggest a particular view of political activity, most leave the meaning of 'politics' and 'political' unspecified. And regardless of what particular authors may think about the distinguishing features of political activity, the claim that science is essentially political, taken by itself, only tells us *where* politics occurs (within all practices and institutions associated with science), rather than *what* activities it involves. Additionally, asserting that science is essentially political, regardless of whether actors see it as such, emphasizes the role of analysts in understanding the politics of science.

STS scholars have not been alone in calling certain things – or even everything – essentially political (Palonen, 2006a: 65). During the 1970s, feminists popularized the slogan 'the personal is political' – although for most the slogan did not entail 'a simple or a total identification of the personal and the political' (Okin, 1989: 128). During the 1980s and 1990s, inspired by feminism, multiculturalism, and certain readings of Marx or Foucault, many leftist scholars asserted the pervasiveness of politics as an expression of emancipatory resistance. It became 'intellectual common sense' among many academics to insist that everything is political (Dean, 2006: 761; see also Barry, 2001: 193–194; Pestre, 2004: 352). And not without reason. The claim that science is essentially political has served the important purpose of criticizing scientism in various ways.

Portraying science as essentially political has offered a way of rejecting both the positivist image of science as value-free knowledge, on the one hand, and either Marxist or neoliberal reductions of science to economic imperatives, on the other. Understood in this sense, claiming that science is essentially political bluntly conveys the important notion that scientific methods and theories are value-laden (Proctor, 1991). Similarly, the notion that science is essentially political may be taken as suggesting, correctly, that science is always subject to politicization (Thorpe, 2008: 76). Science often raises questions of power, justice, morality, and group identity (Miller, 2001: 265), and when such questions become controversial, science may become a site of politics. In this respect, the claim that science is essentially political has helped open up science to both scholarly research and public critique and engagement.

Indeed, beyond the purpose of debunking scientism, the notion that science is essentially political has inspired STS studies of both *interactions* between science and politics and their *mutual constitution* (Jasanoff, 2004). Science–politics interactions include science advice and science policy: science affects politics through science advice, and politics affects science through science policy. The mutual constitution of science and politics has been carefully documented in STS studies that show, for example, how concepts such as 'experiment', 'natural law', or 'testimony' have long combined scientific and political meanings (Ezrahi, 1990; Keller, 1985: 131–134; Shapin and Schaffer, 1985).

Unfortunately, the claim that science is essentially political amounts to a polemical critique that has become counterproductive, even for the limited purpose of debunking scientism (Latour, 1993: 147). Calling science essentially political merely inverts the



traditional image of science as essentially nonpolitical. It tends to evoke polemical counter-claims from those concerned to defend scientific truth and objectivity. And for the broader purpose of studying the politicization of science, the claim also has several shortcomings. If science is *always* political, then we cannot compare situations where it is and where it is not, and it becomes difficult to study what people mean by calling science ‘political’ and what is at stake in doing so. Moreover, if something is always already political, it cannot *become* political. In this respect, asserting that science is essentially political may undermine the practical work of making science into a site or object of politics in specific contexts. As Dean (2006) notes, ‘if *everything* is already political, there’s no need to bother with organizing, consciousness-raising, or critique’ (p. 763, original emphasis). As Barry (2001) argues, ‘it takes a lot of work to make an object political, and to create the kinds of sites within which political action can happen’ (p. 194; Palonen, 2003: 182). To say that science is always subject to politicization means only that it is always *potentially* a site of politics, not that it is always *actually* so.

Moreover, if we distinguish between ‘politics’ (noun) and ‘political’ (adjective), as suggested previously, we can see how it is often misleading to claim that science is essentially political. If that claim were taken to address only the widely accepted external interactions between science and politics – if it were only a way of calling attention to science advice and science policy – few would object, even if they disagreed over particular cases. Indeed, saying that something that was affected by politics is ‘political’ should be no more worrisome than saying that food that was affected by cooking is ‘cooked’ – good to know, but not especially interesting or controversial. If this is what it means to say that science is essentially political, the claim is true but trivial, since nearly everything is indirectly affected by politics and indirectly affects politics as well. Moreover, in this broad sense, science is not only always political but also social, material, cultural, and linguistic. But the claim that science is essentially political is often taken to entail the more controversial and less plausible notion that scientific practices necessarily amount to ‘politics’ in the sense of political activity.

Finally, conceiving science as essentially political neglects the importance of nonpolitical relations for both science and democracy. Many scientific institutions are run in part through politics (e.g. voting on hiring committees or advisory bodies), but as long as professional norms and practices seem effective and legitimate to those affected by them – controversies over which are the stuff of boundary-work, discussed in a moment – such norms and practices generally provide more reliable and amiable means of organizing inquiry than the power-laden negotiations often associated with politics.

### *Description of scientific practice: science is politics by other means*

A more nuanced version of the notion that science is essentially political appears in Latour’s Clausewitzian slogan: ‘Science is not politics. It is politics by other means’ (Latour, 1988: 229, 1983: 167–168, 2007: 813; see also Callon et al., 2009: 68; Harding, 1991: 10; for discussion, see Pels, 2003: 24). The slogan captures a key insight of early laboratory studies, which during the 1970s and 1980s used anthropological methods to show how scientific claims emerge through mundane processes of negotiation rather

than the impersonal application of formal methods. Going beyond a spatial-conception of politics, the first part of Latour's slogan rejects a simple equation of science and politics, while the second part asserts that science involves activities that amount to 'politics', even if scientists themselves disagree. Latour's early studies linked the notion that 'science is politics' to a specific view of political activity as strategic alliance building. Latour and Woolgar (1979/1986) characterized scientists as 'strategists' engaged in a struggle for credibility, whose 'political ability is invested in the heart of doing science' (p. 213, see also p. 237). Latour (1983, 1988) later employed a similar conception of political activity but extended it beyond the lab, showing how Pasteur built alliances between the microbes isolated in his laboratory and various societal interests, leading to innovations in sanitation and hygiene that transformed the world more profoundly than most of what occurs in ordinary politics. Although many perceived these studies as critiques of science, the authors maintained that their primary purpose was empirical description (Latour and Woolgar, 1979/1986: 21–39).

Despite its value in revealing key aspects of scientific practice, the conception of politics associated with Latour's slogan, especially as it appears in ANT, has key shortcomings, even for the limited purpose of empirical description. Like behaviorist political science, ANT studies generally rely on a thin conception of agency that sets aside the motives and aims of actors as 'practically unimportant' (Callon and Law, 1982: 618; Jensen, 2014: 206–207). ANT studies typically attribute agency to anyone or anything, including any nonhuman, that makes a difference in something else (Latour, 2005b: 71; Sayes, 2014: 141). ANT views agency from the outside, as it were, in terms of effects rather than purposes. This conception of agency is not conducive to understanding what either science or politics means to actors themselves. In this respect, the empirical descriptions it generates arguably miss something important. More broadly, as I will discuss in more detail, ignoring actors' self-conceptions makes it difficult to study how the politics of science relates to democratic self-governance.

### *Description of boundary-work: science is contingently political*

Whereas ANT studies have often seemed to reject the very notion of boundaries between science and politics, STS studies of 'boundary-work' have sought to show how such boundaries become socially established (Gieryn, 1995, 1999; Jasanoff, 1990). In contrast to earlier efforts by Popper, Merton, and Kuhn to specify essential demarcation criteria, studies of boundary-work transform the science–politics boundary into a question of constructivist practice. From this perspective, science is contingently political, in the sense that science becomes political only when actors conceive it as such. Scholars adopting this approach thus leave the meaning of 'politics' largely unspecified, focusing instead on the science–politics boundary. They ask where actors see politics, rather than what they mean (or should mean) by 'politics', which suggests an implicit spatial-conception of politics.

This conception of politics serves the purpose of empirical description by not imposing the analyst's categories onto the actors being studied. It may also help researchers discern how the processes and criteria through which actors judge what counts as politics may change over time. Proctor (1991), for example, mentions a few common ways in which analysts see science as political, and then he adds,

Science is also political, though, in the sense that alternatives usually become possible only when they are recognized as alternatives and when people capable of making them come about are moved to make them come about. Most importantly, science is political whenever the objects under investigation are matters of vital human interest – problems of health, security, and the various forms of privilege and exclusion which societies enjoy or from which they suffer. (p. 267)

Proctor here suggests that science is best deemed political when people: (a) recognize alternative ways of conducting or organizing some aspect of science, (b) are capable of attempting to realize those alternatives, and (c) are ‘moved’ to do so by ‘matters of vital human interest’. These criteria suggest that we conceive of the politics of science in part with reference to the normative stakes of sociotechnical alternatives, as perceived by reflective and critically self-conscious actors themselves, a view that resonates with my own account of what it means to politicize science.

Nonetheless, even for the limited purpose of empirical description, an actor-focused approach has certain shortcomings, especially when STS scholars argue that analysts should be careful not to do any boundary-work themselves, but instead only ‘watch’ the actors (Gieryn, 1995: 394, 2008: 95; Latour, 2005b: 23). Gieryn (1995) writes, for example, that science is ‘Nothing but a *space* ... empty *until* its insides get filled and its borders drawn amidst context-bound negotiations over who and what is “scientific”’ (p. 405, original emphasis; see also Gieryn, 1999: xii, 5, 14–15). Of course, the notion that boundary-work constantly reconstructs the boundaries between science and politics requires that boundaries already exist, prior to the analyst’s study of how actors reconstruct them. And to say that actors in particular contexts may negotiate the specific nature and location of the boundary does not require that everything about what counts as ‘science’ or ‘politics’ is indeterminate prior to any particular negotiation over the boundary between them. As Gieryn (1999) mentions elsewhere, most boundary-work occurs ‘around the edges of science’ (p. 15). Gieryn (1995) is thus misleading when he writes that the ‘space’ of science is ‘initially empty’ (p. 405). Each episode of boundary-work is inevitably shaped by the results of past episodes, and Gieryn actually goes on to explain that he means ‘empty’ merely in the sense of not entirely determined by the past (i.e. not really empty at all), and he rightly notes that his argument ‘could easily be exaggerated into a silly conclusion that every episode of boundary-work occurs *de novo*’ (Gieryn, 1995: 406, see also p. 442 note 7; Gieryn, 1999: 20–21, 34–35).

Gieryn (2008) restates his actor-centered approach in a more recent essay, in which he distinguishes between ‘settled’ and ‘unsettled’ boundaries between science and other areas of cultural practice:

Boundary-work does not happen all of the time, nor in all places ... Only occasionally (and in identifiable conditions like courtrooms) do the cultural boundaries between science and non-science become the object of actors’ explicit discursive practices, destabilized (or defended) in the pursuit of credibility and legitimacy. Only occasionally does science become a contingently constructed space ... For the rest of the time, nobody bothers to ask, or *needs* to ask whether this is science or not. (p. 95, original emphasis)

The phrase in Gieryn’s first set of parentheses raises a key question: what ‘identifiable conditions’ lead to boundary-work? Gieryn distinguishes between institutionalized

spaces that encourage boundary-work (e.g. courtrooms) and those that suppress it (e.g. research laboratories). As an example of suppressed boundary-work – which could also be called ‘suppressed politics’ (Warren, 1999: 215) – Gieryn discusses the Clark Center, a laboratory at Stanford University:

Actually, the Clark Center is full of politics, but in this place politics coexist peacefully with science, and boundary-work recedes almost invisibly into the implicit. Politics are inscribed in the walls and floors of the Clark Center, where they are very difficult to discern ... [I]ts visions of a good society, its power and interests, its desires and fears, get built into the architecture of the place. (Gieryn, 2008: 97)

Gieryn goes on to identify a politics of free-market innovation in the design of the Clark Center. Notably, Gieryn uses the term ‘politics’ to refer to both the explicit politics that occur in the boundary-work of a courtroom *and* the suppressed politics of a laboratory where old boundary-work has become part of the environment and invisible.

These formulations suggest a key ambiguity: Gieryn suggests both that politics is always part of science *and* that actors draw boundaries between science and politics. Some scholars attempt to reconcile these two claims with the misleading suggestion that any science–politics boundary is merely a ‘perceived boundary’ that separates ‘seemingly distinct spheres’, even as they rightly treat such boundaries as ‘real’ in the sense of having real but not necessary effects (Jasanoff, 2011a: 14, 2011b: 21). There does not seem to be a vocabulary for distinguishing between the politics ‘embedded in’ established boundaries, on the one hand, and the politics through which people contest such boundaries, on the other. Similarly, there does not seem to be a widely accepted means of distinguishing between the ‘politics’ of situations that involve actual, current, practical possibilities for political activity, on the one hand, and the ‘politics’ of situations where such possibilities no longer (or do not yet) exist, on the other. One possibility would be to reserve the term ‘politics’ for current political activity and boundary-work, and to use the term ‘suppressed politics’ for contexts such as the Clark Center. I discuss this issue again with regard to the fifth conception of politics.

Another instructive example of conceiving science as contingently political appears in an essay by Gomart and Hajer (2003). They aim ‘to open up the question of “what is (contemporary) politics” to empirical investigation’, and they ask, ‘how can we, along with the actors in the field, help to re-invent a democratic politics?’ (p. 35). Unlike Gieryn, who says that analysts should restrict themselves to observing politics, Gomart and Hajer suggest ‘the existence of an actual *field of experimentation* where actors and analyst might work together to elaborate and try out new political forms’ (p. 35, original emphasis). Here Gomart and Hajer go beyond an actor-focused approach, and seem to endorse something like the ‘dialogical’ approach mentioned previously. But Gomart and Hajer leave unclear how they conceive of the role of analysts in shaping what counts as politics or political. On the one hand, they repeatedly deemphasize the role of the analyst, echoing the previously mentioned empiricism of much STS: ‘The empirical issue here would first of all be to see what is made political in these cases and how this happens; the understanding of “democratic” politics would then be postponed to a later phase of research’ (Gomart and Hajer, 2003: 45). And they insist that ‘no one can define

a priori what is “politics””. They want to ‘empiricize the question of politics’ (p. 56). One might ask the following: When does this ‘later phase’ of research begin? Is it really possible for empirical research to entirely precede conceptual understanding? On the other hand, despite repeated disavowals of any theory of politics, Gomart and Hajer conclude by rightly arguing that Dewey’s theory of politics as the experimental construction of publics and states provides ‘echo and support’ for their approach to studying the politics of science (p. 56). This reliance on a long-dead theorist suggests that an empirical approach to studying politics has more to gain from pre-existing theoretical resources than much of their discussion indicates.

### *Democracy as collective world making: science generates ‘matters of concern’*

The conceptions of politics considered so far serve relatively narrow purposes of critique and description. Each of the last two conceptions I want to consider serves the broader purpose of articulating and promoting a particular conception of democracy. While the more ‘activist’ strands of STS have long addressed questions of democracy, during the past two decades such questions have become increasingly central to the field (Sismondo, 2008). Building on Durant’s (2011) account of two implicit conceptions of democracy in STS, the notion of democracy considered in this section emphasizes open-ended contestation of established institutions, while the view discussed in the next section focuses on collective decision-making through such institutions. Both of these conceptions of democracy offer a constructivist alternative to modernist theories of representative democracy and their associated values of rationalism, universalism, and efficiency (Ezrahi, 1990). Both also recognize the decline of nation states relative to regional and transnational actors, and the associated shift in political authority from centralized sovereign ‘governments’ to decentralized networks of ‘governance’ (Irwin, 2008: 584–585). But whereas the first view often presents constructivism as fundamentally opposed to established institutions of representative democracy, the latter develops a constructivist version of representative democracy. These are clearly not the only conceptions of democracy at work in STS. Moreover, neither of these conceptions necessarily excludes the other, and the distinction between them is a matter of emphasis. Callon et al. (2009) and Latour (2004a), for example, combine elements of each.

Many STS studies – especially those that draw on ANT, posthumanism, and related approaches – suggest a conception of democracy similar to what Marres (2012) calls ‘material democracy’ (pp. 107–113; see also Asdal et al., 2008; Barry, 2013; Callon et al., 2009; Latour, 2004a, 2005a). In his book *Carbon Democracy*, for example, Mitchell (2011) suggests that we ‘think of democracy not in terms of the history of an idea or the emergence of a social movement, but as the assembling of machines’ (p. 109) – that is, in his case, as sociotechnical mechanisms that have intertwined democratic politics with fossil fuels and imperialism. In contrast to conceptions of democracy that highlight the role of popular movements in generating collective ‘power to’ (Arendt, 1958; Habermas, 1996), or those that emphasize the role of state institutions in legitimating authoritative and coercive ‘power over’ (Weber, 1978: 53–56), accounts of material democracy focus

on tracing disciplinary or productive power as it circulates through material and epistemic practices (Barry, 2001: 5–6; Foucault, 1978, 1980; Irwin, 2008: 589–590). Accordingly, they emphasize the need to ‘open up’ established concepts, identities, and issue framings (Stirling, 2008). They focus on the articulation of political issues and objects, rather than public efforts to respond to them (De Vries, 2007: 807; Marres, 2007).<sup>4</sup> And as Durant (2011: 20) notes, they tend to view established boundaries as something to be challenged through politics rather than as a resource for politics (Irwin, 2008: 590–592; Jasanoff, 2003; Latour, 2004a: 93; Law and Singleton, 2013: 500–501; Wynne, 2003, 2007).

Given these emphases, some theorists of material democracy find support in Dewey, who argued that ‘democracy is more than a form of government; it is primarily a mode of associated living, of conjoint communicated experience’ (Dewey, 1916/1980: 93; see Bennett, 2010: 100–104; Latour, 2007: 814; Marres, 2007, 2012: 40–46). For Dewey (1927/1954), democracy ‘must affect all modes of human association, the family, the school, industry, religion’, and of course science and technology as well (p. 143, see also p. 149). Accounts of material democracy might also find support in some poststructuralist versions of radical democracy, and especially in the notion that ‘democracy is not a form of government or set of institutions but rather a moment marking the practice of politics itself’ (Lloyd and Little, 2009: 3; Rancière, 1999: 99).

A key element of material democracy, although not advocated by all the authors cited here, is the political inclusion of nonhumans. Latour (1993), for example, famously advocates a ‘democracy extended to things themselves’ (p. 142, see also Latour, 1988: 211). He even claims that the political exclusion of nonhumans will soon seem as strange as the exclusion of ‘slaves, poor people, or women’ (Latour, 2004a: 69; see also Bennett, 2010: 99, 108–109; Harman, 2009: 89, 102; Irwin, 2008: 593; Papadopoulos, 2010: 185–187). Similarly, Harman (2009) uses the words ‘democracy’ and ‘democratic’ to mean ontological equality among humans and nonhumans (pp. 34, 35, 66, 72, 77, 88–89).<sup>5</sup> It is worth noting, however, that cautious posthumanist accounts do not reject all distinctions between humans and nonhumans. Instead, they argue that such distinctions are historically contingent and should be empirically documented rather than assumed, and that human–nonhuman distinctions are best understood as continuous along a spectrum of capacities rather than as dichotomous (Callon and Latour, 1992: 356; Latour, 2005b: 76; Marres, 2012: 1–5; Sayes, 2014: 142–143).<sup>6</sup> This point is important because it opens a space for theoretical and empirical research that considers the role of already constructed, currently noncontroversial subjects and objects – established facts, machines, identities, institutions, concepts, and so on – rather than restricting our attention to sites of controversy where boundaries are in flux.

Material democracy is closely intertwined with a conception of politics that Latour (2007: 818), drawing on Stengers (2005), calls ‘cosmopolitics’. Similar notions include ‘object-oriented politics’ (Marres, 2007; Marres and Lezaun, 2011) and ‘ontological politics’ (Mol, 1999; Woolgar and Lezaun, 2013). Many authors writing in this vein conceive of ‘politics’ as any action or event that contributes to the constitution of a common world (Braun and Whatmore, 2010: xxii; Callon et al., 2009: 68, 107–152; De Vries, 2007; Harbers, 2005: 266–69). Latour thus suggests that we ‘redefine politics as *the entire set of tasks* that allow the progressive composition of a common world’ (Latour,

2004a: 53, original emphasis; see also Latour, 2007: 813). From this perspective, all research is also a form of politics, because ‘to study is always to do politics in the sense that it collects or composes what the common world is made of’ (Latour, 2005b: 256).<sup>7</sup> Indeed, according to Harman’s (2009: 89) reading of Latour, ‘All reality is political, but not all politics is human’.

These claims suggest a spatial-conception of politics, because they emphasize the question of where politics occurs – namely, everywhere and anywhere that humans and nonhumans mutually constitute a common world – usually without specifying any distinctive activities associated with ‘politics’. Studies on cosmopolitics, ontological politics, and related concepts tend to conceive of politics with respect to its outcomes – the objects, issues, actors, and collectivities constituted through politics – rather than the particular qualities of political activities.<sup>8</sup> Moreover, these studies implicitly give priority to the analyst in determining the meaning of politics, insofar as they say little about whether actors themselves consider particular actions or events ‘political’ or part of ‘politics’.

These ANT-inspired, posthumanist conceptions of politics serve the purpose of articulating and promoting material democracy in various ways, only a few of which can be mentioned here. First, these conceptions of politics facilitate detailed empirical studies of how political subjects and material objects are constructed and enacted through socio-technical controversies. As ANT scholars have long argued, assuming a fixed ontological divide between humans and nonhumans makes it impossible to study how they shape each other in particular contexts, when boundaries between them have not yet been established (Latour, 2005b). Posthumanist conceptions of politics help show how science and technology often fail to produce accepted factual knowledge and instead generate contentious ‘matters of concern’, such as mad cow disease or genetically modified food, which become focal points of scientific uncertainty and political controversies (Latour, 2004b). They show how such controversies may go beyond conflicting interpretations of a single pre-existing reality and instead constitute multiple new realities.

Additionally, posthumanist conceptions of politics challenge modernist conceptions of both humans and nonhumans. They show that human agency is not entirely autonomous and self-determined, and that nonhuman nature is not best understood as inert material for human exploitation (Bennett, 2010; Marres, 2012: 108–109). In this respect, posthumanism promises more ecologically sustainable politics. By acknowledging our materiality, humans may learn to better cultivate our dependence on nonhuman nature.

Finally, by challenging teleological and scientific views of nature as a prepolitical foundation for morality and politics, posthumanist conceptions of politics potentially foster more democratic practices. The modernist divide between nonhumans and humans has long supported technocratic appeals to scientific authority in politics (Latour, 2004a). By proposing a more open-ended view of relations between humans and nonhumans, cosmopolitics may promote more vibrant democracies.

If we turn to the task of studying the politicization of science, the concept of cosmopolitics reveals certain shortcomings. First, attributing political agency to nonhumans potentially obscures questions of responsibility, because most nonhumans lack the critical self-consciousness and norm-responsiveness that responsibility requires (Krause,

2011: 312; Sayes, 2014: 141–142). As noted previously, ANT scholars usually conceive of agency in terms of material effects rather than subjective aims and purposes, thus attributing agency to anything that makes a detectable difference in something else (Latour, 2005b: 71). This approach usefully captures certain aspects of political activity, but studying the specifically *democratic* features of politics requires asking about the meaning of politics to actors themselves. One needs to know, for example, whether someone did not vote because they simply forgot, could not get off work, or wanted to protest the election (Hay, 2007: 74). More broadly, actors' purposes and self-conceptions are a key part of democracy as self-governance (Warren, 1999: 211–12).

Additionally, posthumanist conceptions of politics often suggest the possibility of politics without conflict – or more precisely, without subjective conflict among relatively self-conscious actors – which arguably makes it difficult to understand the politicization of science. Latour sometimes includes subjective conflict in his view of politics, as when he associates politics with the etymology of the word 'thing': something that 'brings together people *because* they disagree' (Latour, 2007: 815, original emphasis; 2005a: 22–23). But in his account of five phases in the trajectory of political issues, Latour (2007) includes two meanings of the term 'political' that do not seem to include subjective conflict. (Latour here uses the term 'political' rather than 'politics', but he does not say anything about the distinction, and he uses the noun 'cosmopolitics' to cover all five meanings of the adjective 'political'.) Latour's 'political-1' designates anything that modifies the collective by producing 'new associations between humans and non-humans', including 'the almost daily discovery of extra-solar planetary systems' (p. 816; see also Bennett, 2010: 98; Mol, 1999: 83). It seems that such new associations and discoveries do not necessarily involve political conflict or 'politics' in the sense of political activity. Similarly, Latour identifies the Paris sewage system and other 'vast and silent bureaucracies that rarely make the headlines' as 'political-5', because they used to be controversial and 'might reopen at any moment' (p. 817).<sup>9</sup> As suggested previously, if we say that such established institutions are always *already* part of politics, it becomes difficult to study how they may be politicized and thus *made into* a part of politics. But if we instead distinguish between 'politics' (noun) and 'political' (adjective), we can say that established institutions may be 'political' in the sense of having political origins, implications, and effects, but they are not (at the moment) sites of 'politics'.

### *Democracy as collective self-governance: science may become a site of politics*

In partial contrast to the preceding section, some STS scholars suggest a view of democracy as collective self-governance, thus emphasizing the etymological meaning of 'democracy' as a form of rule. Elements of this view appear in STS research on science policy, science advice, and various forms of public engagement in sociotechnical controversies, including studies on social movements, patient advocacy groups, and lay deliberative forums (Callon et al., 2009; Guston, 2000; Hess et al., 2008; Irwin, 2008; Jasanoff, 1990; Pielke, 2007). As I conceive it here, this view of democracy differs from modernist liberal-democratic conceptions that relegate citizens to the occasional task of voting for



elected representatives. Modernist views of democracy conceive of political representation according to a juridical model of direct correspondence between representative decisions and either pre-existing public will or elite knowledge (Brown, 2009: 6–7, 65–93). This section, in contrast, assumes a nonmodernist, constructivist conception of democracy as self-governance, according to which representation and participation should continually shape each other. Representative claims thus help constitute the same publics they represent (Latour, 2004a; Urbinati and Warren, 2008).<sup>10</sup> This view of democracy is not immune to ideological cooptation or the absorption of participatory politics into disciplinary regimes of governmentality (Pestre, 2008). But it conceives political representation as potentially enriched by institutions and practices that facilitate diverse modes of public engagement, especially those that empower disadvantaged citizens and hold elites accountable. From this perspective, it is not necessarily undemocratic that some citizens have more persuasive power than others in public deliberation. Nor is it necessarily undemocratic that public officials have greater institutional power than ordinary citizens. As long as such hierarchies serve public interests and do not involve hidden forms of domination, they may be democratically legitimate.

No less than posthumanist conceptions of democracy, this view of democracy as self-governance finds support in Dewey. Dewey repeatedly argues that most people aspire to some degree of purposeful, broadly ‘instrumental’ control over the conditions of their lives (Dewey, 1916/1980: 15; Dewey, 1927/1954: 12). Dewey’s conception of democracy thus includes not only a flexible egalitarian culture but also state institutions that represent public interests. Whenever people seek to address the public effects of private interactions, Dewey (1927/1954) writes, ‘suddenly the gears of the state are in mesh’ (p. 28, see also pp. 72–73; Brown, 2009: 140–146; Gomart and Hajer, 2003: 57). And ‘the state’, for Dewey, is not a fixed transcendental entity but an evolving set of institutions and their associated publics, constituted through citizen engagement, with the potential to enforce public decisions through the exercise of power.

This view of democracy as self-governance may be promoted by diverse conceptions of politics, and here I sketch only one such conception: politics as purposeful activities that aim for collectively binding decisions in a context of power and conflict (Hay, 2007: 65–70; Waldron, 1999: 102; Warren, 1999: 218). This is an activity-conception of politics, and in some respects it is analyst-focused because it specifies minimal conditions of what should count as politics in a democracy. But it is also sufficiently open-ended to serve as a provisional conceptual lens for a dialogical approach to empirical research on how actors understand politics in particular contexts. It includes four elements: power, conflict, purposeful activity, and the aim of collectively binding decisions.

*Power* is a key element of most conceptions of politics, but there are many conceptions of power. Many scholars today lump together the concepts of politics and power, equating politics with the exercise, possession, or circulation of power (Kleinman, 2005: 10). They often seem to echo Foucault (1978: 93–94, 1980: 131–33), who showed how power pervades all knowledge-making practices. But even though Foucault often revised his conceptions of politics and power, he usually avoided collapsing them together (Sluga, 2011: 72–74). Moreover, if we equate politics and power, we lose an effective way of distinguishing situations where power is contested from those where it is not (Laclau and Mouffe, 1985: 152–153; Warren, 1999: 214–215). Differences in power may

be uncontested because those with less power (students, laboratory staff, constituents of elected representatives) assess their situation in a relatively critical and self-conscious manner and deem it legitimate. But if custom or ideology blinds subordinate groups to alternative possibilities, then uncontested power relations may be illegitimate. Such situations often involve latent conflicts, consisting of unvoiced tensions, passive aggressions, feelings of alienation, and the like. Friedan's (1963) *The Feminine Mystique*, for example, described a 'problem that has no name', something that 'lay buried, unspoken ... a strange stirring, a sense of dissatisfaction, a yearning that women suffered in the middle of the twentieth century in the United States' (p. 1). Warren (1999) suggests the term 'suppressed politics' for these kinds of power relations in which conflicts are latent (p. 215). From this perspective, the women's movement activated and publicized latent conflicts, thereby *politicizing* the power relations between men and women, transforming the household into a site of politics.

This example suggests that an agent-centered conception of power ('power over' and 'power to') can be seen as complementing a systemic or productive view of power as constituting both agents themselves and their sociotechnical conditions of action (Clegg, 1989). Indeed, Foucault himself argued that techniques of disciplinary power and governmentality have transformed but not replaced state institutions of sovereign power (Foucault, 1978: 144, 1980: 92–108, 1991: 101–102; Pels, 1997: 706–709). Similarly, Law (1991b) explains that power can be both a capacity that is stored or exercised by individual agents *and* an effect of widely distributed heterogeneous networks. Having said that, politics as conceived here especially relies on an agent-centered (but not modernist) view of power for mobilizing citizens, resolving collective action problems, enforcing decisions, and 'getting things done' (Mansbridge, 2012: 4–5). Productive power is certainly 'political', but it is not necessarily 'politics'. Politics encompasses only a small subset of power relations. Even though power may be pervasive, politics is not, because politics involves both power and conflict (Brown, 2006: 79–80; Sluga, 2011: 74; Warren, 1999: 214–215).

*Conflict* is also a familiar element in theories of politics (Mouffe, 2005). Woolgar and Lezaun (2013), for example, define ontological politics as 'the encounter and conflict between different ways of being in the world' (p. 334). And for Pestre (2008), '[t]he central function of politics is to learn how to live with conflict' (p. 106). Of course, socio-technical controversies involve many kinds of conflicts. Within a particular laboratory or research network, scientists may conflict over whether the available evidence supports a particular theory. They may conflict over the appropriate standards for making such judgments. They may conflict over personnel decisions, authority relations, research agendas, funding priorities, and other aspects of the social organization of science. Conflicts of each type may be resolved through power-laden persuasion and negotiation, but to the extent that participants enjoy realistic possibilities of exit and face little need to reach mutually binding decisions, these conflicts alone do not make science into a site of politics as conceived here (Warren, 1999: 221–222).

The possibility of exit is always constrained by factors ranging from financial worries to Kuhnian paradigms. But scientific institutions and the scientific 'mode of existence' have provisionally established norms that, except in contexts of deep controversy,

allow practitioners to make everyday practical distinctions between science and politics (Fuller, 2002: 188–89; Gieryn, 2008: 95; Latour, 2013; Pels, 2003: 146–50; Pestre, 2008: 113). While many such norms are contextually specific, they often require that when researchers persistently fail to reach agreement they should go their separate ways and each pursue their own ideas. Participants at an academic conference, for example, generally face little pressure to reach binding agreements. And while various concerns may prevent scientists from disputing a claim they find unpersuasive, practitioners can recognize their silence as a departure from scientific norms. Star and Griesemer (1989) thus note that ‘allies enrolled by the scientist must be disciplined, but cannot be *overly-disciplined*’ (p. 407, original emphasis). The notion that scientists should be able to pursue their own ideas without risk of excessive penalty is arguably what distinguishes a scientific conflict from a political conflict, and collegial relations from political relations. If the losers to an intellectual dispute retain realistic possibilities of exit, conflicts of opinion are probably best deemed nonpolitics. Of course, as noted previously, what counts as politics is a political question, and the process of defining a particular conflict as a matter of ‘scientific opinion’ rather than ‘politics’ may well be the outcome of ‘politics’ understood as power-laden conflict aimed at collectively binding decisions. But again, we should not conflate the results of politics with political activity itself.

*Purposeful activity* is also a familiar feature of various conceptions of politics (Hay, 2007: 65), and it seems especially important for a theory of democracy as self-governance (Stirling, 2008: 267; Warren, 1999: 223). This does not mean we need to accept modernist conceptions of individual autonomy, self-control, or mastery. As political thinkers like Machiavelli and Weber have emphasized, politics often involves unintended, unpredictable, and uncontrollable outcomes. Moreover, we can draw on ANT and posthumanism to conceive human agency as a locally contingent achievement, dependent on networks of allies that should not be taken for granted. And we can see human agency as entirely material, while still acknowledging that ‘the distinctiveness of human materiality as reflexive and norm-responsive is crucial to sustaining the sense of responsibility required for democratic citizenship and an ethical life’ (Krause, 2011: 312). Similarly, this conception of politics can draw on posthumanism to conceive of agency as a matter of degree: human babies and some nonhuman animals exhibit some but not all of the agential capacities of human adults, while inanimate objects (as far as we know) lack the reflexive capacities required for a view of democracy as self-governance by agents who *see themselves as governing* in at least some respects (Krause, 2011: 310).

Finally, the *aim of collectively binding decisions* is a key part of a conception of politics that serves the purpose of democracy as self-governance, especially in pluralist societies that have little prospect of reaching consensus on controversial issues (Mouffe, 2005; Palonen, 2006a: 181–186; Pielke, 2007: 22–38). As Stirling (2008) notes, despite the importance of efforts to ‘open up’ established power relations, processes of ‘closing down’ options and adopting a particular rule, standard, policy, or course of action remain ‘necessary, inevitable, and desirable’ (p. 284). Such ‘closing down’ may occur in part through diffuse cultural processes of institutional ‘commitment’ rather than ‘explicit, discrete, or even deliberate decisions’ (p. 265; Jasanoff, 2005: 21–22). Conversely, in

some contexts, expert dissent and societal disagreement may allow politicians to stage a moment of authoritative 'decision', such that 'politics becomes visible as politics' (Bogner and Menz, 2010: 907). In any case, democratic citizens who suffer injustice generally not only want their concerns to be recognized as 'political', but also for those concerns to be addressed by some kind of enforceable decision or commitment that improves their situation (Hay, 2007: 65). Funtowicz and Ravetz (1993) suggest a similar view of politics when they define 'post-normal science' as a dialog involving all relevant laypeople and experts that leads to creative solutions, 'which can then be *implemented and enforced*'. The alternative is that 'crude commercial pressures, inept bureaucratic regulations, or counterproductive protests will dominate, to the eventual detriment of all concerned' (p. 751, emphasis added). When citizens fail to establish and enforce collectively binding decisions, the result is not a lack of societal change, but the undisturbed power of elites to continue promoting their own narrow interests (Connolly, 2013: 40; Mansbridge, 2012).

Such collectively binding decisions might involve technical standards or artifacts rather than laws or regulations. They might be made by actors other than those directly involved in the political activity in question, such as when a science advisory body tries to influence public policy makers. They might also be a long way off, and they might be only one aspect of a general vision or goal that shapes and gives purpose to political activity, what Dewey (1916/1980) calls an 'end-in-view' (pp. 112–113). In this respect, not all political activity involves formal decision making or the direct use of authoritative power. But without at least some indirect, aspirational connection to instrumental goals and enforceable decisions, politics easily becomes narcissistic and self-defeating. Indeed, activists might say it is 'just talk'.

In addition to supporting a view of democracy as collective self-governance, this conception of politics has several advantages for studying the politicization of science. First, it highlights the normative stakes of politicization. According to this view of politics, politicizing science amounts to contesting established power relations within scientific institutions and practices, which is a precondition for democratizing those power relations (Fuller, 2002: 277; Guston, 2004). Homes, workplaces, and laboratories, for example, become sites of politics when people persistently and effectively contest their associated power relations. They become nonpolitics when such contests are either suppressed or resolved in favor of relations based on routine, custom, intimacy, collegiality, or consensus. Some artifacts 'have politics', but like people who 'have an illness' or 'have fun', most artifacts do not have politics all the time. Many artifacts 'had politics' and could again in the future. Of course, once something has been politicized, people are unlikely to see it anytime soon as essentially incontestable. But without actual contestation, according to this view, there is no politics. This view of politics thus allows one to 'see how politics can be a pervasive potential of every social relation without identifying every social relation with politics' (Warren, 1999: 223; see also Barry, 2001: 7, 16; Hay, 2007: 78–87; Schmitt, 1932/1996: 37; Turner, 1989: 555–56).

Second, this view of politics can help us avoid romantic conceptions of public engagement. In pluralist societies, politics is frequently the best way of resolving power-laden conflicts, especially if violence is the only alternative, but it is usually difficult and often

disagreeable. Politics involves unpleasant challenges to people's identities and interests, requires bitter compromises, and often compels people to engage with issues they dislike and live according to decisions they opposed. Indeed, one of the virtues of this conception of politics is that it helps explain why most people dislike politics. A society that maintained all sociotechnical relations through politics, if it were possible, would be highly inefficient and unpleasant, and quite likely tyrannical (Durant, 2011: 706; Mouffe, 2005: 17; Warren, 1999: 216, 221).

Finally, although advocates of 'cosmopolitics' may find this conception of politics rather narrow, it is broader than conceptions that limit politics to a particular sphere or form of activity. It accommodates both 'idealistic' conceptions of politics as public deliberation or popular resistance and 'realistic' views of politics as electoral competition or strategic negotiation. It is not restricted to any specific activities (voting, deliberating, advising, storytelling, marching, boycotting, hunger-striking, etc.) or institutional locations (legislatures, businesses, households, laboratories, advisory committees, etc.). In any case, a narrow conception of politics does not necessarily imply a narrow view of where politics can occur or what it can achieve. By the same token, there is nothing inherently radical or emancipatory about a conception of politics that encompasses all human and nonhuman relations. Nonetheless, the notion of cosmopolitics complements the conception of politics articulated in this section, insofar as the former focuses on the creation of political objects and issues, while the latter emphasizes democratic efforts to respond to them.

## Conclusion

Each of the conceptions of politics examined here (and this is obviously not a comprehensive account) has served important purposes. Those purposes are best understood with reference to their intellectual and political contexts. Efforts to debunk scientism with the claim that science is 'essentially political' have apparently outlived their usefulness. It also seems that today it does more harm than good to try to avoid so-called a priori commitments by relying solely on actors' conceptions of politics. But depending on one's goals, each of the conceptions of politics considered here may continue to animate valuable research.

In any case, it seems prudent to avoid the widespread academic tendency to valorize 'politics' as such and, when in doubt, to endorse the politicization of all human and nonhuman relations. It is possible to acknowledge the many nonhuman forces and entities that are relevant for politics, and in that respect properly called 'political', without insisting that we expand our notions of political activity to include any and every politically relevant thing or event. Like other spatial-conceptions of politics, a view of politics as everything that affects the common world tells us little about what political activity might entail. More limited activity-conceptions, in contrast, can help clarify and facilitate contests over what counts as politics in particular contexts. In the end, however, any conception of politics will be more fruitful for studying some issues than others, and different conceptions will illuminate different aspects of the same issue. The main point is that efforts to understand and shape the politics of science may benefit from more careful attention to alternative conceptions of politics.

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## Notes

1. This essay is largely consistent with my discussion of 'how science becomes political' in Brown (2009: chap. 8), but the latter does not make the distinction, key to this essay, between 'politics' (noun) and 'political' (adjective).
2. In Kantian philosophy, the term 'a priori' applies to either logically true statements or transcendental categories of understanding, not social or political theory.
3. Some might distinguish the terms 'inevitably', 'intrinsically', 'essentially', and so on, but the authors in question use them as synonyms, so I will too.
4. As Marres (2007) rightly notes, 'This should not be taken to mean that we should now focus on practices of issue formation *instead* of those through which publics engage with issues' (p. 772, original emphasis). But that is what many studies of material democracy or ontological politics seem to do.
5. Harman has said that he was perhaps 'a bit careless in the manuscript [of *Prince of Networks*] in equating ontological democracy with political democracy, although I think that connection is there in Bruno's work' (Latour et al., 2011: 93).
6. The widespread view that actor-network theory (ANT) entirely rejects distinctions between humans and nonhumans rests on a failure to consistently distinguish between the useful methodological requirement to assume no such distinctions for the purpose of empirical inquiry, on the one hand, and the implausible theoretical claim that all such historically established distinctions should be ignored, on the other (Brown, 2009: 181–183; Sayes, 2014: 143).
7. Sismondo (2008), in contrast, helpfully distinguishes between activist research that amounts to a form of politics, on the one hand, and an 'engaged program' for which '[p]olitics has become a site of study rather than a mode of analysis', on the other (p. 21).
8. Latour (2013) offers a somewhat more specific conception of politics as one 'mode of existence' among others. Speaking 'politically', he argues, requires the 'curved speech' of mediating and translating among diverse actors, rather than the 'straight' talk associated with 'double-click' efforts to apply Science or Truth directly to politics (pp. 339–355; see also Latour, 2003: 161–162; Harman, 2014: chap. 4).
9. According to the terminology of this essay, Latour's political-1 and political-5 are 'political' but not 'politics', while political-2 (mobilizing and constituting publics), political-3 (government policymaking), and political-4 (citizen deliberation) are both.

10. Latour's account of representation echoes the constructivist view summarized here, but Latour also adopts Hobbes's juridical notion that representatives unite and replace the represented (Latour, 2003: 150; Latour, 2004a: 143–150; Latour, 2013: 339, 341; see also Brown, 2009: 172, 178–180).

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