

Notes

1 Participation as if Things Mattered

1. Good grounds for declining to answer this question of prime movers can be found in the metaphysical tradition too, as Graham Harman has demonstrated in his work on vicarious causation (2007). As I hope to make clear, the argument I am presenting here is not intended as an argument against metaphysics. It is rather to continue the project of broadening the category of metaphysics, in the spirit of John Dewey's pragmatism. Thus, this book can be read as proposing a version of 'a metaphysics of the crutch', one that posits that all entities are sustained in their existence by others. In doing so, however, it places special emphasis on types of entities that many metaphysicians have little patience for, namely information technologies, everyday devices and domestic settings.
2. One could be tempted to ask whether this is a new situation. But I would like to join other constructivists in noting that the fact that we can pose the question at all may be more significant than its answer. When a phenomenon is emerging, the question whether it is new or not tends to be literally an open question, one that cannot really be disentangled from this process of emergence. Only when it is well underway may we be able to answer it (or as the case may be, if it does not get underway after all). Which is why the question 'is this new?' seems misguided to constructivists: it supposes that we are dealing with a phenomenon that can already be disconnected from our descriptions of it.
3. This means that the social study of material participation as I outline it here is a continuation of post-Foucauldian analyses of the materiality of citizenship. As I will discuss in what follows, to adopt a performative perspective on material participation is to break with the understanding of materiality as a *latent* dimension of participation. But it is also a way of elaborating the idea that participation may be usefully studied from the standpoint of the apparatus (*dispositif*) that makes it possible.
4. This and the following sections draw on the introduction to 'Devices and Materials of the Public' (2011) that I co-authored with Javier Lezaun.
5. The literature on the material dimensions of public life is rich and marked by multiple influences, from Michel Foucault's famous studies of public architecture to the work of Richard Sennett on the role of costume in the public spaces of eighteenth-century France. Also, matter has been the subject of a number of recent anthologies and edited collections in the social sciences and the humanities (Coole and Frost, 2010; Latour and Weibel, 2005; Hicks and Beaudry, 2012; Braun and Whatmore, 2010; Marres and Lezaun, 2011). These collections testify to a diversity of influences informing object-centred studies of social and political life, from phenomenology to existentialism. In this book I follow a particular trajectory, one that moves from

pragmatism to ethnomethodology and actor-network theory (not necessarily in that order).

6. What I refer to here as the 'object turn' is closely related to other recent shifts in social and political theory, such as the move from epistemology to ontology (Law and Urry, 2004; White, 2000; Hacking, 2004) and performativity (Callon et al., 2007; MacKenzie et al., 2007; Butler, 2010). One could say that the object turn, like these other turns, is just one more attempt to explore and summarize the implications of a much broader philosophical movement, one that is associated with Nietzsche, Dewey, Wittgenstein and Foucault: the move from a representational to a constructivist perspective sensitive to technology and materiality, from a concern with the capacity of knowledge, language and ideas to convey a given reality to the question of how phenomena come into being, under conditions of the circulation of objects, texts, technologies and forms of action. In social studies, much of this work has drawn on political metaphors of performance, negotiation and battles of force, and perhaps for this reason it has taken some time for this approach to be introduced in theories of politics proper.
7. This reticence has mostly been latent, but may have something to do with the fact that a material perspective on participation does not only challenge the modern twentieth-century critique of objectivity in social science but also the age-old republican critique of materiality and the way it renders participation as conditioned by dis-entanglement (see below).
8. Another way of putting this is to say that these studies seek to challenge a purely instrumental conception of the role of objects, according to which material settings, technologies and objects present no more than a passive context or tool for public engagement, which does not determine the enactment of participation in its normative dimension. Habermas' (1962/1991) is still the most famous and sophisticated formulation of this position. But I am suggesting that authors that are often placed at the other end of the social theory spectrum, like post-Foucauldian theorists, in a way fit this description too.
9. Another well-known example is Brian Wynne's (1996) sheep farmers, who could be portrayed as 'lesser' – less competent, less relevant – participants in public controversy as long as their 'ontological' implication in the issues at hand went unrecognized.
10. Political theorists, and some philosophers of science, have questioned the very idea that materiality was ever forgotten in Western political theory (Frost, 2008; Stengers, 2010; Bennett, 2010). They have turned to classic authors like Thomas Hobbes to recover a material account of the body politic that has been 'there' in the history of modern political thought all along (Frost, 2008; Skinner, 2009). To the extent that materiality has indeed been 'edited' out of some modern theories of democracy, it was not exactly forgotten, but rather actively subdued or put in its place, as required by a philosophical schema based on the Cartesian duality of mind and matter (Frost, 2008). Here I am saying that it is equally important to recognize that empirically speaking the claim of the 'forgetting of materiality' gets us only so far. The idea mainly works for those empirical cases in which the material dimension of participation remains under-articulated in practice and theory.

11. Deliberative approaches stand in a complex relationship to informational conceptions of citizenship discussed in the introduction. The former are often presented as an alternative to the latter, but they share a number of assumptions, most importantly the idea of knowledge – being well-informed – as a precondition for adequate participation.
12. There is also a more general reason: much work in post-Foucauldian social studies and actor-network theory upholds the analytical distinction between the messy proliferation of stuff and socio-material attachments on the ‘ground level, and the preservation of modern institutional forms of science, democracy and so on, on another ‘higher’ level, as I will discuss in the chapters that follow.
13. These perspectives on participation can be variously characterized as ‘object-centred’ or ‘ontological’ (Leach et al., 2005; Lash and Lury, 2007; Marres, 2007; Michael, 2009). The latter term connotes a metaphysical approach, while the former suggests a post-metaphysical perspective. However, as I will discuss in chapters 2 and 4, the meanings of these terms are themselves opened up by the object turn, which is why I prefer the more minimal terminology for the moment.
14. I have used the concept of a democratic deficit myself in earlier work, but in a particular sense, namely in reference to the corruption of trajectories of issue formation. In what follows I will problematize the public in different, more positive terms. I will argue that the object turn invites a reformulation of problems of the public, namely as problems of relevance: when actors are already actively implicated in issues, but find themselves at a remove from platforms of issue formation, the question is how different modes of being involved in issues may or may not be rendered relevant *to one another*.
15. In addition, work in actor-network theory *empiricises* problems of engagement: it proposes that the challenge of fostering engagement, of enrolling social actors, is one faced by the actors themselves, as they go about their projects of building infrastructure, dealing with disease, governing cities and so on (Latour, 1988).
16. This kind of problematization of the public can also be seen as an artefact of economistic approaches to public participation. It seems in part a result of the proliferation of a particular method for the measurement of public engagement in the area of climate change, which is taken from the field of environmental economics: the measure of the ‘willingness to pay’ (Berk and Fovell, 1999). The popularity of this measure in public research on climate change can be made sense of in terms of the wider prevalence of economic formats in efforts at the societal ‘domestication’ of climate change (cap-and-trade, carbon budgeting, etc.). Such an economization thesis, however, is incomplete as an analysis of material participation. As I will argue in Chapter 3, we need to consider how devices of material participation allow for the *co-articulation* of economics, politics and science, as modes of articulation from each of these fields are linked up, so that it is not always clear which register will prevail over the others.
17. The term problematization is Foucault’s and in his work is associated with the idea of an epistemic field in which the parameters of discourse are set (what can be true, what can be false, what is the problem, what are possible solutions) (Rabinow, 2005). But the term also resonates with the classic

pragmatist concept of the problematic situation. Actor-network theory has interpreted the term as referring to as an operator of social, epistemic, material and technical processes of articulation (Callon, 1980; see also more recent work by Latour (2007) on matters of concern). In Chapter 5, I will add the term 'issuefication' as a way of emphasizing the normative variability of objects that become subject to problematization.

18. One can ask whether this 'passivity' model of the public counts as a successor to the famous 'deficit model' of the public (Wynne, 1992). However, as I suggested above, the problem of the dis-invested public is perhaps best understood not as a deficit thesis in general but as a particular reformulation of problems of literacy: in both problem definitions, the ability to act on issues tends to be correlated with access to information and resources.
19. These problems may further account for some of the hesitations on the part of social studies to fully extend the object turn to participation. As mentioned, it is striking how important representatives of the object turn in social theory have continued to privilege deliberative forms of participation.
20. This requirement, of course, has been challenged many times over in the history of social and political thought, from liberal political theory to Marxism and feminist thought. I will suggest that material participation, understood as a distinctive public form, only in some ways challenges this requirement of the dis-embedding of action from everyday material life, and in other ways fulfils it.
21. To account for the emergence of this claim in historical terms would require a book of its own, and here I am only arguing that an awareness of its historicity is important for its study as a contemporary form.
22. It is an open question whether this wider adoption and/or appropriation of the 'participatory agenda' in relation to science, technology and environment can be attributed to intellectuals and scientists associated with the science, technology and society movement. But it has in several cases threatened to reduce them to the Eliotesque exclamation: 'but this is not what we meant at all!' Here I will propose that, in response to this development, the ambivalent approach that STS has championed in relation to technology should be extended to participation.
23. This narrative, too, centres on the notion of a 'democratic deficit' associated with a politics informed by science and technology. This deficit has received different formulations, but Stephen Turner (2001) provides a useful one in his account of the 'problem of expertise for democracy': to the extent that science and technology constitute forms of power in modern societies, this is likely to threaten or undermine ideals of equality and inclusiveness in decision-making and social and political life more widely. The opening up of the domains of scientific knowledge production and technological innovation to the public is one notable solution to this problem, and has been advocated in social studies of science and technology. Helga Nowotny, for instance, has evoked the idea of a transition from the Platonist model of a king surrounded by wise men to the Aristotelian model of public deliberation on matters of common concern as symbolized by the Athenian Agora to point to a way forward for the governance of technoscience (Nowotny et al, 2001).

24. There are of course many other political forms associated with the commitment to render science more central to politics, including nineteenth-century socialism, twentieth-century social democracy and the cultural libertarianism of the 1960s. But scientific liberalism has been an especially predominant form in the Anglo-Saxon context, and it is one on which much of the political and cultural contestation of empiricism in politics concentrates today.
25. There has been an odd asymmetry in social studies of science and technology in this respect: while work in this field rejected the diagnosis of technocracy in relation to society, noting the proliferation of *socio-technical* systems, much of this work continued to frame its own contribution in terms of the fight against technocracy, thus upholding the democratization thesis.
26. Deliberative theories of public participation arguably have contributed to the persistence of this opposition between democracy and technology. While these theories frequently note the technological base of participation, the concept of deliberation also makes it possible to bracket the technological mediation of the public, by projecting the metaphor of the face-to-face exchange onto technologically mediated interaction (Warner, 1990). I will return to this point in Chapter 6.
27. Work in science and technology studies has argued that a concern with multiplicity is the logical outcome of treating the relations between, on the one hand, democracy, and on the other hand, science, technology and nature, as an empirical question. A discursive approach like Yaron Ezrahi's analysis (1990; 1995) of the 'civic epistemology' that can be found at the heart of twentieth-century liberal democracy still allows it to be treated in the singular. But an empirical approach requires us to recognize that relations between science, technology, nature and democracy are inherently variable (Jasanoff, 2005a). Much of the subsequent debate in STS has focused on the question of whether we should stick to a relatively straightforward empiricism, in which STS can deploy mainstream social science tools of comparative analysis, or whether we must adopt a more radical strategy and recognize the inherent performativity of all 'empirical' phenomena. In this book I adopt the latter approach, as I draw attention to the role of empirical technologies in the enactment of material participation, and the implications this has for our understanding of 'political ontology' – I return to this issue in chapters 4 and 5.
28. There are some problems with these labels: 'post-environmentalism' might be taken to suggest that it is possible to be 'done' with the externality of nature, and the concept of ethical consumption fails to capture that ethicization precisely breaks down the distinction between production and consumption, as it must inevitably refer to the broader trajectories of objects (Stassart and Whatmore, 2003). The category of behaviour change is a complex one, and I critique a disciplinary incarnation of the concept in Chapter 5. However, it seems to me the most promising of the three, as it might offer ways to develop further an experimental perspective on participation.
29. A focus on this site also means that my perspective on the role of non-humans in participation is effectively limited to objects that are part of

the domestic landscape, on the intimate level or more remotely. Indeed, to adopt a performative perspective on participation also means that an adequate account of the role of different objects, say animals or large natural phenomena like volcano eruptions (Clark, 2010; Bingham, 2006), require a different type of empirical and conceptual engagement, and cannot simply be subsumed under the general rubric of the role of non-humans in politics and ethics.

30. I here use the term 'setting' in a technical sense which includes objects, methods and technologies, without it necessarily being possible to make a neat distinction between the three (Garfinkel, 1967 (1984); see also Duhem, 1906 (1982) on experimental settings). This is also to say that participation is here constituted as 'environmental' in at least two respects: (1) as pertaining to environmental issues like climate change and (2) as accomplished through the modification of domestic environments.
31. The concept of device has a heterogeneous intellectual pedigree: it can be traced back to the Foucauldian notion of *dispositif*, but also to the work of Pierre Duhem who developed an important critique of the abstractability of theories and methods from experimental practice: from this perspective, to study devices of participation is to recognize the traffic between method, theory and setting as constitutive of the phenomenon in question (see chapters 3, 4 and 5).
32. This assumption has been famously critiqued in ethnomethodology, and it has also been elaborated in science and technology studies, where it has been argued that it is impossible to abstract experimental methods from the material settings in which they are deployed (Lynch, 1991; Latour, 1988). It can be traced back to the holistic philosophy of science of Pierre Duhem (1906 (1982)) who famously argued that the indistinguishability of concepts, methods and objects is a constitutive feature of experimental settings. In what follows I will apply this argument to experimental settings of participation. Duhem's argument also has implications for how we understand empiricist engagements with theory. There are different understandings of this project: for some it involves a move from normative to descriptive analysis, while for others it is about a shift from prescriptive to empiricist modes of valuation. However, Duhem can be taken to suggest a third version, which focuses on the relative indistinguishability of method, empirical content and theory in experiments. Applying this claim to a multiply appropriated research site like the environmental home, this raises a question about 'participatory' research. What is the appropriate division of labour between theory, method and data in these settings? This may be treated as an object of negotiation and contestation in which social research has its stakes.
33. To focus on devices is then also to reject any simple opposition between material and linguistic modes of involvement: a 'device-centred' perspective on material participation precisely enables us to move beyond the implausible opposition between linguistic and material forms of engagement. From such a perspective it is clear that the more 'material' forms of environmental engagement too, such as 'trying not to use one's hose pipe', clearly include informational components.

34. Mitchell's article on carbon democracy focuses on the power plant, the oil rig and the mining site as settings where the politics of energy is done. He seems to suggest that the supply side has more affordances for a participatory politics of energy than the demand site. A performative analysis of environmental homes, however, proposes a different distribution of politics, one in which the constitution of an environmental society in domestic settings is seen as a central component of the politics of energy today.
35. One important starting point and target of this project of re-specification is the ideal of 'involvement made easy', but Chapter 2 presents another starting point – the understanding of the material public as a 'community of the affected'.

2 The Invention of Material Publics: Returns to American Pragmatism

1. Earlier work in the sociology of science and technology on the role of non-humans in the enactment of participation has been primarily empirical in orientation, with some authors suggesting that the analysis of participation in its material dimension can or should principally take the form of a project of empirical re-description (Callon and Rabeharisoa, 2004; Lezaun, 2007). Here I am questioning whether this limitation to the empirical is possible: a concern with the materiality of participation, in and of itself, may implicate us in theoretical projects, which we do well to examine critically.
2. The politics of problem-solving is not unique to scientific liberalism (see, e.g., Unger, 2007), but the idea that politics may be *reduced* to problem-solving, and that this provides a way to keep out power and ideology may well be particular to it.
3. Among concepts of the community of the affected we could also include theories of affective politics developed in recent cultural theory (Thrift, 2008; Terranova, 2007; Blackman, 2008). Such 'post-emotive' conceptions of the public propose to understand the mobilization of publics in terms of the quick and intense propagation of feeling through a population that sensationalist media make possible, in a quasi-epidemiological way. Importantly, the rise to prominence of such affective publics is often traced back to precisely the period in which the pragmatists wrote their books about democracy in the technological society, the 1920s, and indeed, to these very works, insofar as they also discuss the new opportunities provided by mass media for the instant proliferation of passions and the creation of sensations, and relatedly, the increased possibilities for the manipulation of public sentiments, and their deployment for partisan purposes. (Walter Lippmann, moreover, holds a special place in this history as a member of the American national public propaganda committee during the First World War.) This affective public may arguably be understood as a technologically mediated version of the crowd. I have decided to exclude this community of the affected from consideration here, as it opens up a very different set of problems of the public than the ones I will focus on. The biggest problem of affective publics is arguably that of their 'overaffectation', an unsustainable, unproductive form of engagement in which mobilization does not translate

into action. By contrast, the public problem of relevance that I will discuss highlights almost the opposite situation: the problem that public engagement requires significant investment from social actors in complex issues, to which there can easily seem to be no point from the standpoint of the public.

4. A related problem is that of descriptivism or sociologism. Studies that profess to merely describe the techniques, objects and architectures that come into play in enactments of publics are susceptible to a particular suspicion: by documenting the role of technology in the organization of publics, they may implicitly subscribe to the 'technicisation' of publics, as a development that seems characteristic of advanced liberal, mediatised societies (see Chapter 1). Furthermore, there are some intriguing crossovers between classic liberal theories of democracy and constructivist concepts of the public developed in science and technology studies (STS) and related fields: Isabelle Stengers' cosmopolitical proposal, for instance, draws on elements of the classic liberal philosophy of Popper, such as his concept of reality as resistance (recalcitrance), and the notion that if we want to theorize politics, we must study scientific controversy.
5. A different version of this argument has been put forward in discussions about politics in science and technology studies. Here it has been argued that the ascription of politics to science and technology may result in 'emptying out' the category of politics, insofar as politics must now be said to be occurring in all sorts of places, from laboratories to the GP's waiting room, and if politics can happen everywhere, it loses its distinctiveness (Harbers, 2005; De Vries, 2007). More generally speaking, as Frank Ankersmit (1997) has also argued, the un-bounding of politics is often taken to signal its de-politicization (for a contrasting view, see Beck's writing on the becoming unbound of politics (*Entgrenzung*)). In this chapter, I focus on the concept of the public, and the issue of *its* relative uncontainability – something which I agree requires a different way of thinking about the public, but one which I argue has *already* been developed by John Dewey and Walter Lippmann.
6. As I suggested in chapter 1, we could posit that there is a 'deficit model' (Wynne, 1996) that is particular to the material public. In this case, the model would not focus so much on cognitive abilities, but rather on the failure to take responsible action. This might also be taken to imply that the understanding of the public according to a 'deficit model' is a more general phenomenon than suggested by critiques of it in the social studies of science and its publics: the public is all too frequently defined in terms of its shortcomings, whatever these may be.
7. This concept can be traced back to the pragmatist notion of the problematic situation, as I discuss below, and is a central concept of early actor-network theory (ANT) (Callon, 1980) and more recent incarnations (Latour, 2005b). To apply the concept to a theoretical category like the public is to use it in a different way than ANT: ANT tends to account for problematization as an operation on empirical relations. I turn to the issue of problematization as an empirical event in Chapter 4.
8. Not coincidentally, the currently available version of *The Public and Its Problems* (1991 (1927)), features a review from the Whole Earth Catalog on the back.

9. In her case: between gender theory, post-modernism, and theories of deliberative democracy. Mottier (2004) holds neo-pragmatists like Rorty partly responsible for the lack of exchange among these theoretical approaches, as he put the emphasis on very particular aspects of pragmatist writing, such as anti-foundationalism (see in particular Rorty, 1981, and also Festenstein, 1997). This obscures the resonance of pragmatism with, for instance, gender theory, and its positive conception of knowledge-making as embodied practice. Here I am making a similar argument: I too suggest that we need to move beyond an 'anti-metaphysical' reading of pragmatism to understand how it prefigures various positive, object-centred concepts of the public: materialist, proceduralist and post-instrumentalist. I also agree with Mottier that the relational ontology developed by the pragmatists is particularly relevant if we return to pragmatism to retroactively enact encounters between such different approaches. More generally speaking, discussions of pragmatism rarely consider the conceptual resonances *between* the different twentieth-century theoretical traditions that draw on it, though for an important exception see Bernstein (2010), on pragmatism as a site of encounter between analytic philosophy of language and deconstructivism.
10. In this respect, American pragmatism may also be said to prefigure experimental concepts of ontology that have been developed in social studies of science and technology – in the work of Bruno Latour, Annemarie Mol and John Law among others. However, whereas Dewey made experimental ontology a central proposition of his theory of *democracy*, this recent work in STS has been more concerned with the *sub*-political effects of material intervention. I will discuss this in more detail in the chapters that follow.
11. See Muniesa (forthcoming) for a discussion of Dewey's dynamic concept of ontology and his attempt to think ontology in-and-as action. Importantly, however, Dewey's definition of the public highlights the practical necessity of action, rather than action itself – which in turn can be taken to mean that Dewey has also pre-emptively addressed a critique of ANT, that of presentism (Fraser, 2008). Dewey's ontological dynamic of problematization is *not* quite a dynamic of actualization.
12. This conception of the public arguably places Dewey in the liberal tradition going back to Locke: As the American political theorist Tracy Strong (2009) has suggested, Locke and others in the liberal contract tradition were precisely concerned with the problematics of 'material entanglement': the contract theory of political community is an attempt to resolve this predicament, according to which we are self-enlaved as long as we do not realize the consequences of our implication in wider material entanglements.
13. This is how Dewey defines the problematic situation in his essay on the practical character of reality (Dewey, 1998 (1908), p. 130): 'Awareness means attention, and attention means crisis of some sort in an existent situation: a forking of the roads of some material, a tendency to go this way and that. It represents something the matter, something out of gear, or in some way menaced, insecure, problematical and strained.'
14. This is also to say that, while Dewey called his own philosophy instrumentalism, it is clear that he meant something quite different from the utilitarian brand of 'means-ism'. More generally speaking, Dewey's insistence that publics come into existence in disruptive events sets his account apart from

other consequentialist approaches to morality and politics, such as utilitarianism. Dewey *did* follow utilitarianism in defining the public in terms of consequences of action, but he certainly did not subscribe to its conception of politics as principally concerned with the maximalization of ‘agreeable’ consequences, and the prevention of disagreeable ones. Dewey appreciated the utilitarian insight that a focus on consequences helps us recognize ‘the empirical character’ of morality and politics. But he was extremely critical of the idea that it is possible to *calculate* future consequences of action, and of the distinction between means and ends on which such a calculative approach is predicated. Dewey rejected the utilitarian identification of politics and morality as concerned with the determination of the proper means that will help to realize *specifiable* desired ends, because he could not accept the instrumentalist carving up of the world into means and ends that this implied (Dewey, 2007 (1922), pp. 222–7).

15. In this respect, Dewey could be said to have given an ontological charge to the definition of the public as a form of stranger relationality (Warner, 2002).
16. To emphasize this aspect of Lippmann’s work is to complicate prevailing analyses of the Lippmann–Dewey debate, which tend to portray Lippmann’s contribution in mainly negative terms, as offering a *critique* of classic modern ideals of participatory democracy (Robbins, 1993; Ryan, 1995). In such accounts, Lippmann figures as the journalist-thinker who courageously argued in favour of a ‘reality check’ on concepts of the public. As Robbins put it, Lippmann argued that political philosophy had been complicit in furthering an ‘image of the public that is so hazy, idealistic, and distant from actual people, places, and institutions around us, that it can as easily serve purposes that are anything but democratic’ (Robbins, 1993, p. xi). I do not think that such a reading of Lippmann is wrong, but I think his work also contains elements of a re-constructive project: it develops a conception of the public that is attuned to conditions for its organization in technological societies. In this chapter, I concentrate on the ways in which Lippmann’s re-constructive account of the public brings into view a non-instrumental concept of the material public, though one which ultimately is also limited.
17. In this respect, Lippmann’s concept of the public also prefigures the concept of the ‘wicked problem’, the social problem which is marked by uncertainty and resistance to established problem-solving strategies (Rittel and Webber, 1973; Rayner, 2006). However, the pragmatists theorize these problems not in epistemic terms – i.e. in terms of the knowledge strategies that they require – but in ontological ones – i.e. as implying a particular mode of problem-involvement by material means.
18. As a corollary to this, Lippmann also emphasizes in *The Phantom Public* that the articulation of public issues requires insiders to transform themselves into outsiders: those who are familiar with the issues need to ‘go public’ if the issue is to receive a public articulation. For Lippmann, the production of confusion over who counts as an insider and who as outsider to an affair is a good indicator that the public articulation of an affair is underway.
19. Lippmann’s environmental specification of the public is then taken as an element in his critique of the myth of the ‘omnicompetent citizen’, his

- attack on a prevailing political imagination of the public which upholds an impossible standard of citizenship, assuming that everyday individuals possess political competences which not even full-time politicians can be assumed to have acquired, such as 'knowledge of the facts'.
20. In this respect, Lippmann's public prefigures a development that has been situated in a later historical period: that of the 'socialization' of citizens, and their (re-)specification as workers and household consumers in social research of the post-war period (Mort, 2006, p. 232).
 21. Lippmann and Dewey did propose solutions to this problem, but in formulating these, they let go of their definition of the public in material terms. Thus, later in *The Public and its Problems* Dewey reverted to a definition of the public as a social community, while Lippmann put forward a procedure of public consultation in the second half of *The Phantom Public* (for a discussion see Marres, 2005a). In both cases, however, these 'solutions' entailed a dissolution of their definition of the public in terms of the insider/outsider conundrum of the material public: Dewey's public as social community consists of insiders, while Lippmann's consultation procedure constitutes the public as consisting of outsiders.
 22. *The problem of relevance* is the title of a book by Alfred Schutz (1970). This book offers a socio-psychological account of relevance, and as such substracts some of the progress made by the situational philosophy developed by Dewey (see footnote 14 in Chapter 6).
 23. I derive the term from Alfred Schutz' concept of the isohypses of relevance, which I discuss in Chapter 6. The notion of an isoline of public relevance, moreover, echoes the concept of the uncertainty trough put forward by Donald MacKenzie (1990), though here again we should note that the pragmatists specify not an epistemic but an ontological dynamic of issue implication.
 24. It is also to say that, according to Lippmann, publics have little to gain from direct involvement, as the issues at stake are of no *intrinsic* interest to them. For him, the main reason that public involvement in political affairs is ultimately called for is that it alone is able to break deadlocks in political affairs: outside involvement is capable of generating pressures no amount of stakeholding can. This understanding of the problem of the public prefigures subsequent arguments in favour of expertocracy, as in E. E. Schattschneider's (1960) *Semi-Sovereign People*, for which Lippmann serves as a point of reference.
 25. In proposing such an empiricist understanding of ontology, the pragmatist approach is directly opposed to materialist assumptions, i.e. the idea that publics can be reduced to a homogeneous set of material relations that are constitutive of them. Relations of entanglement, instead, emerge continuously among entities that are unlikely to fit the straightjacket of an ontology that reduces the world to a set of 'basic building blocks'.
 26. In Lippmann's account the tenuousness of public-issue-relations also translated into erraticness on the part of the public. Taking the notion of the *phantom public* from Kierkegaard, he noted the disorientation and unreliability of publics in the technological society. While this problem is often approached today as a problem with public media, their sensationalism and short time-cycles, Lippmann and Dewey equally emphasized problems

related to the fact that in technological societies affectedness by issues *cannot* be instantaneous. It is this latter problematic on which I concentrate here.

27. I take this term from Steve Woolgar (2005), but use it in a somewhat different way. For Woolgar ontology does seem to have a 'trans-empirical' status: in his chapter on ontological disobedience, at least, he seems to accept the distinction between a narrow empirical register of instrumental reason and a more fundamental register of ontology. Here I am suggesting that pragmatist ideas about 'problem ontologies' help us to re-think the distinction between the empirical and the metaphysical (see also chapters 4 and 5).
28. Wolin has described how the adoption of a problem-centric approach by progressive US administrations from the early twentieth century onwards did not result in the type of enlightened, participatory form of rule that Dewey was committed to (Wolin, 2004b, pp. 518–19). In practice, Wolin suggests, Dewey's object-oriented politics came down to a form of technocratic government that idealized expert-driven forms of policy-making, dedicated to narrowly defined ideals of 'problem-solving'. Ezrahi has equally presented Dewey as a precursor of instrumental modes of governance. Dewey's belief in the traceability of 'harmful' consequences, he notes, involves a commitment to an empiricist ideal of accountability, i.e. a belief in the possibility of documenting events and 'locating the trouble' without getting caught up in confusing complexities involving interests, obscure motives and political games of assigning blame (Ezrahi, 1990). These historical analyses have also been contested: Diggins (1994) for instance notes how irritated Dewey was by the New Deal. Here I am arguing that the reduction of pragmatism to this history, i.e. its portrayal as a precursor of instrumentalist rationalism is to ignore some of its conceptual potential. To characterize pragmatism as a conceptual site of encounter, as I do here, is to emphasize that multiple intellectual traditions and commitments can be traced back to it.
29. This implies a very different normative agenda from liberal theories of global democracy and their concept of the issue-based community. In the pragmatist account, to make democracy revolve around issues is certainly not to strip it of the 'hard stuff': territory, ideology, culture and so on. A characterization of the public as a mode of socio-material entanglement renders the question of the role of environments, settings, habitats and habits more rather than less crucial. However, it *is* to question the assumption, which notions like territory may imply, that the specification of the public is already accomplished.
30. As I suggested in Chapter 1, this dynamic can be observed in relation to environmental publics today, with 'post-environmentalists' suggesting that environmental problems are at heart domestic, social problems. The problem of relevance implies a critique of this idea: it suggest that even if environmental issues are not simply 'out there', this does not mean that their successful internalization in social practice can be assumed. Just as it was a mistake to assume the successful externalization of environmental issues (to assume that there were problems of nature, that could be delegated to natural science), so it is a mistake to assume their successful internalization (and the subsumption of the category of the environment by that of economy, society, psychology, or a combination thereof). Rather, the

challenge is that of the articulation of relations of relevance when modes of issue-implication are both intimate and distant.

3 Engaging Devices: Everyday Carbon Accounting and the Cost of Involvement

1. Device-centred perspectives on participation, in this respect, can be understood as extending arguments from the philosophy and sociology of science to the study of participation, and democracy more widely: the idea of the abstractability of experimental method from practice was a principal target of critique of the holistic philosophy of science and, later, constructionist sociology of science (Duhem, 1906 (1982); Kuhn, 1962 (1996); Lynch, 1997; Latour and Woolgar, 1979). I have previously criticized science studies for its asymmetrical treatment of method in science and politics, as it combines a radical critique of the concept of scientific method with a fairly uncritical acceptance of procedural approaches to public participation. But device-centred perspectives on participation *can* be understood as contributing to a more symmetrical approach in this respect. Furthermore, the critique of the abstractability of method is also relevant to the study of participation in other respects. For instance, insofar as abstractability is also a feature of method itself – i.e. as something that method makes possible – this critique challenges wider investments in abstraction in theories of participation: it also touches upon the idea that public participation requires the dis-embedding of action and actors from the material entanglements of everyday life.
2. To foreground this focus on methodological instruments is to situate social studies of devices in a particular theoretical tradition: it is to present them as further elaborations of ideas from the holistic philosophy of science (Duhem 1906 (1982)) and ethnomethodological studies of experimental settings (Lynch, 1991; 1997). Others have presented Foucault's concept of 'dispositif' as an important precursor of devices studies (Callon, 2004; see also Gomart and Hennion, 1999). From the standpoint I adopt here, however, the Foucauldian precedent is less useful insofar as it invites a 'subpolitical' perspective on the politics of technology, i.e. an understanding in which materiality is understood as a latent feature of participatory or political arrangements (see Marres and Lezaun, 2011).
3. This formulation draws on the vocabulary of ethnomethodology. There are some notable connections between this methodology of social science research and contemporary environmental accounting: both are concerned with deployments of everyday settings in order to produce accounts of social life as part of social life (Garfinkel, 1967 (1984)). For more on this connection, see Marres, 2012.
4. 'The measure of a value a person attaches to a thing is not what he *says* about its preciousness, but the care he devotes to obtaining and using the means without which it cannot be attained.' (Dewey, 1955 (1908)) Dewey was of course not critical of discourse in general, but of a particular tendency in the expression of moral sentiment, one that ends up 'merely wishing' that 'things were different' (Dewey 1955 (1908)), p. 15).

5. There we argue that materiality has often figured as an under-articulated, under-formatted undercurrent in the performance of public participation, participation that does not involve much *explicit* reference to its material constitution.
6. Arduino is an open-source electronics prototyping platform that can be used to translate sensor inputs into visual outputs.
7. Device-centred perspectives can be said to 'de-naturalize' participation: to stress the role of equipment in the enactment of citizenship is to deviate from a focus on philosophical anthropology in classic democratic theory: a focus on the nature of man and whether belief in this nature is justified, i.e. in human capacities to develop citizenly abilities. This question was still central to early twentieth-century debates about democracy in a technological society, also to that between American pragmatists (Stears, 2010).
8. The Tea Light relies on information from realtimcarbon.org.uk, which provides carbon intensity data for the national UK energy supply, including whether it is above or below a given threshold. As such, this device arguably addresses a criticism that is frequently made of smart electricity meters (and carbon accounting more generally): that these devices rely on purely conventional measures of CO2 emissions. Carbon calculations are generally based on equations to extrapolate what amount of emissions are associated with energy use, and for that reasons fail to account for empirical variation. However, to the extent that the Tea Light itself constitutes a 'thought experiment', it too is limited by its speculative aspects.
9. Traweek spoke of 'the culture of no culture', in reference to scientific culture and its ability to erase its own particularity.
10. The term 'script' should here be taken in the literal sense, as referring to a dramaturgical genre, and not conceptually or metaphorically, as in social studies of technology as script (Akrich, 1992; Latour, 1992).
11. Chris Adams, 'Tea, Arduino and Dynamic Demand', blog post, 24 April 2009.
12. 'Doability' was introduced in the repertoire of the social studies of science and technology by Joan Fujimura (1987), who describes knowledge production, and more specifically the organization of cancer research, in terms of the formulation of 'do-able' research problems.
13. Classic feminist studies of domestic technology have also documented effects of 'co-articulation'. They showed how the framing of *technology* (in terms of 'labour-saving') had implications for the place of the household, and the housewife, in the wider *political economy*. But these accounts did not really consider the performative constitution of domestic subjects or action as at once technological, political and economic in nature.
14. The intersection of different activities has been described as a constitutive feature of mundane settings. Social studies of science and technology have offered a particular interpretation of everyday settings: they provide a space in which multiple, conflicting concerns, activities and values must be juggled or somehow brought into alignment (Murphy, 2006; Roberts, 2006; Michael, 2006; see also Deville, 2011).
15. 'Carbon-calculating data site Ameer scores seven-figure investment', *The Guardian*, 11 December 2008, <http://www.guardian.co.uk/media/pda/2008/dec/11/startups-carbon-footprints>.

16. Adam Vaughan, 'Why you don't want to overfill your kettle', 13 May 2007 http://thegreenguy.typepad.com/thegreenguy/2007/05/video_why_you_r.html
17. This requirement for participation of the dis-embedding of actors and action from everyday life has been problematized many times over in the history of political theory, as Javier Lezaun and I (2011) argue elsewhere: in the liberal, Marxist and feminist traditions. Furthermore, social studies of science and technology has argued that the aim and aspiration of participation in public affairs is precisely the problematization of restrictive framings of action and issues (Callon et al., 2009; Wynne, 2003; Irwin and Michael, 2003). Here I am arguing that wider societal efforts at the location of participation in everyday settings create a situation in which this problematization features as an effect of participatory technologies themselves.
18. These two arguments can be combined in forceful ways, as in the claim that locating environmental engagement in the private sphere is a way of externalizing costs: the costs of environmental change are taken off the balance sheets of public and corporate organizations and displaced into the informal economy of the domestic sphere.
19. Consideration of different logics of co-articulation is also crucial for understanding why device-centred perspectives on participation do not necessarily have to be a subset of device-centred perspectives on the economy (see on this point also Deville, 2011). Many device-centred studies of participation, it should be noted, have been developed by economic sociologists, or as an extension of market analyses (Cochoy, 2007; Lezaun, 2007).
20. 'Days 7 and 8 – Groundworks Finished', 15 August 2005, The Greening of Hedgerley Woods, <http://www.hedgerley.net/greening/index.php?paged=5> and Time for Mr MacGregor, May 13, 2008. The Greening of Hedgerley Woods, <http://www.hedgerley.net/greening/?p=86>
21. Prescott, Matthew, 'Personal carbon trading: The idea its development and design', Carbon Unlimited, RSA, interim recommendations, September 2007. A project like the RSA's on-line personal carbon trading platform fits Michel Callon's (2009) definition of an 'experimental market': it combines a market experiment with a stakeholder dialogue designed to enable 'learning' about the experiment. Over the 2 years that the online trading platform was active, Carbon Unlimited published a range of reports, debates and studies on the associated debate forum, identifying a range of emergent problems linked to carbon accounting. But a more general dynamic also requires consideration: accounting initiatives result in the proliferation of further accounts. This raises questions about the ways in which accounting practices (and not just market practices) may translate into the public performance of controversy.
22. *The Guardian*, 9 June 2008 <http://www.guardian.co.uk/environment/2008/jun/09/carbonfootprints.carbonemissions>
23. 'Days 7 and 8 – Groundworks Finished', 15 August 2005, The Greening of Hedgerley Woods, <http://www.hedgerley.net/greening/index.php?paged=5>
24. Carbon rationing initiatives then blur the public and the private in another way: they can be seen to *actively confuse everyday and professional modalities of engagement*. Engagement is here not only codified *as work*, rather than leisure, it is specified in relation to work, as in the case of the gardener

mentioned above. More generally speaking, exercises in carbon-based living tend to be performed by people who are also professionally active in environmental communities: many, though certainly not all, participants have more or less 'relevant' professional roles, as employees of environmental NGOs, building engineers, journalists, civil servants and so on. Indeed, this confusion of roles, in which those professionally involved with the environment adopt the role of 'everyday subjects', suggests that the notion of everyday life, too, may have to be understood as a experimental construct in these cases, one that has special affordances for intervening in this issue area. As noted, the confusion of roles between 'insiders' and 'outsiders', between those that are professionally entangled and those that may speak in the name of the public, has long been understood as an important aspect of public controversies (Lippmann, 1927).

25. Kerr, Andy and William Batty, 'Personal carbon trading: Economic efficiency in interaction with other policies', Report for the RSA Carbon Unlimited, June 2008.
26. Arguments about the 'hidden costs' of personal carbon accounting were taken up by Department for Environment, Food and Rural Affairs (DEFRA) in support of their decision against any significant investment in it.
27. Islington-Hackney CRAG meeting, Monday 5 January 2009. Note how this contrasts with a news media report of the same experiment: 'Using solar panels and a mixed bag of more rudimentary techniques – including reading by candlelight and converting the waste from her toilet into fertilizer – Jacqueline Sheedy has turned the former coal barge where she lives into a model of energy efficiency.' James Kanter, 'Local groups use peer pressure – and fines – to cut carbon emissions', *International Herald Tribune*, Tuesday, 16 October 2007, <http://www.iht.com/articles/2007/10/16/business/crags.php?page=1>
28. Group email, 30 June 2009.
29. Suitable Despairing, '37 Consequences of Going Green', Monday, 26 November 2007, <http://suitablydespairing.blogspot.com/2007/11/37-consequences-of-going-green.html> (accessed 30 April 2010).
30. Islington-Hackney CRAG meeting, Monday 17 June 2009.

4 Sustainable Living Experiments or a 'Coming Out' for the Politics of Things

1. The sociology of demonstrations presents a broader literature that draws on actor-network theory (ANT), post-Foucauldian sociology and related constructivist approaches in science and technology studies. What I referred to in the previous chapter as device-centred studies of participation are a subset of this literature.
2. To be clear, classic studies of public experiments like Shapin and Schaffer's (1989) already suggested that different modalities of publicity come together in the public experiment, such as social technology and literary devices. However, the main topic of theirs is and related studies remains modern experimental science, whereas the sociology of demonstration explicitly expands the study of public experiments beyond the world of science.

3. The privilege accorded to a few discursive formats of public action, such as public debate and deliberation, oddly, also returns in studies of science and technology, which have done so much to unearth the covert 'politics' going on in ostensibly 'non-political' places, like the laboratory (Callon and Rabeharisoa, 2004; Rose and Novas, 2004).
4. The discursive perspective developed by Shapin and Schaffer differs slightly from that adopted by Ezrahi and others: the former focuses explicitly on the deployment of literary, social and virtual *technologies*. As such, it prefigures devices perspectives in important respects (see below).
5. As such, this approach implies a move beyond what Collins and Evans (2002) have called the problem of extension. It does not conceive of participation as an optional feature that may or may not be added to existing epistemic and political processes. Rather, participation is always already going on in experiments, whether officially authorized as 'public participation' or not. I return to this point in Chapter 6.
6. Interestingly, Barry explicitly phrases this argument in terms of do-ability: It is because the experiment is able to seduce in this way, that it helps to make involvement doable – both for those intent on engaging audiences and the actors who are to be engaged. Barry argues that this is increasingly important in a time when public institutions must prove their validity by demonstrating that they are able to draw in crowds, and audiences can decide to stay away. But in view of the last chapter we can also characterize this focus on doability as a distinctively liberal concern.
7. There are a number of online portals for carbon and green living blogs: <http://uk.oneworld.net/section/blogs/carbon> ; <http://www.bestgreenblogs.com>; <http://greenblog.ir/en/> The number of blank green blogs on the Web may be taken as an indication that it is on its way to become a media format.
8. <http://thegreenguy.typepad.com/>, <http://greenasathistle.com/>
9. <http://www.hedgerley.net/>
10. <http://suitablydespairing.blogspot.com/>
11. <http://www.busymomsgogreen.blogspot.com/>
12. <http://noimpactman.typepad.com/>
13. Here I consider small-scale, individual living experiments, as they bring into relief the formal features of this type of experiment.
14. The term has also been taken up by John Dewey, and invokes the pragmatist concern with the experimental application of science and technology in social and everyday life to progressive purpose.
15. Such a characterization of the sustainable living experiment as a mode of inquiry also contrasts interestingly with more narrow definitions of it as a participatory device, which tend to characterize participation as in terms of behavioural change or economic action, and not the contribution to public inquiry.
16. More generally, feminist theorists have also designated 'experiments in living' as a site or genre for the 'reinvention' of politics. Here, the experiment in living figures as a topos for 'a politics of surprise, a politics that cannot be mapped out in advance [...], directed more at experimentation in ways of living than in policy and step-by-step directed change, a politics invested more in processes than in their results'. (Grosz, 2005). In

another resonance with feminist thinking, experiments in living can be approached as 'enactment of intimacy in public' (Berlant, 1997, see also Habermas, 1991 (1962), Warner, 2002). One could say that the experiment in living extends this modality to the material world, as it enacts intimacy with things in public. Finally, the genre also resonates with the domestic experiments of reality television, where intimacy makes possible a moral or ethical discourse of 'self-improvement', albeit of a potentially oppressive type (Wood et al., 2009).

17. As a site of environmental engagement, the experiment in living evokes societal reform movements of the early twentieth century, as for example the UK Garden Cities Movement, and their efforts to realize living environments in which people could reconnect with nature, in cities that are open to the skies and built from local materials (Carter, 2007).
18. Colin Beavin, *No Impact Man: The Movie*. <http://www.noimpactdoc.com/trailer.php>
19. Polly Nash, about the Ration Me Up Blog, 24 March 2009. The project is hosted on the Herne Hill Climate Action Network Website and according to this site was commissioned by the New Economics Foundation. <http://www.hernehillcan.org/rationmeup>.
20. Polly Nash, Day Thirty, final day, 24 April 2009, <http://www.hernehillcan.org/rationmeup>
21. Suitably Despairing, '37 Consequences of Going Green', 26 November 2007, <http://suitablydespairing.blogspot.com/2007/11/37-consequences-of-going-green.html>
22. In these accounts in the philosophy and sociology of technology, the moment of breakdown tends to be characterized in terms of an *accident*, but in sustainable living experiments this moment features as an *object of performance*. In experimentally removing or adding or modifying objects of everyday living, sustainable living experiments can then be said to produce *staged versions* of this pivotal moment in the philosophy and sociology of technology. They offer modest, artificial versions of 'breakdown' as a moment of articulation: selling the car, using a smart meter, cleaning with vinegar here constitute *deliberate* attempts to specify the socio-technical-material components that constitute everyday living.
23. <http://greenasathistle.com/green-listed/>
24. Polly Nash, Day Thirty, final day. Herne Hill Climate Action Network, 24 April 2009 <http://www.hernehillcan.org/rationmeup-blog/day-thirty-final-day>.
25. <http://greenasathistle.com/2007/05/17/hopelessly-fridgeless-day-78/>
26. Green as a Thistle, 'The Final Post', 29 February 2008, <http://greenasathistle.com/2008/02/29/the-final-post/>; <http://21stcenturymummy.blogspot.com/2008/03/robot-in-making.html>
27. In another departure from the breaching experiment, sustainable living experiments open up the horizon of a morally problematic material disorder (as opposed to the social order that is put on display in breaching experiments). Alternatively, it could be argued that sustainable living experiments open up an inherently *dynamic* space of socio-environmental, technological and-so-on change (i.e. they enact change and not order).

28. Adam Vaughan, 'Smart meters turn up the heat on those with money to burn', 14 June 2007, <http://www.guardian.co.uk/environment/2007/jun/14/energy.utilities>.
29. Adam Vaughan, 'Smart meters turn up the heat on those with money to burn', 14 June 2007, <http://www.guardian.co.uk/environment/2007/jun/14/energy.utilities>. Many experiments in sustainable living reported on the Web have a gender bias. It typically involves a male experimenter reporting on the behaviour of female household members, in effect treating them as experimental subjects, often without discussing issues of consent, or joking about it, or calling these household members collaborators when the relationship is clearly asymmetric. In several cases girlfriends are presented as reliable witnesses to the experiment because they have no interest in technical matters.
30. Anna Shepard, 'Energy for All', 25 August 2006, http://timesonline.typepad.com/eco_worrier/2006/08/energy_for_all.html
31. Nigel, 'Watt fun: smart meter games', 19 June 2007, <http://www.nigelsecostore.com/blog/2007/06/19/108/>
32. The Greening of Hedgerley Wood, 'Great Gadgets', 12 April 2006, <http://www.hedgerley.net/greening/?p=64> The BBC reported a similar view: 'When people can see how much energy and money they are saving when they switch off the TV rather than leaving it on standby, they immediately become more engaged in the whole issue of energy efficiency.' Mark Kinver, 'Bringing meters out of the closet', 18 May 2006, <http://news.bbc.co.uk/1/hi/sci/tech/4754109.stm>
33. One can wonder whether the environment is invoked as an 'external authority' in these practices, something which is not without consequences for the type of consumer-citizen being performed here. Where the postliberal citizen-consumer has been described as self-regulating, self-validating and consequently rather self-absorbed, green living experiments present us with an implicated subject, tied into the physical, economic and environmental assemblages of energy use.
34. In this respect, one could also say that sustainable living experiments present us with a different distribution of entanglement and disentanglement. However, such an account can take us only so far, as sustainable living experiments equally display logics of disentanglement: locating the experiment in the domestic setting, for instance, partly enables the disentanglement of energy issues from professional and bureaucratic networks.
35. More generally speaking, much work in ANT upholds the analytical distinction between the messy proliferation of stuff and attachments on the 'ground level', and the preservation of modern institutional forms of science, democracy and so on, on another, 'higher' level.
36. This kind of asymmetry in material or 'ontological' perspectives on engagement has been partly undone by recent analysis of socio-technical forms of participation. Some sociologists have emphasized the crossovers that may occur between projects of public engagement and practices of socio-material entanglement. Thus, Thrift (2008) and Lash and Lury (2007) have proposed that certain object-centred forms for engaging publics, such as the distribution of freebies and platforms for user-involvement in product

design, precisely disrupt the distinction between being implicated and being involved, between being caught up in something socio-materially speaking and being engaged in it as a social or political actor. However, in other respects, the latter accounts also can be said to maintain an analytic distance between socio-material entanglement and public involvement, insofar as they too present the former as an aspect of public involvement that remains underacknowledged in dominant framings of it.

37. This notion of a re-distribution of labour among heterogeneous entities is of course not alien to sub-political perspectives on the politics of things, to the contrary. Sociologists of technology, including actor-network theorists, have long emphasized that the normative effects that we might be tempted to ascribe to a given device or technological arrangement in fact have a much more diffuse provenance. We often say things like ‘computers dull our senses’ or ‘cars speed up our perception’, but actor-network theorists insist that such effects can only be adequately understood as produced in broader socio-materio-technical arrangements, composed of, so the language goes, ‘heterogeneous entities’: ways of talking, institutions, designers, and so on (Bijker and Law, 1992). Here I am exploring the extension of this kind of account to explicitly moral and political forms of action.
38. As I will discuss in the next chapter, I am not sure that the term reality is really appropriate in this context: as ontological politics posits the performative status of entities and relations, the existence of these things becomes relatively optional, while I take the term reality to refer to stable, inevitable or recalcitrant entities. I explore this further in the next chapter.
39. To complicate matters, sociologists of science and technology can be said to undertake a turn to ontology in *multiple registers*. These accounts, after all, involve both an empirico-historico claim – about the reconfiguration of worlds as a consequence of the introduction of new techno-scientific objects – and a shift of *conceptual* perspective – namely the commitment to recognize non-humans as constituent components of social practices, and to conceive of configurations of humans and non-humans as dynamic ‘all the way down’.
40. From this perspective, object-centred theory carries the promise of a plane not dictated by human presence in which volcanos bubble and leaves rustle, and accordingly the call for a device-centred account of object-ontologies may seem to draw us back into a ‘social’ space tainted by traces of human presence. Here I take issue with this equation of a performative perspective and a human-centred one.

5 Ecoshowhomes and the Material Politics of Experimental Variation

1. Advocates of non-humanist politics tend to criticize their opponents for falsely suggesting that non-humans must be like humans if they are to qualify as political actors. I agree this is a problem (indeed, if we consider how things are *equipped* with politics, we can understand better why these politics must be understood as specific to these things). However, I do not think this critique of anthropomorphism takes us far enough, insofar as

- it continues the debate on the plane of theoretical ontology (it lets itself be drawn into a debate about what capacities non-humans are 'naturally' endowed with).
2. The ontological turn has also been associated with other problems of democracy: earlier arguments in science and technology studies (STS) on the capacity of science and technology to re-order socio-technical and onto-political relations have been interpreted as diagnoses of democratic deficits of the technological society, as they highlight the limits of formal democratic arrangements to regulate social change in this context (Marres, 2005a).
 3. Some authors associated with ANT have however interpreted the focus on ontological politics as fitting with the wider intellectual project of the radical left to pitch politics against democracy.
 4. Callon and others have of course made significant contributions to democratic theory – no doubt, the most of which being the concept of the hybrid forum (Callon and Rip, 1991; Callon et al., 2009). Interestingly, however, even as this concept puts heterogeneous assemblages at the centre of democratic life, it upholds the format of public debate as the key form of democratic action (see for a discussion Marres, 2007). In some ways, this state of affairs is reminiscent of asymmetries in the philosophy of science, where irreconcilable differences between the accounts of scientific practice and of scientific forms were justified in reference to the distinction between the context of discovery and context of justification.
 5. Here I prefer to focus on the distinction between constituted and constitutive action, rather than 'sub-politics', as the former seems of wider significance to understanding ANT, and its solution to the problem that non-humans pose to concepts of normativity, not just in political sociology, but moral, political and democratic theory as well.
 6. There is also another, anti-constructivist way of dealing with this problem to which I alluded in Chapter 2. Proposals to extend participation to non-humans could be criticized for creating confusion between two distinct modes of involvement, which modern democratic theory has worked hard to keep separate: that between the physical state of 'being affected' by things, events or issues, and 'political' forms of involvement in political affairs. From this perspective, to include non-humans in democracy is to muddle two different modalities of being 'caught up' in issues: de facto material implication and de jure political or moral forms of participation. In Chapter 4, I offered a different interpretation of this confusion, namely as a deliberate effect produced in the performance of material participation. ANT has also directed attention to the practical impossibility of keeping physical and political involvement separate: its concept of 'enrolment', signals at once complicity and engagement (though ANT presents this confusion as a sub-political phenomenon, not as a performative and/or public accomplishment).
 7. This is the problem with approaching the politics of non-humans as a question of *theoretical* ontology. Because it specifies the normative capacities of non-human on the theoretical plane, it allows only limited appreciation of the empirical dynamics of non-human normativity.
 8. The sociology of demonstrations can be read as an elaborate critique of this understanding of the empirical base of democracy, but to my knowledge

work in this field has not specifically addressed what I call here the paradox of material democracy.

9. Experimentality is the name of a programme initiated by Bron Szerszynski at the Institute for Advanced Studies, University of Lancaster.
10. Some authors have questioned the usefulness of the home as a unit of environmental change (Hommels, 2005), proposing the city as the more relevant unit (infrastructurally, and policy-wise). This argument is in many ways convincing, but in recent years the ecoshowhome has nevertheless become one of the most publicized sites for its enactment (see footnote 23).
11. Sustainability from rhetoric to reality. The green refurbishment, part four 5 August 2009, by Phil Clark. <http://zerochampion.building.co.uk/2009/08/05/the-green-refurbishment-part-four/>
12. Social studies of 'buildings as technology', to use Wiebe Bijker and Bijsterveld's (2000) useful term, have precisely drawn attention to this usage of empirical devices to transform domestic environments into spaces for the enactment of technological innovation, societal change and public participation (see also Murphy, 2006). Bijker and Bijsterveld have analysed housing as a form of democratic technology in a study of women advice committees in the Netherlands, which sought to involve prospective users in the public evaluation of prototype social housing, giving them a say in home design. Other studies have also highlighted the connections produced between empirical research, democratic involvement and societal transformation in everyday settings, as in Ann Kelly's work (2011) on the use of 'experimental huts' in participatory research on malaria in Tanzania. David Oswell's (2008) study of the introduction of audio-visual media in the home in the twentieth century carefully documents the material adaptation of domestic settings to the demands of new technologies of publicity, with the introduction of the television requiring the rearrangement of furniture and wider living room arrangements. And in this case too the introduction of new technology in the home was accompanied by appeals to the public and democracy. Each in different ways, these studies then foreground the confluence between empirical equipment and the material transformation of everyday spaces into more or less 'ideal' settings of public engagement.
13. In this respect too, ecoshowhomes resemble sustainable living experiments and everyday devices of carbon accounting.
14. Sustainability from rhetoric to reality. The green refurbishment, part four 5 August 2009, by Phil Clark. <http://zerochampion.building.co.uk/2009/08/05/the-green-refurbishment-part-four/>
15. The Islington Green Living eco-retrofit was defined as a site of participation in a variety of ways. The United House website, for instance, reports on a number of initiatives of community engagement that it has undertaken in relation to this project. The public tour I took (on the invitation of a member of the the Hackney Carbon Rationing Action Group) included several people from the neighbourhood. Incidentally, the quoted slogan on carbon saving also suggests that the STS concept of the 'co-production' of technology and society may require empirical treatment these days.
16. Unlike some other devices examined in this book, environmental homes are explicitly analysed in the social scientific literature as instruments of material politics (see especially Guy and Moore, 2005).

17. Guggenheim has criticized the pre-occupation of social studies of architecture with building type, insofar as this pre-empts an appreciation of the building as a site and device of socio-technical *change*. In his account, a focus on the embodiment of types in buildings makes it difficult if not impossible to meaningfully analyse the transformation of buildings, such as refurbishments. I here develop a similar argument, though it seems to me that an ideal typical analysis of buildings *can* be extended to models of change, as in the case of Guys and Shove's (2000) analysis of energy and buildings. My analysis emphasizes the political significance of demonstrational buildings as sites for the *performance* of change.
18. Guy and Moore (2005) have drawn on theories of antagonistic democracy to conceive of the politics of buildings in terms of discursive contestation among different values of sustainability. In this chapter I focus on the re-conception of material politics in empirical terms, but place similar emphasis on the importance of antagonism to democracy (see for more explicit treatment of this, Marres, 2010).
19. Rowan Langley, A Londoner's back-garden renewable energy project, 9 January 2006 <http://uk.oneworld.net/article/country/826/>
20. Latour (1999) examines this issue of how successful ANT has been in transcending the epistemic trick of freeze-framing in the chapter on reference. Where he finds a solution in the concept of the chain of reference, I turn to concepts of variable normativity.
21. Variability is of course a classic feature of the modern scientific experiment: Carnap (1966) defines this form of knowledge in terms of the possibility of modulating the variables or 'settings' of the experimental set-up.
22. Robert Cohen, 'Green refurbishment the hard way', 26 January 2009. <http://zerochampion.building.co.uk/2009/01/26/green-refurbishment-the-hard-way/>
23. Such a performative perspective on change can be contrasted with non-performative understandings, as for instance that of Hommels (2005). If I understand her correctly, Hommels argues that because so much of socio-technical change is 'merely performative', we must inquire into the obduracy of socio-technical arrangements, i.e. their resistance to change. I am not unsympathetic to the approach, but think we should also take an interest in *the incredible spread of environmental demonstration projects and performances of environmental change themselves*. During a renewable energy conference in Trondheim in 2009, a presentation on Zero Emissions Buildings started off with the question: how do we get market penetration, with the presenter pointing out that 'at the moment we have only demonstrational projects. However, there seems to be something about the ecohome that makes it work *specifically* as a demonstrational device (something which has to do with its top-heavy equipment with empirical devices of monitoring and display). I would almost say: it is a demonstrational device.
24. A trace of such resistance to approaching ontological change as a performative phenomenon can arguably be found in Steve Woolgar's (2005) discussion of 'ontological disobedience' as opposed to 'instrumental disobedience'. Where the latter aspires to changing society, he notes, the former enacts a continuous mode of disruption, continuously sensitizing us to our dependence on social orders. The concept of change, it seems, is

here relegated to the domain of the instrumental. Though, as I argue here, there are good reasons for this association, it may also be important to resist it as well.

25. In this respect, we can also note that these projects draw on very different experimental traditions: on the one hand, the 'positivistic' tradition of empirical building research (Ganzevles, 2007), and on the other hand, the counter-cultural genre of the 'experiment in living' (Hawkins, 2006; and see Chapter 4).
26. Ontological variability can be distinguished from ontological multiplicity, in a number of ways. Accounts of ontological multiplicity in STS have relied on the ethnographic specification of the device. The account I develop here is less informed by ethnography and more by media-logical approach, or minimally, by following the proliferation of a trope. Furthermore, whereas multiplicity has been presented as somehow intrinsic to ontology, the normative variability I discuss here is at least in part an artefact of experimental settings.
27. Part of the reason for this distinction was probably that this work concentrated on the difference between an epistemic and an ontological understanding of science: its principal concern was the shift from representation to intervention, as the principal mode in which science operated. I am arguing that with the increased acceptance of intervention as technoscience's default mode of operation, the distinction between instrumental and experimental modes of intervention now especially requires our attention.

6 Re-distributing Problems of Participation

1. To my knowledge, the contribution of STS to the study of participation is not often characterized in terms of symmetry, in the sense of even-handed, empirical treatment of participation and non-participation.
2. Whereas work on the Public Understanding of Science sought to re-distribute knowledge (and ignorance) among science and its publics, actor-network theory (ANT) offered what we could call an ontological re-distribution of participation, focusing on the socio-material implication of everyday actors in processes of the domestication of science and technology.
3. The radicalization of the symmetry principle has, in some sense, been the bread and butter of science and technology studies, as most significant strands of work in this field, from the strong programme to ANT, claim to undertake such a radicalization (the strong programme proposed a symmetrical treatment of true and false science, and ANT applies symmetry to humans and non-humans). This circumstance makes my suggestion here somewhat tongue-in-cheek, but not entirely so – I am serious about the need for a re-distributive approach to problems of participation (see on this point also Hayden, 2007).
4. In particular, my presentation of the problem of extension unduly simplifies the work of Collins and Evans (2002), who have used this phrase in their prescriptive analysis of public participation. Among others, their approach is more sensitive to institutional flaws and shortcomings than

my account of this problem suggests. Nevertheless, it is true of their work too that it displays little or no interest in questioning the relevance of established platforms of political and epistemic process, and virtually no recognition of what I term here the problem of relevance. In developing this account, I draw on the critiques that Sheila Jasanoff (2003b) and Brian Wynne (2003) published in response to the extension article by Collins and Evans. However, where their critique assumed a theory of discursive politics as their framework, my version of the problems of relevance focuses on the socio-technico-material relations between settings of participation,

5. This work has a metaphysical target, in that it challenges the unitary ontologies that underlie conventional understandings of the role of science in society – the idea that objects are singular, and multiplicity is limited to human perspectives on them. In engaging with this issue of political ontology, this work must be differentiated from other approaches foregrounding multiplicity in the study of democratic government and governance. For example, work on multi-level and multi-sited politics and governance precisely limit their account to epistemic and political multiplicity, excluding ontological multiplicity.
6. The caption of this image reads: 'Although the perspectives of the world people vary in space and in time, every human concern falls somewhere on the space time graph. The majority of the world's people are concerned with matters that affect only family or friends over a short period of time. Others look farther ahead in time or over a larger area – a city or a nation. Only a very few people have a global perspective that extends far into the future' (Meadow et al., 1972).
7. Fraser (2009) provides a different lineage for relational relevance, tracing it back to the work of Alfred North Whitehead. In this concluding chapter, I am focusing on the broad outlines of an experimental, device-centred analysis of participation, and am not doing justice to the more subtle differences between different relational and topological approaches developed in sociology, geography and STS.
8. In *The Problem of Relevance* (1970), Schutz further develops his account of relevance, distinguishing between topical, situational and motivational relevance. In doing so, he explicitly takes issue with the pragmatist conception of relevance, which in his view relies too much on situational relevance: in his view, Dewey overemphasizes the ability of problematic situations to effectively constrain thought and action. Schutz may be right in criticizing the pragmatists for an instrumental over-determination of relevance. However, his retreat into a socio-epistemology of multiple zones and forms of relevance does not necessarily help matters. Schutz also deemed the pragmatist concept of relevance too environmental – something which I consider one of its big advantages, and as something that may well make up for its sin of over-determination: by attending to environmental devices, we may account for the determination of relevance as not an epistemic effect, but as an accomplishment of the setting.
9. Schutz (1964) distinguished between three zones of relevance: primary, secondary and tertiary, which loosely map onto the categories of human perspectives: it moves from that which is socio-ontologically proximate to that which is far removed in space and time.

10. Note how the definitions of citizenship and sustainability here nearly collapse into one another: both can be defined in terms of the effort to maximize the entities to be taken into account in social action, or conversely, the attempt to reduce the zone of the irrelevant.
11. To use the word 'event', here, is to highlight that an immanent view of relevance does *not* necessarily bring its accomplishment further under human control. A topological conception of social and political space has long been advocated in social and political theory more widely (Latour, 1993; Michael, 2006; Massey, 2005; Connolly, 2011). In STS, reliance on a Euclidian conception of space and time – on rigid notions of linear time and geometric space – has been held responsible for a certain misconception of problems of public engagement. In this field, the notion that technology should in principle spread unimpededly through social space – without encountering obstruction from social forces – has been associated with the persistence of Euclidian geometry: the static space-time grid, in which objects remain stable as they spread outwards along the x and y axes. And this idea of unimpeded technological diffusion, in turn, has suggested a conception of public engagement in extensionalist terms: it makes it seem that the diffusion of technology does not *depend* on the active engagement and commitment to their uptake on the part of social actors.
12. Nowotny here draws on a familiar trope in STS: the maximization of the entities to be taken into account is also the principal accomplishment, according to ANT, of dynamics of problematization, as in public controversies. Also, we should note that, in positing such an expansive ontology, Nowotny's account clearly differs from the version of post-environmentalism discussed in Chapter 2, which proposed a much narrower notion of lifestyle, or social-material practice, as limited to the here and now.
13. To focus on this question is to propose that relations of relevance emerge on a much higher level of specificity than Schutz's still largely scalar notion of the 'zones of relevance' (see note 9) allows for: relations of relevance are then viewed as co-emergent with entities.
14. A device-centred approach also implies a different account of the sources of variation in distributions of relevance. Schutz, following the tried and tested ways of post-Kantian philosophy, offers us the choice between either subjective or objective sources of variation – he traces differences among the spheres and isolines of relevances back either to differences among actor-types or to historical changes. A relational perspective, by contrast, directs attention to the 'in-between' or media res. Here, the establishment of relevance relations between issues and actors is a mediated process. From here it is only a small step to focus on the role of settings, technologies and objects in the mediation of these relations. We then locate variation in spheres in relevance at least in part in the devices that mediate and organize the relations between publics and issues.
15. This term draws on a move proposed by Steve Woolgar, namely the move from governance to governancing.
16. Such a device-centred conception of relevance makes it more dynamic. Schutz seemed to assume that topographies of relevance only change at the glacial pace of grand history. Whenever he talks of such changes, he adopts the solemn language that belongs to long-term, all-encompassing

- developments. In 'modern civilization', he writes, we have become, 'subject to everybody's remote control. No spot of this globe is more distant from the place where we live than sixty airplane hours. Electric waves carry messages in a fraction of a second from one end of the earth to the other; and very soon every place in this world will be the potential target of destructive weapons released at any other place' (Schutz, 1964, p. 28, 29).
17. The figure presents a cumulative view of the tags used by a sample of English-language green living blogs to categorize their own postings (including most of those featured in the preceding chapters). The tag cloud assigns different sizes to terms based on word frequency analysis. The visualization was made using software developed by The Digital Methods Initiative (DMI) at the University of Amsterdam. DMI has used tag clouds as a tool for what Rogers and others have termed cross-spherical analysis (Rogers, 2009; Schneider and Foot, 2005). This mode of analysis seeks to compare different web spheres, like blogs, news and web, and the relative resonance of terms in them, and as such implies and enables the symmetrical approach to relevance that I am discussing here. I discuss the connections between a device-centred analysis of participation and these digital methods elsewhere (Marres, 2012).
 18. This citation makes it clear that the idealization of participation, and the imagination of heterogeneous assemblies, does not happen in an ideological vacuum: it happens in the context of projects and debates regarding the 'withdrawal of the state'. In previous chapters, I have tried to show that this connection is an under-determined one, insofar as participation is used both as an opportunity to strengthen and to challenge this project.
 19. The invocation of public debate here entails the projection of perspectival space onto practice. Perspectival space, in turn, is closely associated with a geometrical rendering of political, social and cultural space, as in the appropriately named 'human perspectives' figure earlier. A geometrical concept of participatory space is rarely far away when the metaphor of public debate is invoked.
 20. Mapping controversies was the focus of the collaborative EU-funded project Mapping Controversies on Science for Politics (MACOSPOL) initiated by Bruno Latour, which brought together several international researchers including Kristin Asdal, Massimiano Bucchi, Cordula Cropp, Marieke van Dijk, Dominique Lindhardt, François Mélard, Valerie November, Richard Rogers, Albena Yaneva, Andrei Mogoutov and myself. <http://www.mapping-controversies.net>
 21. Consumer Focus, 'Reduce risks and increase benefits of smart meters', press release, London, 30 September 2009.
 22. Alastair Jamieson, Smart meters could be 'spy in the home', *Daily Telegraph*, 11 October 2009.
 23. The Googlecrawler was designed by govcom.org and the Digital Methods group at the University of Amsterdam, both led by Richard Rogers. I also discuss this case study in a forthcoming article called 'The uses and abuses in the social analysis of technology' (*Theory, Culture and Society*, forthcoming.)
 24. To suggest a topological analysis of public controversies is certainly not to propose something new: social studies of technology precisely invoked topology to develop a better appreciation of the controversiality of

technology (Mol and Law, 1994, Latour, 1993). And at least since the 1980s, controversy analysis has drawn on *methodological repertoires* that can well be characterized as topological, which significantly include network and textual analysis, which have translated in conceptualizations and visualizations of science and technology that explicitly assume a post-Euclidian frame, as for instance in co-word analysis and citation network analysis (Marres, 2012). However, whether the use of these methods also translated into an explicitly topological concept of public controversy is another matter. One could say it mostly did not, as conceptions of controversy as public debate remained long prevalent in social studies of science and technology too.

25. A device-centred account of material participation also suggests that it matters when and where we pose this question. We should probably not get stuck on the question of the expansion of the zone of relevance: to expand the range of entities is surely a good thing, but how could we, in view of our highly variable attention spans, *not* agree with Whitehead's point that civilization means that we can increase the things we do *without* having to take more things into consideration?

Bibliography

- Adkins, L. and C. Lury (2009). Introduction to special issue 'What is the empirical?'. *European Journal of Social Theory* (12): 5–20.
- Agrawal, A. (2005). *Environmentality: Technologies of Government and the Making of Subjects*. Durham: Duke University Press.
- Akrich, M. (1992). The De-Description of Technical Objects. In W. Bijker and J. Law (eds), *Shaping Technology/Building Society: Studies in Sociotechnical Change*. Cambridge: MIT Press, pp. 205–24.
- Ankersmit, F. (1997). *Aesthetic Politics. Political Philosophy Beyond Fact and Value*. Stanford and Cambridge: Stanford University Press.
- Anderson, B. (1983). *Imagined Communities: Reflections on the Origins and Spread of Nationalism*. London and New York: Verso.
- Anderson, K. and B. Braun (2008). Introduction. In K. Anderson and B. Braun (eds), *Environment: Critical Essays in Human Geography*. Farnham: Ashgate, pp. xi–xxiii.
- Archibugi, D. (ed.) (2003). *Debating Cosmopolitics*. London/New York: Verso.
- Arendt, H. (1958). *The Human Condition*. Chicago: Chicago University Press.
- Asdal, K. (2008). Enacting things through numbers: Taking nature into accounting. *Geoforum* (39): 123–32.
- Barry, A. (1998). On Interactivity: Consumers, Citizens and Culture. In S. Macdonald (ed.), *The Politics of Display: Museums, Science, Culture*. London: Routledge.
- Barry, A. (2001). *Political Machines: Governing the Technological Society*. London and New York: Athlone.
- Barry, A. and D. Slater (eds) (2005). *The Technological Economy*. London: Routledge.
- Beck, U. (1996). *The Reinvention of Politics: Rethinking Modernity in the Global Social Order*. Cambridge: Polity Press.
- Beck, U. (2005 (2002)). *Power in the Global Age*. Cambridge: Polity Press.
- Bennett, J. (2004). The force of things: Steps toward an ecology of matter. *Political Theory* 32(3): 347–72.
- Bennett, J. (2005). In Parliament with Things. In Lars Tonder and Lasse Thomassen (eds), *Radical Democracy: Politics Between Abundance and Lack*. Manchester: Manchester University Press.
- Bennett, J. (2007). Edible matter. *New Left Review* (44): 133–45.
- Bennett, J. (2010). *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press.
- Berk, R. and R. Fovell (1999). Public perceptions of climate change: A 'Willingness to Pay' assessment. *Climatic Change* (41): 413–46.
- Berkhout, F., M. Leach and I. Scoones (eds) (2003). *Negotiating Environmental Change: New Perspectives from Social Science*. Cheltenham: Edward Elgar.
- Berlant, L. (1997). *The Queen of America Goes to Washington City: Essays on Sex and Citizenship*. Durham: Duke University Press.
- Bernstein, R. (2010). *The Pragmatic Turn*. Oxford: Polity Press.

- Bijker, W. and K. Bijsterveld (2000). Women walking through plans: Technology, democracy, and gender identity. *Technology and Culture* 41(3): 485–515.
- Bijker, W. and J. Law (1992). *Shaping Technology/Building Society Studies in Sociotechnical Change*. Cambridge: MIT Press.
- Bingham N. (2006). Bees, butterflies, and bacteria: biotechnology and the politics of nonhuman friendship. *Environment and Planning A* (38): 483–98.
- Blackman, L. (2008). Affect, relationality and the problem of personality. *Theory, Culture and Society* (25): 23–47.
- Blok, A. (2010). Divided Socio-natures: Essays on the Co-construction of Science, Society, and the Global Environment. Doctoral dissertation, University of Copenhagen, Denmark.
- Bowerbank, S. (1999). Nature Writing as Self-Technology. In Eric Darier (ed.), *Discourses of the Environment*. Malden: Blackwell Publishers.
- Braun, B. and S. Whatmore (2010). The Stuff of Politics: An Introduction. *Political Matter: Technoscience, Democracy and Public Life*. Minneapolis: University of Minnesota Press, pp. ix–xxxviii.
- Brown, B. (2003). *A Sense of Things: The Object Matter of American Literature*. Chicago: Chicago University Press.
- Brown, M. (2009). *Science in Democracy: Expertise, Institutions, and Representation*. Cambridge, MA: MIT Press.
- Butler, J. (2010). Performative agency. *Journal of Cultural Economy* 3(2): 147–61.
- Clark, N. (2010). Volatile worlds, vulnerable bodies: Confronting abrupt climate change. *Theory, Culture & Society* (27): 31–53.
- Callon, M. (1980). Struggles and Negotiations to Define what is Problematic and what is not: The Sociology of Translation. In K. D. Knorr, R. Krohn and R. D. Whitley (eds), *The Social Process of Scientific Investigation: Sociology of the Sciences Yearbook*. Dordrecht and Boston: Reidel, 4, pp. 197–219.
- Callon M. (1986a). The Sociology of an Actor-Network: The Case of the Electric Vehicle. In M. Callon, J. Law and Arie Rip (eds), *Mapping the Dynamics of Science and Technology*. London: Macmillan, pp. 19–34.
- Callon, M. (1986b). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay. In J. Law (ed.), *Power, Action and Belief: A New Sociology of Knowledge*. Sociological Review Monograph. London: Routledge and Kegan Paul, 32, pp. 196–233.
- Callon, M. (2004). Europe wrestling with technology. *Economy and Society* 33(1): 121–34.
- Callon, M. (2009). Civilizing markets: Carbon trading between in vitro and in vivo experiments. *Accounting, Organizations and Society* (34): 535–48.
- Callon, M. and B. Latour (1992). Don't throw the baby out with the Bath School! A reply to Collins and Yearley. In A. Pickering (ed.) *Science as Practice and Culture*. Chicago: Chicago University Press, pp. 343–68.
- Callon, M. and V. Rabeharisoa (2004). Gino's lesson on humanity: Genetics, mutual entanglements and the sociologist's role. *Economy and Society* (33): 1–27.
- Callon, M. and V. Rabeharisoa (2008). The growing engagement of emergent concerned groups in political and economic life: Lessons from the French association of neuromuscular disease patients. *Science Technology Human Values* 33(2): 230–61.

- Callon, M. and A. Rip (1991). Forums hybrides et négociations des normes socio-techniques dans le domaine de l'environnement. *Environnement, Science et Politique*, Cahiers du GERMES (13): 227–38.
- Callon, M., Y. Millo and F. Muniesa (eds) (2007). *Market Devices*. Oxford, Blackwell.
- Callon, M., P. Lascoumes and Y. Barthe (2009 (2001)). *Acting in an Uncertain World: An Essay on Technical Democracy*. Cambridge: MIT Press.
- Carnap, R. (1966). The Experimental Method. In *An Introduction to the Philosophy of Science*. New York: Basic Books, pp. 40–7.
- Carter, S. (2007). *Rise and Shine: Sunlight, Technology and Health*. Oxford: Berg Publishers.
- Chance, T. (2009). Towards sustainable residential communities; the Beddington Zero Energy Development (BedZED) and beyond. *Environment and Urbanization* 21(2): 527–44.
- Cheah, P. and B. Robbins (eds) (1998). *Cosmopolitics – Thinking and Feeling Beyond the Nation*. Minneapolis: University of Minnesota Press.
- Cochoy, F. (2007). A brief theory of the 'captation' of publics : Understanding the market with Little Red Riding Hood. *Theory, Culture Society* (24): 213–33.
- Cockburn, C. and R. Furst-Dilic (eds) (1994). *Bringing Technology Home: Gender and Technology in a Changing Europe*. Milton Keynes: Open University Press.
- Collins, H. (1988). Public experiments and displays of virtuosity: The core-set revisited. *Social Studies of Science* 18(4): 725–48.
- Collins, H. and R. Evans (2002). The Third Wave of Science Studies Studies of Expertise and Experience. *Social Studies of Science* 32(2): 235–96.
- Connolly, W. (2011). *A World of Becoming*. Durham: Duke University Press.
- Coole, D. and S. Frost (2010). Introduction. In D. Coole and S. Frost (eds), *New Materialisms: Ontology, Agency and Politics*. Durham: Duke University Press, pp. 1–46.
- Cooper, M. and A. Mitropoulos (2009). The household frontier. *Ephemera* (9): 363–8.
- Crick, B. (1962/2000) *In Defence of Politics*. London: Continuum.
- Cussins, C (1996). Ontological choreography: Agency through objectification in infertility clinics. *Social Studies of Science* 26(3): 575–61.
- Darby, S. (2010). Smart metering: What potential for householder engagement? *Building Research and Information* (38): 442–57.
- Darier, E. (1999). Foucault and the Environment: An Introduction. In E. Darier (ed.) *Discourses of the Environment*. Oxford: Blackwell, pp. 1–33.
- Davies, G. (2010). Where do experiments end? *Geoforum* 41(5): 667–70.
- Dean, J. (2002). *Publicity's Secret: How Technoculture Capitalizes on Democracy*. Ithaca and London: Cornell University Press.
- Deleuze, G. and F. Guattari (1994 (1991)). *What is Philosophy?* trans. Hugh Tomlinson and Graham Burchell. New York: Columbia University Press.
- Deville, J. (2011). The Landscape of Consumer Credit Default: Tracing Technologies of Market Attachment. Unpublished PhD Thesis, Goldsmiths, University of London.
- Dewey, J. (1955 (1908)). Theory of valuation. Repr. In O. Neurath, R. Carnap and Ch. Morris (eds), *International Encyclopedia of Unified Science*, vol. 2, no. 4. Chicago: University of Chicago Press.

- Dewey, J. (1990). Review of Public Opinion, by Walter Lippmann. In J. A. Boydston (ed.), *Essays in Philosophy, Education and the Orient, 1921–1922. Vol. 13 of The Middle Works of John Dewey, 1899–1924*. Carbondale: Southern Illinois University Press.
- Dewey, J. (1991 (1927)). *The Public and Its problems*. Athens: Swallow Press and Ohio University Press.
- Dewey, J. (1998 (1908)). Does Reality Possess Practical Character? Repr. In L. A. Hickman and Th. M. Alexander (eds), *The Essential Dewey*, vol. 1, *Pragmatism, Education, Democracy*. Bloomington: Indiana University Press, pp. 124–33.
- Dewey, J. (2007 (1922)). *Human Nature and Conduct: An Introduction to Social Psychology*. Repr., New York: Cosimo.
- Didier, E. (2009). *En quoi consiste l'Amérique ? Les statistiques, le New Deal et la démocratie*. Paris: La Découverte.
- Diggins, J. (1994). *The Promise of Pragmatism: Modernism and the Crisis of Knowledge and Authority*. Chicago: University of Chicago Press.
- Dish, L. (2010). 'Faitiche'-izing the People: What Representative Democracy Might Learn from Science Studies. In B. Braun and S. Whatmore (eds), *Political Matter: Technoscience, Democracy and Public Life*. Minneapolis: University of Minnesota Press.
- Dobson, A. (2003). *Citizenship and the Environment*. Oxford: Oxford University Press.
- Dobson, A. and D. Bell (2006). Introduction. In A. Dobson and D. Bell (eds), *Environmental Citizenship*. Cambridge, MA: MIT Press.
- Dryzek, J. (1999). Global Ecological Democracy. In N. Low (ed.), *Global Ethics and Environment*. London: Routledge, pp. 264–82.
- Dryzek, J. (2004). Pragmatism and democracy: In search of deliberative publics. *The Journal of Speculative Philosophy* (18): 72–9.
- Duhem, P. (1982 (1906)). Physical Theory and Experiment. In *The Aim and Structure of Physical Theory*. Princeton: Princeton University Press, pp. 180–218.
- Eckersley, R. (2000). Deliberative Democracy, Ecological Representation and Risk: Toward a Democracy of the Affected. In M. Saward (ed.), *Democratic Innovation: Deliberation, Representation and Association*. London and New York: Routledge.
- Eckersley, R. (2004). *The Green State: Rethinking Democracy and Sovereignty*. Cambridge, MA.: MIT Press.
- Eden, S., Ch. Beara and G. Walker (2008). Mucky carrots and other proxies: Problematising the knowledge-fix for sustainable and ethical consumption. *Geoforum* 39 (2): 1044–57.
- Ehn, P. and R. Badham (2002). Participatory Design and the Collective Designer. In T. Binder, J. Gregory and I. Wagner (eds), *Proceedings of the Participatory Design Conference, 23–25 June 2002, Malmö, Sweden*, pp. 1–10.
- Ezrahi, Y. (1990). *The Descent of Icarus: Science and the Transformation of Contemporary Democracy*. Cambridge: Harvard University Press.
- Ezrahi, Y. (1995). Technology and the Civic Epistemology of Democracy. In A. Feenberg and A. Hannay (eds), *Technology and the Politics of Knowledge*. Indiana Series in the Philosophy of Technology. Bloomington: Indiana University Press, pp. 159–72.

- Felt, U. and M. Fochler (2010). Machineries for making publics: Inscribing and de-scribing publics in public engagement. *Minerva* 3(48): 219–38.
- Festenstein, M. (1997). *Pragmatism and Political Theory*. Oxford and Chicago: Polity Press and Chicago University Press.
- Filmer, P. (2003). On Harol Garfinkel's Ethnomethodology. In: M. Lynch and W. Sharrock (eds), *Harold Garfinkel, Sage Masters in Modern Social Thought*. London: Sage.
- Foucault, M. (1975). *Discipline and Punish: The Birth of the Prison*. New York: Random House.
- Foucault, M. (2008). *The Birth of Biopolitics: Lectures at the Collège de France 1978–1979*. Basingstoke: Palgrave Macmillan.
- Fraser, M. (2008). Facts, Ethics and Event. In C. Bruun Jensen and K. Rødje (eds), *Deleuzian Intersections in Science, Technology and Anthropology*. New York and Oxford: Berghahn Books.
- Fraser, M. (2009). Experiencing sociology. *European Journal of Social Theory* 12(1): 63–82.
- Fraser, M., S. Kember and C. Lury (2006). *Inventive Life: Approaches to the New Vitalism*. London: Sage.
- Fraser, N. (2005). *Reframing Justice: The 2004 Spinoza Lectures*. Amsterdam: Van Gorcum.
- Frost, S. (2008). *Lessons from a Materialist Thinker: Hobbesian Reflections on Ethics and Politics*. Stanford: Stanford University Press.
- Fujimura, J. H. (1987). Constructing 'Do-able' problems in cancer research: Articulating alignment. *Social Studies of Science* (17): 257–93.
- Ganzevles, J. (2007). Technologie voor mens en milieu: een actor-netwerk analyse van de ontwikkeling van energietechnologie voor woningen. Doctoral dissertation, University of Twente.
- Garfinkel, H. (1984 (1967)). *Studies in Ethnomethodology*, 2nd rev. edn. London: Polity Press.
- Girard, M. and D. Stark (2007). Socio-technologies of Assembly: Sense-making and Demonstration in Rebuilding Lower Manhattan. In D. Lazer and V. Mayer-Schoenberger (eds), *Governance and Information: The Rewiring of Governing and Deliberation in the 21st Century*. New York and Oxford: Oxford University Press.
- Gomart, E. and M. Hajer (2003). Is That Politics? For an Inquiry into Forms in Contemporary Politics. In B. Joerges and H. Nowotny (eds), *Looking Back, Ahead – The 2002 Yearbook for the Sociology of Sciences*. Dordrecht: Kluwer.
- Gomart, E. and A. Hennion (1999). A Sociology of Attachment: Music Amateurs and Drug Addicts. In J. Law and J. Hassard (eds), *Actor Network and After*. Oxford: Blackwell and the Sociological Review, pp. 220–47.
- Grosz, E. (2005). *Time Travels: Feminism, Nature, Power*. Durham: Duke University Press.
- Guggenheim, M. (2009). Mutable Immobiles. Change of Use of Buildings as a Problem of Quasi-Technologies. In T. Bender and I. Farias (eds), *Urban Assemblages. How Actor-Network Theory Changes Urban Studies*. London: Routledge.
- Guilhot, N. (2005). *The Democracy Makers: Human Rights and the Politics of Global Order*. New York: Columbia University Press.

- Guy, S. and S. Moore (2005). *Sustainable Architectures: Cultures and Natures in Europe and North America*. London: Spon Press.
- Guy, S. and E. Shove (2000). *Sociology of Energy, Buildings and the Environment: Constructing Knowledge, Designing Practice*. London: Routledge.
- Habermas, J. (1991 (1962)). *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*, trans. Th. Burger. Cambridge: MIT Press.
- Habermas, J. (2001). The Postnational Constellation and the Future of Democracy. Chap. 4 in *The Postnational Constellation: Political Essays*. Cambridge and Oxford: Polity Press and Blackwell Publishers.
- Hacking, I. (2004). *Historical Ontology*. Cambridge: Harvard University Press.
- Hagendijk, R. and A. Irwin (2006). Public Deliberation and Governance: Engaging with Science and Technology in Contemporary Europe. *Minerva* 44 (2): 167–84.
- Hajer, M. (1995). *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Oxford University Press.
- Haraway, D. (1994). A Game of Cat's Cradle: Science Studies, Feminist Studies, Cultural Studies. *Configurations* (2): 59–71.
- Harbers, H. (ed.) (2005). *Inside the Politics of Technology: Agency and Normativity in the Co-production of Technology and Society*. Amsterdam: Amsterdam University Press.
- Harman, G. (2002). *Tool-being: Heidegger and the Metaphysics of Objects*. Chicago: Open Court Publishing.
- Harman, G. (2007). On Vicarious Causation. In R. Mackay (ed.), *Collapse II, Special Issue on Speculative Realism, Urbanomic*, pp. 187–220.
- Harman, G. (2009). *Prince of Networks: Bruno Latour and Metaphysics*. Sydney: Re-press.
- Harvey, P. (2010). Cementing relations: The materiality of roads and public spaces in provincial Peru. *Social Analysis* 54, no. 2.
- Hawkins, G. (2006). *The Ethics of Waste: How We Relate to Rubbish*. Lanham: Rowman & Littlefield Publishers.
- Hawkins, G. (2011). Packaging Water: Plastic Bottles as Market and Public Devices. In N. Marres and J. Lezaun (eds), *Materials and Devices of the Public*. Special Section, *Economy and Society* 40(4): 534–52.
- Hayden, C. (2007). Taking as giving: Bioscience, exchange, and the politics of benefit-sharing. *Social Studies of Science* (37): 729–58.
- Heath, C. and D. Lehn (2008). Configuring 'Interactivity': Enhancing engagement in science centres and museums. *Social Studies of Science* 38(1): 63–91.
- Held, D. (2000). The Changing Contours of Political Community: Rethinking Democracy in the Context of Globalization. In B. Holden (ed.), *Global Democracy: Key Debates*. London: Routledge.
- Held, D. (2004). *Global Covenant: The Social Democratic Alternative to the Washington Consensus*. Oxford: Polity Press.
- Heur, B. van, R. Brand, A. Karvonen, S. Guy and S. Wyatt (2009). Urban laboratories: Toward an STS of the built environment. *EASST Review* 28(4): 4–6.
- Heyting, L. (1994). *De Wereld in een Dorp: Schilders, schrijvers en wereldverbeteraars in Laren en Blaricum 1880–1920*. Amsterdam: Meulenhoff.
- Hicks, D. and M. C. Beaudry (eds) (2012). *The Oxford Handbook of Material Culture Studies*. Oxford: Oxford University Press.

- Hinchliffe, S. (1996). Helping the earth begins at home. *Global Environmental Change* (6): 53–62.
- Hobson, K. (2006). Bins, bulbs and shower timers: On the techno-ethics of sustainable living. *Ethics, Place and Environment* (9): 335–54.
- Hommels, A. (2005). *Unbuilding Cities: Obduracy in Urban Sociotechnical Change*. Cambridge, Mass.: MIT Press.
- Honig, B. (1993). *Political Theory and the Displacement of Politics*. Ithaca and London: Cornell University Press.
- Irwin, A. and B. Wynne (1996). *Misunderstanding Science?: The Public Reconstruction of Science and Technology*. Cambridge: Cambridge University Press
- Irwin, A. (2001). Constructing the scientific citizen: Science and democracy in the biosciences. *Public Understanding of Science* (10): 1–18.
- Irwin, A. (2006). The politics of talk: Coming to terms with the ‘new’ scientific governance. *Social Studies of Science* 36 (2): 299–320.
- Irwin, A. and M. Michael (2003). *Science, Social Theory and Public Knowledge*. Milton Keynes: Open University Press.
- Jananoff, S. (2003a). Technologies of humility: Citizen participation in governing science. *Minerva* 41(3): 223–44.
- Jananoff, S. (2003b). Breaking the waves in science studies. *Social Studies of Science* 33 (3): 389–400.
- Jananoff, S. (2005a). *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton: Princeton University Press.
- Jananoff, S. (2005b). ‘Let Them Eat Cake’: GM Foods and the Democratic Imagination. In M. Leach, I. Scoones and B. Wynne (eds), *Science and Citizens: Globalization and the Challenge of Engagement*. London: Zed Books, pp. 183–98.
- Jananoff, S. (2010). A New Climate for Society. In B. Szerszynski and J. Urry (eds), Special issue on climate change. *Culture, Theory and Society* 27 (2–3): 233–53.
- Karlsson, J. (2006). Affected and Subjected—The All-Affected Principle. In Transnational Democratic Theory. Working Paper, Wissenschaftszentrum Berlin Für Sozialforschung.
- Karvonen, A. and S. Moore (2008). Sustainable architecture in context: STS and design thinking. *Science Studies* 21(1) : 29–46.
- Kelly, A. (2011). ‘Will he be there?’ *Journal of Cultural Economy* 4(1): 65–79.
- Kelly, A. and P.W. Geissler (2011) The Value of Transnational Medical Research. *Journal of Cultural Economy* 4(1): 3–10
- Kelty, C. (2008). *Two Bits: The Cultural Significance of Free Software*. Durham: Duke University Press.
- Kelty, C. (2010). Prototyping prototyping: A preface. In *Prototyping Prototyping. Anthropological Research on the Contemporary*, Episode (3): 5–10
- Keulartz, J., M. Korthals, M. Schermer and T. Swierstra (2002). *Pragmatist Ethics for a Technological Culture*. Dordrecht: Kluwer Academic Publishers.
- Kierkegaard, S. (1978). Two ages: The Age of Revolution and the Present Age. A Literary Review. In H. V. Hong and E. Hatlestad Hong (eds), *Kierkegaard’s writings XIV*. Princeton: Princeton University Press.
- Kirk, A. (2007). *Counterculture Green: The Whole Earth Catalog and American Environmentalism*. Lawrence: University Press of Kansas.
- Klumbyté, N. (2010). The Soviet sausage renaissance. *American Anthropologist* 112(1): 22–37.

- Knorr-Cetina, K. (1997). Sociality with objects: Social relations in postsocial knowledge societies. *Theory, Culture and Society* 14(4): 1–30.
- Kräftner, B. and J. Kröll (2003). Good Bye Tomato – Good Morning Rice. How to describe a scientific project in the public realm. Report of a Case Study. In B. Pellegrini (ed.), *Science au musée, sciences nomades*. Georg Editeur, pp. 319–24.
- Kuhn, Th. S. (1996 (1962)) *The Structure of Scientific Revolutions*. 3rd edn. Chicago: University of Chicago Press.
- Kymlicka, W. (1999). Citizenship in an era of globalization: Commentary on Held. In I. Shapiro and C. Hacker-Cordón (eds), *Democracy's Edges*. Cambridge: Cambridge University Press.
- Lash, S. and C. Lury (2007). *Global Culture Industry: The Mediation of Things*. Cambridge and Oxford: Polity.
- Latour, B. (1988). *The Pasteurization of France*. A. Sheridan and J. Law (trans.). Cambridge: Harvard University Press.
- Latour, B. (1991). Technology is society made durable. In J. Law (ed.), *A Sociology of Monsters Essays on Power, Technology and Domination*. Sociological Review Monograph 38. London: Routledge, pp. 103–31.
- Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. Bijker and J. Law (eds), *Shaping Technology/Building Society: Studies in Sociotechnical Change*. Cambridge: MIT Press, pp. 225–58.
- Latour, B. (1993). *We Have Never Been Modern*, trans. C. Porter. Cambridge: Harvard University Press.
- Latour, B. (1999). *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge: Harvard University Press.
- Latour, B. (2001). From 'matters of facts' to 'states of affairs'. Which protocol for the new collective experiments?. Lecture to the Darmstadt Colloquium, 30th March.
- Latour, B. (2004a). Why has critique run out of steam? From matters of fact to matters of concern. *Critical Inquiry* 30(2): 225–48.
- Latour, B. (2004b). *Politics of Nature: How to Bring the Sciences Into Democracy*. Cambridge: Harvard University Press.
- Latour, B. (2005a). From Realpolitik to Dingpolitik – An Introduction to Making Things Public. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Cambridge: MIT Press, pp. 14–41.
- Latour, B. (2005b). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Latour, B. (2007). Turning around politics: A reply to De Vries' paper. *Social Studies of Science* 37(5): 811–20.
- Latour, B. (2008a). What is the style of matters of concern ? Two lectures in empirical philosophy. Spinoza Lectures at the University of Amsterdam. Amsterdam: Van Gorcum.
- Latour, B. (2008b). Introduction. In W. Lippmann, *Le Public fantôme*. Paris: Demopolis.
- Latour, B. and P. Gagliardi (2006). *Les atmosphères de la politique – dialogue sur un monde commun*. Paris: Les Empêcheurs de Penser en Rond.
- Latour, B. and P. Weibel, P. (eds) (2005). *Making Things Public: Atmospheres of Democracy*. Cambridge: MIT Press.
- Latour, B. and S. Woolgar (1979). *Laboratory Life. The Social Construction of Scientific Facts*. Beverly Hills: Sage Publications.

- Latour, B. and A. Yaneva (2008). Give me a Gun and I will Make All Buildings Move. In R. Geiser (ed.), *Explorations in Architecture: Teaching, Design, Research*. Basel: Birkhäuser, pp. 80–9.
- Latour, B., G. Harman and P. Erdely (2011). *The Prince and the Wolf: Latour and Harman at the LSE*. Zero Books.
- Laurent, B., J. Lezaun and N. Marres (2010). Technologies of democracy. Panel description, Annual meeting of the Society for the Social Studies of Science. Tokyo. August 25–9.
- Law, J. (2004a) *After Method: Mess in Social Science Research*. London and New York: Routledge.
- Law, J. (2004b). Matter-ing, Or How Might STS Contribute?. The Centre for Science Studies, Lancaster University, <http://www.comp.lancs.ac.uk/sociology/papers/law-matter-ing.pdf>
- Law, J. and A. Mol (2008). Globalisation in practice: On the politics of boiling pigswill. *Geoforum* 1(39): 133–43.
- Law, J. and J. Urry (2004). Enacting the social. *Economy and Society* 33(3): 390–410.
- Leach, M., I. Scoones and B. Wynne (eds) (2005). *Science and Citizens: Globalization and the Challenge of Engagement*. London: Zed Books.
- Leigh Star, S. and A. Strauss (1999). Layers of silence, arenas of voice: The ecology of visible and invisible work. *Computer Supported Cooperative Work (CSCW)* 8 (1–2): 9–30.
- Lezaun, J. (2007). A market of opinions: The political epistemology of focus groups. *Sociological Review* (55): 130–51.
- Lezaun, J. and M. Lynch (2008). Ontography: Investigating the Production of Things, Deflating Ontologies. Paper presented at 'A Turn to Ontology', Oxford Said Business School, June.
- Lezaun, J. and L. Soneryd (2007). Consulting citizens: Technologies of elicitation and the mobility of publics. *Public Understanding of Science* (16): 279–97.
- Lippmann, W. (1997 (1922)). *Public Opinion*. New York: Free Press Paperbacks, Simon & Schuster.
- Lippmann, W. (2002 (1927)). *The Phantom Public*. New Brunswick and London: Transaction Publishers.
- Lockwood, M. and J. Bird (2009). *Plan B? The Prospects for Personal Carbon Trading*. London: Institute for Public Policy Research.
- Lockwood, M., M. Lewis, N. Newman and R. Sheldon (2007). *Engagement and Political Space for Policies on Climate Change*. London: Sustainable Development Commission.
- Lovell, H. (2007). Exploring the role of materials in policy change: Innovation in low energy housing in the UK. *Environment and Planning A* (39): 2500–17.
- Lury, C. (2007). Thinking Topologically. Paper presented at the workshop 'Topology for culture: metaphors and tools', Department of Media Studies, University of Amsterdam, 29–30 November.
- Lury, C. and N. Wakeford (eds) (2012). *Inventive Methods: The Happening of the Social*. London: Routledge.
- Lynch, M. (1991). Method: Measurement – Ordinary and Scientific Measurement as Ethnomethodological Phenomena. In G. Button (ed.). *Ethnomethodology and the Human Sciences*. Cambridge: Cambridge University Press, pp. 77–108.
- Lynch, M. (1997). *Scientific Practice and Ordinary Action: Ethnomethodology and Social Studies of Science*. Cambridge: Cambridge University Press.

- Lynch, M. (2003). Ethnomethodology. In M. Lynch and W. Sharrock (eds), *Harold Garfinkel, Sage Masters in Modern Social Thought*. London: Sage.
- Macdonald, S. (ed.) (1998). *The Politics of Display: Museums, Science, Culture*. London: Routledge.
- MacKenzie, D. (1990). *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*. Cambridge: MIT Press.
- MacKenzie, D. (2009). Making things the same: Gases, emission rights and the politics of carbon markets. *Accounting, Organizations and Society* (34): 440–55.
- MacKenzie, D., F. Muniesa and L. Siu (eds) (2007). *Do Economists Make Markets? On the Performativity of Economics*. Princeton: Princeton University Press.
- Macnaghten, P. (2003). Embodying the environment in everyday life practices. *Sociological Review* (51): 62–84.
- Macnaghten, P. and J. Urry (1998). *Contested Natures*. London: Sage.
- McNally, R. and P. Wheale (1998). The Consequences of Modern Genetic Engineering: Patents, ‘Nomads’ & the ‘Bio-industrial Complex’. In *The Social Management of Genetic Engineering*. Aldershot: Ashgate, pp. 303–26.
- Marres, N. (2005a). No Issue, No Public. Democratic Deficits after the Displacement of Politics. Doctoral thesis, University of Amsterdam, dare.uva.nl/document/17061.
- Marres, N. (2005b). Issues Spark a Public into Being. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Karlsruhe/Cambridge: ZKM/MIT Press.
- Marres, N. (2007). The issues deserve more credit: Pragmatist contributions to the study of public involvement in controversy. *Social Studies of Science* (37): 759–80.
- Marres, N. (2008). The Making of Climate Publics: Eco-homes as Material Devices of Publicity. In I. Moser and K. Asdal (eds), *The Technologies of Politics*, special issue of *Distinktion, Scandinavian Journal of Social Theory* (16): 27–46.
- Marres, N. (2009). Testing powers of engagement: Green living experiments, the ontological turn and the undoability of involvement. *European Journal of Social Theory* (12): 117–33.
- Marres, N. (2010). Frontstaging Nonhumans: Publicity as a Constraint on the Political Activity of Things. In B. Braun and S. Whatmore (eds), *Political Matter: Technoscience, Democracy and Public Life*. Minneapolis: University of Minnesota Press, pp. 177–210.
- Marres, N. (2012). The experiment in living. In: C. Lury and N. Wakeford (eds), *Inventive Methods: The Happening of the Social*. London: Routledge pp. 76–95.
- Marres, N. and J. Lezaun (2011). Materials and Devices of the Public: An Introduction. N. Marres and J. Lezaun (eds), Special section of *Economy and Society*, 40 (4): 489–509.
- Marres, N. and R. Rogers (2005) Recipe for tracing the fate of issues and their publics on the Web. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Karlsruhe/Cambridge: ZKM/MIT Press.
- Marres, N. and R. Rogers (2008) Subsuming the Ground: How local realities of the Ferghana Valley, the Narmada Dams, and the BTC pipeline are put to use on the Web. *Economy and Society* 37(2), pp. 251–281
- Marvin, S., H. Chappells and S. Guy (1999). Pathways of smart metering development: Shaping environmental innovation. *Computers, Environment and Urban Systems* (23): 109–26.
- Massey, D. (2005). *For Space*. London: Sage.

- Meadows, D. H., D. L. Meadows, J. Randers and W. W. Behrens (1972). *The Limits to Growth*. New York: Universe Books.
- Michael, M. (2006). *Technoscience and Everyday Life: The Complex Simplicities of the Mundane*. Maidenhead: Open University Press/McGraw-Hill.
- Michael, M. (2009). Publics performing publics: Of PiGs, PiPs and politics. *Public Understanding of Science* (18): 617–31.
- Michael, M. and Gaver, B. (2009). Home beyond home: Dwelling with threshold devices. *Space and Culture* (12): 359–70.
- Miller, D. (1998). *A Theory of Shopping*. Ithaca: Cornell University Press.
- Miller, D. (ed.) (2005). *Materiality*. Durham: Duke University Press.
- Mill, J. S. (2002 (1863)). *Utilitarianism*. Indianapolis: Hackett Publishing.
- Mill, J. S. (2002 (1859)). On Individuality, As One of the Elements of Wellbeing. In *On Liberty, The Basic Writings of John Stuart Mill*, The Modern Library, New York, pp. 57–76.
- Mitchell, T. (2009). Carbon Democracy. *Economy and Society* 38(3): 399–432.
- Mol, A. (1999). Ontological politics. A word and some questions. In J. Law and J. Hassard (eds), *Actor-Network Theory and After*. London: Blackwell.
- Mol, A. (2002). *The Body Multiple*. Durham: Duke University Press.
- Mol, A. (2008). *The Logic of Care: Health and the Problem of Patient Choice*. London: Routledge.
- Mol, A. and J. Law (1994). Regions, networks and fluids: Anaemia and social topology. *Social Studies of Science* 24: 641–61.
- Mort, F. (2006). Competing Domains: Democratic Subjects and Consuming Subjects in Britain and the United States since 1945. In F. Trentmann (ed.), *The Making of the Consumer: Knowledge, Power and Identity in the Modern World*. Oxford: Berg.
- Mottier, V. (2004). Pragmatism and feminist theory. *European Journal of Social Theory* 7(3): 323–35.
- Mouffe, C. (ed.) (1996). *Deconstruction and Pragmatism: Simon Critchley, Jacques Derrida, Ernesto Laclau and Richard Rorty*. London: Routledge.
- Mouffe, C. (2000) *The Democratic Paradox*. London/New York: Verso Books.
- Muniesa, F. (2007). Market technologies and the pragmatics of prices. *Economy and Society* 36(3): 377–95.
- Muniesa, F. and M. Callon (2007). Economic Experiments and the Construction of Markets. In D. MacKenzie, F. Muniesa and L. Siu (eds), *Do Economists Make Markets? On the Performativity of Economics*. Princeton: Princeton University Press, pp. 163–89.
- Muniesa, F. and D. Linhardt (2009). At stake with implementation: Trials of explicitness in the description of the state. *CSI Working Papers Series 015*, Centre de Sociologie de l'Innovation (CSI), Mines ParisTech.
- Muniesa, F. (2012) A flank movement in the theory of valuation. In L. Adkins and C. Lury (eds), *Measure and Value*, Sociological Review Monograph, London: Wiley-Blackwell.
- Murphy, M. (2006). *Building Sickness Syndrome: Environmental Politics, Women Workers and the Problem of Uncertainty*. Durham: Duke University Press.
- Nordhaus, T. and M. Schellenberger (2007). *Breakthrough: From the Death of Environmentalism to the Politics of Possibility*. Chicago: Houghton Mifflin Harcourt.
- Nowotny, H. (2002). Vergangene Zukunft: Ein Blick zurück auf die 'Grenzen des Wachstums'. In *Impulse geben – Wissen stiften. 40 Jahre VolkswagenStiftung*. Göttingen: VolkswagenStiftung, pp. 655–94.

- Nowotny, H. (2003). Democratising expertise and socially robust knowledge. *Science and Public Policy* (30): 151–6.
- Osborne, P. (2006). Whoever speaks of culture speaks of administration as well. *Cultural Studies* (20): 33–47.
- Osborne, T. and N. Rose (1999). Do the social sciences create phenomena? The case of public opinion research. *British Journal of Sociology* (50): 367–96.
- Oswell, D. (2008). Concrete Publics? Noise, Phantoms and Architectures of Radio and Television Reception from the 1920s to 1960s in the UK. Paper presented at the Physique of the Public, June 6, Goldsmiths.
- Pateman, C. (1989a). Sublimation and Reification: Locke, Wolin and the Liberal Democratic Conception of the Political. In *The Disorder of Women*. Stanford: Stanford University Press, pp. 90–117.
- Pateman, C. (1989b). Feminist Critiques of the Public/Private Dichotomy. In *The Disorder of Women*. Stanford: Stanford University Press, pp. 118–40
- Peet, R. and M. Watts (2004 (1996)) *Liberation Ecologies: Environment, Development, Social Movements*. London and New York: Routledge.
- Peters, J. D. (1999). *Speaking into Air: A History of the Idea of Communication*. Chicago: University of Chicago Press.
- Pinch, T. and W. E. Bijker (1984). The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science* (14): 399–441.
- Popper, K. (2002 (1945)). *The Open Society and Its Enemies: Volume 1: The Spell of Plato*. London: Routledge.
- Pocock, J. G. A. (1975/2003). *The Machiavellian Moment: Florentine Political Thought and the Atlantic Republican Tradition*. Princeton: Princeton University Press.
- Pocock, J. G. A. (1992/1998). The ideal of citizenship since classical times. In G. Shafir (ed.), *The Citizenship Debates: A Reader*. Minneapolis: University of Minnesota Press, pp. 31–41.
- Preston, I. and V. White (2010). The Distributional Impacts of UK Climate Change Policies. Final report to the Eaga Charitable Trust, Centre for Sustainable Energy and Association for the Conservation of Energy.
- Putnam, R. (2001). *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.
- Rabinow, P. (2005). Midst Anthropology's Problems. In A. Ong and S. Collier (eds), *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*. Malden and Oxford: Blackwell, pp. 3–21.
- Rayner, S. (2006). Wicked problems: clumsy solutions – diagnoses and prescriptions for environmental ills. Jack Beale Memorial Lecture on Global Environment, ANSW Sydney, Australia, July.
- Rittel, H. and M. Webber (1973). Dilemmas in a general theory of planning. *Policy Sciences* (4): 155–69.
- Robbins, B. (1993) *The Phantom Public Sphere*. Minneapolis: University of Minnesota Press.
- Roberts, C. (2006). 'What can I do to help myself?' Somatic individuality and contemporary hormonal bodies. *Science Studies* 19(2): 54–76.
- Rogers, R. (2009). *The End of the Virtual*. Amsterdam: Vossiuspers UvA.
- Rogers, R. and N. Marres (2002). French scandals on the Web, and on the streets: A small experiment in stretching the limits of reported reality. *Asian Journal of Social Science* 30(2): 339–53.

- Rorty, R. (1981). *Philosophy and the Mirror of Nature*. Princeton: Princeton University Press.
- Rorty, R. (1982). *Consequences Of Pragmatism: Essays 1972–1980*. Minneapolis: University of Minnesota Press.
- Rorty, R. (1998). *Achieving Our Country: Leftist Thought in Twentieth-Century America*. Cambridge: Harvard University Press.
- Rose, N. and C. Novas (2004). Biological citizenship. In A. Ong and S. Collier (eds), *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*. Malden and Oxford: Blackwell, pp. 439–63.
- Rosengarten, M. (2009). *HIV Interventions: Biomedicine and the Traffic between Information and Flesh*. Washington: University Of Washington Press.
- Rosenthal, C. (2005). Making science and technology results public. A sociology of demos. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Karlsruhe/Cambridge: ZKM/MIT Press.
- Rowbotham, S. (2008) *Edward Carpenter: A Life of Liberty and Love*. London and New York: Verso Books.
- Ruppert, E. (2009). Identification Technologies and the Interpassive Citizen. Paper presented during the CRESC workshop ‘Science and Citizens’, Open University, Milton Keynes, April 1–2.
- Rutland, T. and A. Aylett (2008). The work of policy: Actor networks, governmentality, and local action on climate change in Portland, Oregon. *Environment and Planning D: Society and Space* (26): 627–46.
- Ryan, A. (1995). *Dewey and the High Tide of American Liberalism*. New York: W. W. Norton & Co.
- Sassen, S. (2006). *Territory, Authority, Rights: From Medieval to Global Assemblages*. Princeton: Princeton University Press.
- Schattschneider, E. E. (1960). *The Semisovereign People: A Realist's View of Democracy in America*. Fort Worth: Harcourt Brace Jovanovich College Publishers.
- Schatzki, Th., K. Knorr Cetina and E. von Savigny (eds) (2001). *The Practice Turn in Contemporary Theory*. London and New York: Routledge.
- Schneider, S. and K. Foot (2005). Web Sphere Analysis: An Approach to Studying Online Action. In C. Hine (ed.), *Virtual Methods: Issues in Social Research on the Internet*. Oxford: Berg Publishers, pp. 157–70.
- Schutz, A. (1944). The stranger: An essay in social psychology. *American Journal of Sociology* 49(6): 499–507.
- Schutz, A. (1964). The well-informed citizen. In *Collected papers* Vol. II. *Studies in Social Theory*. The Hague: Martinus Nijhoff, pp. 120–34.
- Schutz, A. (1970). *Reflections on the Problem of Relevance*. Richard Zaner (ed.), New Haven: Yale University Press.
- Schwartz Cowan, R. (1976). The ‘Industrial Revolution’ in the home: Household technology and social change in the 20th century. *Technology and Culture* (17): 1–23.
- Schwartz Cowan, R. (1983). *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave*. New York: Basic Books.
- Shapin, S. and S. Schaffer (1989). *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton: Princeton University Press.
- Shove, E. (2003). *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Oxford: Berg.

- Shove, E. (2007). Caution: Transitions ahead: Politics, practice and sustainable transition management. *Environment and Planning A* (39): 763–70.
- Shove, E., H. Chappells and L. Lutzenhiser (2009). Introduction. In E. Shove, H. Chappells and L. Lutzenhiser (eds), *Comfort in a Lower Carbon Society*. London: Routledge.
- Sismondo, S. (2007). Science and Technology Studies and an Engaged Program. In E. J. Hackett et al. (eds), *The Handbook of Science and Technology Studies* (3rd edn). Cambridge: MIT Press.
- Skinner, Q. (2009). The Material Presentation of Thomas Hobbes's Theory of the Commonwealth. In D. Colas and O. Kharkhordin (eds), *The Materiality of Res Publica: How to Do Things with Publics*. Newcastle: Cambridge Scholars.
- Slocum, R. (2004). Consumer citizens and the Cities for Climate Protection campaign. *Environment and Planning A* (36): 763–82.
- Stassart, P. and S. Whatmore (2003). Metabolising risk: Food scares and the un/re-making of Belgian beef. Themed 'alternative food networks' issue of *Environment and Planning A*, 35(3): 449–62.
- Stears, M. (2010). *Demanding Democracy: American Radicals in Search of a New Politics*. Princeton: Princeton University Press.
- Stengers, I. (2000). *The Invention of Modern Science*, D. W. Smith (trans.). Minneapolis: Minnesota University Press.
- Stengers, I. (2005). The Cosmopolitical Proposal. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Karlsruhe/Cambridge: ZKM/MIT Press.
- Stengers, I. (2010). Including Nonhumans in Political Theory: Opening Pandora's Box? In B. Braun and S. Whatmore (eds), *Political Matter: Technoscience, Democracy and Public Life* Minneapolis: University of Minnesota Press, pp. 3–34.
- Stöckelová, T. (2009a). Beyond inclusion: Effects and limits of institutionalized public participation. *International Journal of Risk Assessment and Management* 12(1): 48–63.
- Stöckelová, T. (2009b). Uncertainty as Agency. Paper presented at CRESC 5th Annual Conference 2009: Objects – What Matters? Technology, Value and Social Change, University of Manchester, 1–4 September.
- Strathern, M. (2004 (1991)). *Partial Connections*. Oxford: Rowan & Littlefield.
- Strong, T. (2009). Comment on Stephen K. White 'The Ethos of the Late Modern Citizen', Annual Meeting of the American Political Science Association, Toronto, September 3–6.
- Suchman, L. (2000). Organising alignment: A case of bridge-building. *The Organ*, 7(2): 311–27.
- Suchman, L. (2005). Agencies in Technology Design: Feminist Reconfigurations. Retrieved from <http://www.lanccs.ac.uk/fass/sociology/papers/suchman-agenciestechnodesign.pdf>
- Terranova, T. (2007). Futurepublic: On information warfare, bio-racism and hegemony as neopolitics. *Theory, Culture and Society* 24(3): 125–45.
- Thevenot, L. (2006). *L'action au pluriel. Sociologie des régimes d'engagement*. Paris: La Découverte.
- Thorpe, Ch. (2007). Political Theory in Science and Technology Studies. In E.J. Hackett, O. Amsterdamska, M. Lynch and J. Wajcman (eds), *The Handbook of Science and Technology Studies*. Cambridge: MIT Press: 63–82.

- Thrift, N. (2008). Turbulent Passions: Towards an Understanding of the Affective Spaces of Political Performance. In *Non-Representational Theory: Space, Politics, Affect*. London: Routledge, pp. 220–54.
- Thrift, N. and S. French (2002). The automatic production of space. *Transactions of the Institute of British Geographers* (27): 309–35.
- Traweek, S. (1992). *Beamtimes and Lifetimes: The World of High Energy Physicists*. Cambridge: Harvard University Press.
- Turner, S. (2001). What is the Problem with Experts? *Social Studies of Science* 31(1): 123–49.
- Turner, S. (2003). *Liberal Democracy 3.0: Civil Society in an Age of Experts*. London and Thousand Oaks: Sage Publications.
- Unger, R. (2007). *The Self Awakened: Pragmatism Unbound*. Cambridge: Harvard University Press.
- Uribinatti, N. (2003). Can Cosmopolitical Democracy be Democratic? In D. Archibugi (ed.), *Debating Cosmopolitics*. London and New York: Verso Books.
- Verbeek, P. (2005). Artifacts and Attachment: A Post-Script Philosophy of Mediation. In H. Harbers (ed.), *Inside the Politics of Technology*. Amsterdam: University of Amsterdam Press.
- Verran, H. (2012). Number as Generative Device: Ordering and Valuing our Relations with Nature. In C. Lury and N. Wakeford (eds), *Inventive Methods: The Happening of the Social*. London: Routledge.
- Vries, G. de (2007). What is political in sub-politics? How Aristotle might help STS. *Social Studies of Science* 37(5): 781–809.
- Wajcman, J. (1991). *Feminism Confronts Technology*. Pennsylvania: Penn State University Press.
- Walker, G. and N. Cass (2007). Carbon reduction, ‘the public’ and renewable energy: Engaging with socio-technical configuration, *Area* 39 (4): 458–69.
- Warner, M. (1990). *The Letters of the Republic: Publication and the Public Sphere in Eighteenth-Century America*. Cambridge: Harvard University Press.
- Warner, M. (2002). *Publics and Counterpublics*. New York: Zone Books.
- Waterton, C. and R. Ellis (2004). Environmental Citizenship in the making: The participation of volunteer naturalists in UK biological recording. *Science & Public Policy* (31): 95–105.
- Waterton, C., L. Norton, and J. Morris (2006). Understanding Loweswater: Interdisciplinary Research in Practice. *Journal of Agricultural Economics* 57 (2): 277–93.
- Westbrook, R. (1991). *John Dewey and American Democracy*. Ithaca and London: Cornell University Press.
- White, S. K. (2000). *Sustaining Affirmation: The Strengths of Weak Ontology in Political Theory*. Princeton: Princeton University Press.
- Wilkie, A. (2010). *User Assemblages in Design: An Ethnographic Study*. Unpublished PhD Thesis, Goldsmiths, University of London.
- Wolin, S. (2004a). Political Philosophy and Philosophy. *Politics and Vision: Continuity and Innovation in Western Political Thought*. Princeton: Princeton University Press, pp. 3–26.
- Wolin, S. (2004b). Liberalism and the Politics of Rationalism. *Politics and Vision: Continuity and Innovation in Western Political Thought*. Princeton: Princeton University Press, pp. 495–523.

- Wood H., B. Skeggs and N. Thumim (2009). 'It's just sad': Affect and judgment on reality TV. In J. Hollows and S. Gillis (ed.), *Homefires: Domesticity, Feminism and Popular Culture*. London: Routledge, pp. 135–50.
- Woolgar, S. (1999). Do artefacts have ambivalence? – Moses' bridges, Winner's bridges and other urban legends. *Social Studies of Science* (29): 433–49.
- Woolgar, S. (2005). Ontological disobedience – definitely! (maybe) In S. Turner and A. Sica (eds), *A Disobedient Generation*. Chicago: University of Chicago Press, pp. 309–24.
- Woolgar, S., T. Cheniti, J. Lezaun, D. Neyland, C. Sugden and C. Toennesen (2008). *A Turn to Ontology in STS? Provocation Piece*. Oxford Said Business School.
- Wynne, B. (1992). Misunderstood misunderstanding: Social identities and public uptake of science, *Public Understanding of Science* 1(3): 281–304.
- Wynne, B. (1996). May the sheep safely graze? A reflexive view of the expert-lay knowledge divide. In S. Lash, B. Szerszynski and B. Wynne (eds), *Risk, Environment and Modernity: Towards a New Ecology*. London: Sage.
- Wynne, B. (2003). Seasick on the Third Wave? Subverting the hegemony of propositionalism. *Social Studies of Science* 33(3): 401–17.
- Wynne, B. (2008). Public Participation in Science and Technology: Performing and Obscuring a Political–Conceptual Category Mistake. *East Asian Science, Technology and Society: an International Journal* (1): 99–110.
- Yaneva, A. (2005). Scaling up and down: Extraction trials in architectural design. *Social Studies of Science* 6 (35): 867–94.
- Yaneva, A. (2009a). *The Making of a Building: A Pragmatist Approach to Architecture*. Oxford: Peter Lang.
- Yaneva, A. (2009b). The Architectural Presentation. In F. Hackney, J. Glynne, V. Minton (eds), *Networks of Design*. Boca Raton: Universal Publishers, pp. 212–19.

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