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Noortje Marres

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Why political ontology must be experimentalized: On eco-show homes as devices of participation

Noortje Marres
Department of Sociology, Goldsmiths, University of London, London, UK

Abstract

This article contributes to debates about the ontological turn and its implications for democracy by proposing an experimental understanding of political ontology. It discusses why the shift from epistemology to ontology in science and technology studies has proved inconclusive for the study of politics and democracy: the politics of non-humans has been assumed to operate on a different level from that of politics and democracy understood as institutional and public forms. I distinguish between three different understandings of political ontology: theoretical, empirical and experimental. Each of these implies a different approach to the problem that non-humans pose for democracy. Theoretical ontology proposes to solve it by conceptual means, while empirical ontology renders it manageable by assuming a problematic analytic separation between *constituting* and *constituted* ontologies. This article makes the case for the third approach, experimental ontology, by analysing an empirical site, that of the eco-show home. In this setting, material entities are *deliberately* invested with moral and political capacities. As such, eco-show homes help to clarify two main features of experimental political ontology: (1) ontological work is here not so much *relocated* from theory to empirical practice but *distributed* among relevant actors and registers and (2) normative variability does not just pertain to the enactment of things but can be conceived of as *internal* to political objects. From these two features of experimental ontology, something follows for democracy as an ontological problem. This problem does not dissolve in empirical settings, but these settings make possible its articulation by experimental means.

Keywords

actor–network theory, empirical devices, environmental engagement, object-oriented political philosophy, political ontology, politics of objects, public demonstrations

Corresponding author:
Noortje Marres, Department of Sociology, Goldsmiths, University of London, New Cross, London SE14 6NW, UK.
Email: n.marres@gold.ac.uk

Introduction[1]

The time when it could be considered a provocation to speak of non-human entities as participants in social and political life could soon be behind us. No longer just an interest of adventurous intellectuals, an expanding range of people seem prepared to consider this possibility and to acknowledge the active contributions of objects, technologies and environments to the sustenance of social and political community. In areas as diverse as legal theory, product design, environmental policy and computer programming, there is talk today of the role of things in mediating the bonds that hold polities together (Bennett, 2010; Dobson, 2003; see Jasanoff, 2010, for an overview). This can be explained as partly an effect of wider empirical developments in these areas such as the proliferation of sustainability initiatives in policy, business, science and culture and the ongoing digitization of many spheres of life. In this context, the significance of objects, technologies and settings in facilitating social, political and moral life is becoming increasingly obvious and has resulted in an intensification of interest in the precise social, political and legal arrangements required to sustain and regulate the contributions of non-humans to our forms of life (Blok and Bertilsson, 2009). It raises questions such as, 'What kind of legal subject does the atmosphere represent?' And, 'How can everyday technologies like smart electricity meters enable behaviour change?'

However, we may also ask more open-ended questions about the changing status of ideas about the politics of non-humans. What, for instance, does it imply for the sensibilities that inform intellectual debates about this issue? The idea that non-humans have moral and political capacities has occupied social scientists and philosophers for many years, but it holds a special place in science and technology studies (STS). The claim that things have politics is one of the central contributions of STS to wider debates in social theory, and this claim is often singled out – positively or negatively – as the most distinctive feature of approaches developed in the field. Furthermore, it is often argued that recognizing non-humans as social and political agents has significant implications for a wide range of sociological and political concepts; taking non-humans into account transforms concepts of social order, power and morality (Harbers, 2005; Latour, 2005b). Finally, accounts in STS that consider the roles non-humans play in social and political life propose a very particular understanding of ontology, one that markedly differs from definitions of this term assumed in other fields. In attributing a politics to non-humans, one could say that work in STS has rendered ontology empirical. I will discuss this double movement in more detail below, but debates in STS about the politics of non-humans tend to assume that ontological questions cannot be settled by theoretical means. Rather, such questions require detailed empirical investigation of social and political practices (Latour, 1988; Law, 2004; Mol, 2002).[2]

One could argue, then, that the politics of non-humans is only the tip of the iceberg of a much wider conceptual reorientation in social and political research and theory. It does not just involve a re-conceptualization of the material dimension of politics, but also of a whole array of other phenomena as well, and ontology in particular. However, that the attribution of political capacities to non-humans should go hand in hand with an empiricization of ontology is by no means self-evident. Indeed, the idea that there is a politics to things is increasingly popular today, but on the whole, this has not led to a wider engagement with political ontology along the empirical lines proposed in STS. In

political theory, the so-called object-oriented ontology and the 'new materialism' have received much attention in recent years, and this work has spawned renewed interest in the role of material and non-human entities in politics and democracy (Bennett, 2010; Frost, 2008; Harman, 2009). However, while this work extends political recognition to non-humans, it tends to remain invested in a theoretical definition of ontology (for a notable exception, see Bennett, 2010). One could think that this situation offers an opportunity for STS to reassert its distinctively empirical understanding of ontology. But here I would like to make a different argument. Insofar as the political capacities of non-humans are gaining more widespread recognition today, empirical ontology is itself being opened up for questioning. Efforts to respecify the relation between ontology and politics in empirical terms, I will argue, have remained limited in some respects. Because of the ways in which ontology has been empiricized in STS, the recognition of non-humans as political agents took a very particular form. For instance, this recognition did not really extend to public forms of political and democratic life. But there are opportunities today not just to reassert but to expand the project of the empiricization of ontology and to adopt what I will call here an 'experimental ontology'.

In what follows, I will distinguish among three ways of understanding the role of non-humans in political and public life, way that correspond to three ways of understanding the normative role of non-humans and political ontology more widely: theoretical, empirical and experimental. I will discuss why empirical ontology provides only a limited way of accounting for the politics of non-humans and why we need an experimental ontology. I will do this by turning to a particular site, eco-show homes—a site I visited a number between 2007 and 2010 in and around London. In demonstrational environmental homes, everyday objects and settings are deliberately equipped with normative capacities.[3] Accordingly, the politics of objects can here be understood as an empirical or 'experimental' effect itself: it must be regarded as an *ongoing accomplishment of the setting* – as ethnomethodologists have put it so well (Garfinkel, 1984: viii) – of the demonstrational home. I argue that to make sense of this situationally or environmentally accomplished politics of non-humans, we must radicalize the empirical understanding of the politics of non-humans. Rather than positing that objects simply *have* normative capacities (or not), we must investigate how they become *invested* with specific normative powers through the deployment of particular settings and devices. To begin with, however, I would like to say some more about the efforts to develop ontological perspectives on politics and democracy in STS and elsewhere.

The ontological turn in politics and democracy as an unfinished project

A turn to ontology in the study of politics has been in the works for some time. Authors in fields as diverse as geography, political theory, sociology and cultural studies have argued that the roles of objects, animals and matter in political and public life deserve more explicit recognition (Barry, 2001; Bennett, 2010; Braun and Whatmore, 2010; Frost, 2008; Hawkins, 2006; Latour, 2005a). This work argues that some areas of the social sciences have paid insufficient attention to the materiality of politics and democracy and describes how non-human entities – from bees to plastic water bottles and home-made

food – inspire and organize political and public action. Many of these studies refer to STS and, more specifically, to actor–network theory (ANT) and 'material–semiotic' approaches developed in this field, approaches that have long sought to reinsert non-humans in the analysis of social, political and moral life (Callon et al., 2001; Irwin and Michael, 2003; Latour, 1988; Law, 2004).[4] It could therefore be argued that recent work on material politics 'extends' ontological perspectives developed in STS to the analysis of political and public life, which are then understood as constituting distinctive fields of enquiry.

Such a characterization is problematic, however, insofar it assumes that 'science' and 'politics' or 'public life' constitute sharply distinct objects of enquiry, an assumption that work in STS has contested. In STS, arguments about the politics of non-humans are closely connected to the much broader project of developing ontological perspectives of science, technology, society and politics, highlighting their mutual entanglement. In advocating for a shift from epistemology to ontology, STS describes how science and technology change the world materially, socially, technologically, morally and politically; in so doing, STS moves beyond established traditions in philosophy and sociology of science (Woolgar and Lezaun, 2013). Whereas earlier scholars approached science as principally a form of knowledge, concerned with the representation of reality, STS proposes to understand technoscience as a distinct mode of intervention, foregrounding the empirical transformations of the world effected by these means (Latour, 1988; Law, 2004; see also Hacking, 1983): after the introduction of plutonium, the production of new proteins through molecular mechanics and the birth of birth control pills, we lived in different worlds (Hacking, 2004; Latour, 1999).

This general argument has significant political implications because it attributes to science and technology a number of effects normally located in the domain of politics. In the account of ontology given in STS, science and technology are understood to involve attempts to change the world; they help to decide which actors acquire power and influence and who might emancipate themselves. However, this account requires further elaboration and specification because, on closer examination, this kind of ontological account of politics is quite different from how politics is normally understood: as a distinctive activity that depends on specific institutions and requires particular procedures or forms of public life (De Vries, 2007). This is another reason why it may well be a mistake to say that the ontological perspective that STS has developed in accounting for the relations between science, technology and society is now being 'extended' to politics and democracy.

Strikingly, several authors who have advocated the ontological approach to science, technology and society appear disinclined to apply this approach to public life and democracy. While science and technology are today quite routinely characterized as devices for the socio-material reordering of the world, many STS authors have continued to conceive of democracy in terms that are firmly located on the representational or epistemic end of the spectrum. Democracy is still often defined as a matter of including lay actors in public debates and deliberations about a given issue (Callon and Rabeharisoa, 2004; Irwin, 2006; for an exception, see Leach et al., 2005; see also Marres, 2007).[5] To be sure, others have argued in favour of making the ontological moves that STS advocates in relation to politics and democracy, as we see in Latour's (2005b) playful proposal for a Dingpolitik. But such proposals have not received a more detailed formulation so far.

Equally striking, while some authors in STS have sought to explicate the political implications of the broader ontological turn proposed in this field, these very authors have on the whole refrained from engaging directly with concepts of democracy. These authors prefer to speak of politics in a different, post-Foucauldian, register, as principally a matter of the constitution of subjects and objects in social practices (Law, 2004; Mol, 1999, 2002). Their concept of ontological politics refers to latent machinations of socio-technical-material arrangements that enable some forms of life rather than others, machinations not usually detected by the apparatus of political analysis. Ontological politics, in other words, is here sharply distinguished from the institutional or formal activity of capital 'P' Politics (Asdal, 2008; Danyi, 2010; Marres, 2009). We could say, then, that the ontological turn in the study of political and public life has for some time remained suspended between two different kinds of reluctance: the reluctance to ontologize politics on the part of those invested in deliberative or dialogic concepts of democracy and the reluctance to extend notions of ontological politics to the categories of the public and democracy. Why is this so?

One explanation is that STS authors are reluctant to venture too far into normative democratic theory, cognizant of the fact that their principal engagement has been with the sociology and philosophy of science, technology and medicine (Braun and Whatmore, 2010; Brown, 2009). Others have pointed out that it is especially *difficult* to conceptualize the role of non-humans in democracy because to do so is to challenge normative conceptions of the moral and political subject (Bennett, 2010; Verbeek, 2011; see also Marres, 2005). To attribute political capacities to non-humans is to disrupt particular assumptions about the ideal attributes of democratic subjects, more in particular ideals of human self-determination and post-Cartesian ideals of autonomy, which posit that the actions and opinions of public citizens are *not* to be dictated by their particular, material circumstances. (for a more detailed discussion of this Cartesian legacy in modern political and moral theory, see Verbeek, 2011, and Frost, 2008).

Work in STS that moves from epistemology to ontology has effectively challenged the ideal of the autonomous citizen by showing that actors never act alone. Indeed, this claim is essential to the idea that non-humans have political capacities because it suggests that what we understand as human action in practice depends on associations of humans and non-humans acting in concert (Cussins, 1996). On the other hand, ontological approaches in STS partially evade the difficulties that non-humans pose for democracy. They render this problem manageable without directly addressing it; much work in STS takes care not to disturb the fiction of the autonomous citizen. It does this by situating heterogeneous actions involving non-humans on a specific ontological plane–specifically, on the plane of *constituting* phenomena, as opposed to a plane in which politics and democracy are *constituted* phenomena or ideals (Marres, 2011). In other words, ontological approaches in STS tend to respect an analytic separation in their accounts of public and political life. They acknowledge the contributions of non-humans to politics and democracy on the plane of constitutive action, the level at which political and public phenomena are composed, but at the same time, they uphold, or leave undisturbed, the validity of classic, humanist public forms on the level of *constituted* political and democratic life, such as that of public debate (Callon and Rabeharisoa, 2004; Lezaun, 2007; see also Marres, 2012a).

This distinction between constituting and constituted democracy makes it possible to say that, on the one hand, non-humans qualify as participants in social and political life and, on the other hand, that there is no need for such non-human entities to be explicitly recognized as participants in the public or democracy. The participation of non-humans, in other words, does not require modification of the forms of public and democratic life. The distinction between constituting and constituted democracy makes it possible to ascribe a politics to non-humans while leaving untouched the level on which democracy is constituted as a distinct normative ideal or a more narrowly defined institutional and public form (Papadopoulous, 2010). This solution can be recognized among others in earlier work in ANT, which privileged public dialogue and the parliament as the relevant democratic forms. However, it seems that this solution to the problem of how to insert non-humans in democracy is no longer working, as it is becoming more difficult to relegate the role of non-humans in political and public life to the plane of constituting phenomena, insofar as objects, technologies and settings today are explicitly invested with normative capacities. In fields as diverse as ethical consumption and ubiquitous computing. This invites long-time experts on political ontology in STS to think again.

Three versions of political ontology: theoretical, empirical and experimental

As mentioned in the introduction, I think that the reasons for the recent interest in the material and ontological dimensions of democracy are partly empirical. But before examining these empirical reasons in more detail, I want to discuss three ways the relation between ontology and politics can be understood: as theoretical, empirical and experimental ontologies (Marres, 2009). In this typology, theoretical ontology refers to a classic understanding of ontology, namely, as a theory of 'what exists'. Here, ontology involves the stipulation of a general set of entities and relations on the level of theory or discourse, as a general blueprint of the world. This understanding has previously been criticized in STS and elsewhere, insofar as it assumes that what exists is given rather than made, constructed or performed.[6] Political ontology can here be taken to refer to the set of definitions that stipulate the features of specifically political entities (the state, power, citizenship, interest, democracy and so on). The domain of politics, then, has an ontology like other domains of the world. However, we may also include under theoretical ontology a wider application of political concepts in metaphysical theory, such as recent arguments in speculative philosophy about the 'democracy' of objects, which elaborate the general ontological claim that there is 'no prime mover' (Harman, 2009).

Empirical ontology differs from theoretical ontology by proposing that the question of 'what the world is made up of' cannot be answered wholly in theory but is partly settled in practices that must be studied empirically. This is where the shift in STS from epistemology to ontology comes in. Work in STS, and especially in ANT, has proposed the term 'ontological' to characterize the ways in which science and technology intervene in the world. Historical and ethnographic studies of the invention of the vaccine, the birth control pill and genetic technologies, for example, have detailed how these inventions enabled such things as the creation of modern France and a revolution in gender relations. ANT

proposes to understand these changes as transformations in the composition of the world, and in so doing, it has developed an empirical conception of ontology. This approach claimed that what was traditionally considered the province of metaphysics, namely, the issue of what the world is made up of, is in actuality decided through specific, historical, cultural, technological and scientific interventions and as such, should be studied in empirical terms. As mentioned, this has specific implications for politics because ontology is shown to have political dimensions in and of itself. If ontologies vary over time, then the matter of what exists may be transformed from a given into an issue at stake.

What I call 'experimental ontology' is both similar to and different from empirical ontology. Empirical ontology deals with wide, often under-acknowledged transformations of what exists, which are subsequently shown by STS researchers and others to have political effects. What world do we live in? Who has the power? Who gets to be emancipated? By contrast, experimental ontology considers the deliberate investment of non-humans with moral and political capacities. Here objects, and by extension ontologies, have political and moral capacities 'by design'. Experimental ontology, too, treats the issue of 'what the world is made up of' as something that gets partly decided in empirical practices. But it goes beyond that in a number of ways. It directs attention to efforts to purposefully design politics and morality into material objects, devices and settings. Verbeek (2005) and Lezaun (2011) have examined projects in design, social psychology and computing that seek to purposefully equip objects and environments with normative capacities, from cars designed to help us burn less fuel, thereby enabling us to be good 'environmental citizens', to workplace technologies that allow workers to act as participants in a workplace democracy. In detailing these efforts to design politics and morality into objects, this work shows how objects, devices and settings are deployed to specify political and democratic forms and ideals in distinctively material terms.

An experimental perspective on political ontology builds on the empirical approach to political ontology and the wider shift from epistemology to ontology in STS. It proposes to examine how politics and democracy are accomplished through the deployment of devices, objects and settings, rather than accounting for politics and democracy in an epistemic register, that is, in terms of the deployment of discourses and ideas only (for a discussion, see Marres and Lezaun, 2011). In doing so, experimental ontology seeks to account for politics and democracy not only as latent effects but also as constituted forms. In empirical ontology, politics is understood as an attribute of ontology in general and there is a politicization of ontology as such. In experimental ontology, by contrast, the point is the (re)specification of particular political categories in ontological terms – it is concerned with the ontologization of politics. To elucidate this process, experimental ontology proposes that we must move beyond the distinction between constituting and constituted ontologies. The deployment of things may affect the very specification of politics and democracy as public forms: we must examine how non-humans leave their mark on democracy as an ideal. I will analyse this effect in some more empirical detail below, but it should already be clear that experimental ontology offers a distinctive way of dealing with the difficulty of how to insert non-humans into democracy that distinguishes it from both theoretical and empirical ontologies.

In theoretical ontology, this difficulty is addressed through the examination of anti-materialist and materialist theories of politics and morality. For example, political theorists

like Frost (2008) and Bennett (2010) have shown that political ontologies formulated by authors as diverse as Thomas Hobbes and Henry Thoreau offer important conceptual resources for a theorization of democratic subjectivity in relational and material terms. Other political theorists have proposed to address the difficulty with the aid of a prescriptive distinction, that between de facto and de jure modes of involvement, proposing to distinguish between material modes of being affected by things, events or issues, and discursive or procedural forms of getting involved in political affairs (Dobson, 2003; see also Marres, 2012a). From this perspective, to use the moral or political language of 'participation' for the role of non-humans is to muddle two different modalities of being 'caught up' in social and political processes. However, as I will discuss below, in practices of material participation it is precisely impossible to keep these two levels separate: confusion between material and discursive involvement is exactly what material settings of participation produce. (The muddling of these modes of involvement was quite adequately captured by the ANT term 'enrolment', which signalled at once complicity and engagement, except that in ANT it is understood as a sub-political effect, not a performative accomplishment.)

Empirical ontology makes possible the aforementioned solution; it enables the distinction between constituting and constituted politics or democracy. From this standpoint, normatively significant variations in the composition of the world tend to occur on the plane of sub-politics, well below the radar of what is recognized in public discourse at the time. This locates the political contributions of non-humans on the 'constituting' side of the constituting/constituted distinction.[7] Experimental ontology takes up the empirical ontological idea that non-humans have political capacities but deviates from it by undoing the distinction between constituting and constituted politics and democracy. In experimental ontology, the politics of non-humans cannot be relegated to the plane of constitutive ontology. The deliberate investment of things with normative capacities equally operates upon constituted ontologies, the forms of public life there enabled.

The question is what happens to the difficulties resulting from the insertion of non-humans into democracy. To answer this question, we need to gain a clearer understanding of how experimental ontology differs from empirical ontology, and in the remainder of this article, I will explore their differences by examining particular empirical sites, eco-show homes, where experimental ontology can be seen at work. In the conclusion, I will return to the difficulties that non-humans pose for democracy.

The demonstrational eco-show home as a device of material participation

Eco-show homes offer a plethora of examples of attempts to equip settings, devices and objects with the capacity to facilitate citizenship and, sometimes, democracy. Indeed, this particular understanding of political ontology – as involving the deliberate investment of things with normative capacities by experimental means – occurred to me during a series of house visits to eco-show homes in the greater London area between 2007 and 2010.[8] During an European Union (EU)–funded research project on technologies of environmental citizenship, I participated in public tours of a range of demonstrational environmental homes, from the Kingspan 'carbon-neutral pre-fab show home' on display during a 3-day building industry conference in Watford, to the 'extreme refurb' undertaken by a group of

friends in East London of their Victorian terraced house, which was a participant in London Open House, a yearly event in which homes and buildings all over London open their doors to the public. Taking public home tours provided an effective way of unlearning the assumption that the politics of things is a latent phenomenon. Walking around carefully arranged domestic interiors, with tour guides pointing out the wonders of triple glazing, solar heating and biomass boilers, amidst exclamations of appreciation of some fellow visitors, it was clear that, in some settings, the normative capacities of things are very loudly proclaimed. Eco-home demonstrations involved explicit attempts to establish the special capacities of domestic objects and settings to enable people to be good citizens, act upon environmental issues and 'be part of the change'.

According to the literature, demonstrational environmental houses enable a distinctive form of public politics, which Lovell (2007) calls a 'politics of exemplification'; the material artefact of the eco-home provides a key rhetorical device in recent attempts to secure policy change 'from the outside' (Lovell, 2007; see also Guy and Moore, 2005). Show homes have been described as 'technologies of democracy' in Bijker and Bijsterveld's (2000) study of the role of advice committees of women in housing design in the Netherlands in the 1960s. These committees involved prospective users in the evaluation of house designs during house tours of prototype homes (Cockburn and Furst-Dilic, 1994; see also Oswell, 2008). The eco-show homes that I visited in and around London could equally be described as material devices of public participation, as they were deployed as instruments to engage residents, stakeholders and wider audiences in the proposition of environmental living. Especially relevant for my discussion here are the ways in which the eco-show homes I visited were expressly equipped to facilitate environmental engagement, using various material/empirical means such as information displays on walls, the labelling of objects like thermostats with information about the environmental costs of domestic heating or, rather more drastically, translucent panelling inserted in walls to display the insulation.

A poster encountered on a door during a tour of the Green Living Eco-retrofit in the Borough of Islington can serve as a telling example. This Edwardian terraced house had recently been renovated to a reasonably high environmental standard by the local government in collaboration with a housing development corporation called United House as an example of sustainable social housing. I was invited to this public tour by a member of the local Carbon Action Rationing Group, and one of the first things I noticed upon entering the small house was a poster attached to the door opening into the living room, which stated: 'Carbon saving = 50% the technology & 50% the way the tenant uses it !!' (see Figure 1). The poster listed a number of different ways 'we engage with residents, to help them make the best use of their eco refurb', including 'provid[ing] pictures and graphics where possible e.g. label local thermostat showing cost' and 'putting a limit on some bad practice e.g. window opening in cold weather' (with the added caveat that 'such measures are probably not allowable!') and finally noting that 'a Working Party with professionals [is] already working on this problem: Dr Mike P., a psychologist at Univ Hertfordshire'. These points seemed to be underlined by a smart electricity meter that just happened to stand on a nearby coffee table, a device for gathering data and providing feedback about domestic energy consumption in so-called real time.

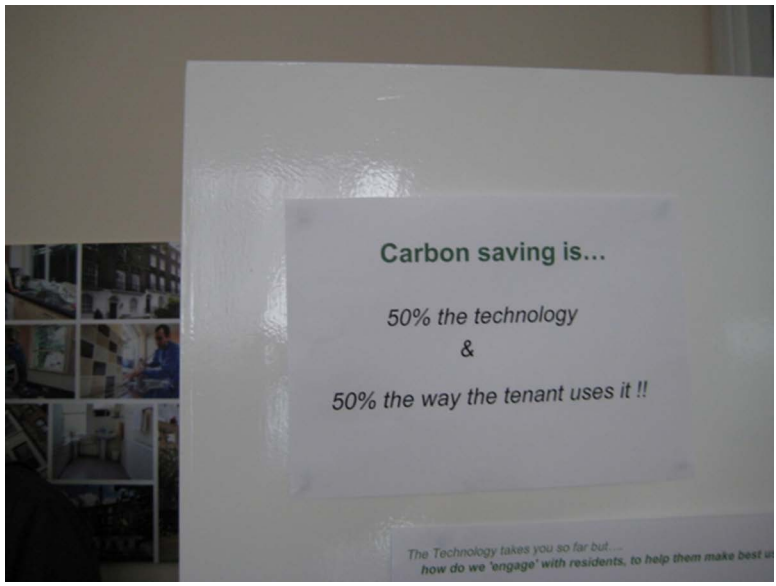

Figure 1. Islington Green Living Re-fit, Islington Council in collaboration with United House, July 2008.

This anecdote can help to distinguish an experimental understanding of the relation between ontology and politics from an empirical one. First, it provides a concrete example of a point I made above. Insofar as we can ascribe a politics to things in a setting like an eco-show home, this politics can certainly not be characterized as a latent, surreptitious force that is exerted below the radar of public discourse. To the contrary, in this setting, material devices – a poster on the door and the window and thermostat nearby – are deployed in order to make a public show of the capacity of domestic environments to do normative work, that is, to engage people, to encourage them to act in moral, political and economical ways on environmental issues.[9] There is, then, nothing hidden about the fact that things are here enlisted in the enactment of environmental participation (though of course this enlistment itself may hide other things). For this reason, it would not suffice to say in this case that non-human entities like doors, windows, heat and thermostats contribute to the performance of public engagement. Material entities here do not only inform the constitution of the phenomenon but also contribute to its specification in distinctively material terms.

In the Islington Green Living Eco-retrofit, environmental participation is *formatted* as a particular type of material action, one in which residents engage with environmental issues through measurable domestic acts like turning down the thermostat or airing a room.[10] In this setting, material entities do not just contribute to the enactment of participation by enrolling actors on a sub-discursive level. The deployment of the setting (a living room and a poster on a door) here informs the very form of the phenomenon enacted–participation. This show home articulates the involvement of everyday people in environmental issues in terms of domestic practices and their modification. It locates

participation in the home and formats it in terms of everyday material action: people are to engage in the issue of climate change by operating windows, thermostats and so on. Here, the role of non-humans in the enactment of a political and moral phenomenon cannot be located on either side of the distinction between participation as a constituting and a constituted phenomena but runs across the two registers.

The particular device of a poster on a door in an eco-show home can then help to clarify some of the differences between an empirical and an experimental understanding of political ontology. Adopting an empirical perspective, one could say that a given concept or ideal, say environmental participation, is here performed in empirical practice. This reading is certainly not implausible. Decoding the poster on the living room door described above, one could argue that the concept of co-production, or at least a version thereof, is here enacted by material means; an assemblage of social, material, technical and discursive elements, the setting of the eco-show home performs a particular version of sustainable housing, one in which the greening of the housing stock requires both a technological and a human contribution as stated explicitly on the poster: '50% technology + 50% the user'.[11] (This proposition, as put forward by the Highbury Eco-refit, we should also note, provides nothing like the idea of co-production as put forward in STS. On the poster described above, as on other visuals on display in different rooms of this house, human and technological contributions are quantified in purely additive fashion rather than framed as underdetermined, heterogeneous social–technical entanglements as in STS.) In such a reading, there is a politics to this material device in at least two senses. First, the Islington Green Living Eco-retrofit *enacts* a political reality, one in which residents of social housing actively participate in performing environmental change, that is, the so-called greening of the housing stock, and do much of the work of reducing energy demand while not necessarily receiving the associated savings in their accounts.[12] Second, this performance of domestically enabled environmental engagement may *intervene* in the world in different ways, materially, discursively or socio-technically, for example, by enrolling actors such as local communities, governmental organizations and environmental researchers in the enactment of this particular, disciplinary version of environmental engagement in and with the home (more on this below).

However, in the Islington Green Living house, something more was going on, something beyond the located enactment of environmental engagement suggested by empirical ontology. This setting did not just enable a particular moral or political phenomenon, environmental engagement, to be brought into being. Here, a terraced social housing property, a living room and a thermostat were expressly equipped so as to enable a distinctively material form of politics: the enactment of participation in and as domestic material practice. In this regard, the normative project of carving out an active role for material entities and settings in participation can here be defined as *a project of the setting*. This implies a different account of the relation between ontology and politics from the empirical one.

The enactment of material participation in the Islington show home does not respect the distinction between constituting and constituted ontology. As we have seen, in the Green Living Eco-refit, things do not contribute to the enactment of a normative phenomenon, in this case participation, in a latent manner. Rather, material settings and things are here themselves equipped to play a visible and notable part in the enactment of engagement. The setting and its objects here participate in the specification of

participation as a normative ideal, and perhaps indeed of democracy, in distinctively material terms: they articulate environmental engagement as a form of everyday material action (Marres, 2011). As such, this eco-show home provides the material upon which an argument can be made against the stance that the politics of things does not require acknowledgement on the level of democratic procedures or ideals. There is also a different point to be made here. My reading of the eco-show home implies a different account than is suggested by empirical ontology of who and what does ontological work. One way of seeing empirical ontology is to say that it relocates ontological work from theory to practice. This approach describes how entities and relations that theoretical ontologists posit on an abstract plane are performed in empirical practice. My account of the eco-show home so far suggests a different understanding of ontology. I argue that the ontological work of specifying the features of a moral and political phenomenon –participation – is not so much *relocated* from one domain (theory) to another (empirical practice). Rather, it is *distributed* among a broad range of actors and registers.

In the Islington eco-show home, a range of entities including a poster on a door, a thermostat, a smart meter, a tour guide, a living room, and community activists, as well as a social researcher/theorist all played a role in the specification of material participation. And crucially, as a consequence, it is impossible to say on which side of the theory/practice divide ontology must be located. It is *not* just the case that something theoretical ontologists would locate on an abstract plane is here enacted in empirical practice: the specification of participation, its features and constituent elements. The articulation of participation is not so much relocated from theory to empirical practice; rather, the specification of participation in material terms is brought about by a broad range of entities that operate in both empirical and conceptual modes to the point that it becomes impossible to clearly distinguish between what happens on an empirical plane and what on a conceptual one.[13] The 'ontological work' of specifying the features of material participation is something in which the setting, actors, stuff, statements on posters and the researching theorist all have parts to play. As a consequence, the question is not so much whether theorists (or theory) or practitioners (or practice) are specifying a political ontology. The work of articulating material participation is distributed in a much looser, unsettled way among the entities and actors involved (Marres, 2012b).

Interlude: politics, ontology and the empirical

My account so far has implications for how we understand not only the relations between politics and ontology but also those between politics, ontology and *the empirical*. Empirical technologies play an important part in the enactment of material participation in the eco-show homes, and it seems important to say more about this, however briefly. The role of empirical knowledge and technologies in the conduct of public and political life has been a central concern in STS, and what I called above the 'empiricization' of ontology has been offered as a key contribution to its analysis. So far I have suggested that the demonstrational setting of the eco-home brings ontology and politics into relation in a distinctive way; the deployment of empirical technologies, and of domestic settings *as* empirical devices, is crucial in this respect. In this section, I therefore want to

clarify what is distinctive in this case about the role of empirical devices in the enactment of a material participation – and in bringing together politics and ontology.

Eco-show homes present us with empirical technologies of different kinds and in different senses of the phrase. First, these homes can be defined as empirical settings insofar as they are expressly equipped to facilitate the showcasing, or demonstration, of a proposition: environmental living and/or sustainable housing (Lovell, 2007; Murphy, 2006). As discussed above, eco-show homes have various technologies of display embedded in them that, serve to publicize their environmental credentials, from a label on a window advertising a special type of triple glazing, to an Energy Performance Certificate on display in a prominent place. Second, empirical devices also play an important role in securing the status and operation of eco-show homes as *environmental* settings. These homes tend to be equipped with various devices for the measurement, monitoring and documentation of the performance of materials, peoples and settings, from smart meters monitoring energy use, to sensors embedded in walls – such as the 'thermocouples embedded in dwellings linked to a data logger to gather performance data', in the Highbury Refit,[14] or a special fan that can be used to test the airtightness of dwellings.[15] These devices for the detection and display of material performance are critical to the articulation of domestic settings as sites for (un)sustainable living: measurement is one of the principal means through which a home can be defined as more or less environmentally harmful or friendly (Miller, 2005). Finally, empirical devices play an important role in the articulation of distinctively material modes of participation in and with eco-homes. The specification of this mode of involvement, in this setting, seems to critically depend on the deployment of devices of 'environmental sensing', to use Murphy's (2006) helpful term.

Another example can help to make this clear: the blog 'The Greening of Hedgerley Wood', which reports on 'one family's attempt to save CO_2' in a rural house in Oxfordshire by means of various more or less drastic house renovations. One entry on this blog covered the installation of a ground heat pump in some detail and includes a picture of Dean, the plumber playfully looking at the camera through his refractometer while the caption reads (see Figure 2):

> Check all the plumbing and electrics and then add glycol to both the ground loops. The mix has to be exactly right to avoid freezing without making the flow sluggish. Dean checks this constantly with his refractometer until he is happy with the level (−1.2).

Further down the page, an account of the blogger himself and his wife taking a bath later in the day describes them as 'enchanted' by the warm water provided by the newly installed heat pump.[16]

The ground heat pump, then, was here enacted as an engaging thing, through a combination of devices that each can be defined as empirical, though for different reasons: a refractometer, a photo, a blog post and the taking of a bath. Each of these instruments enabled the enactment of a material form of implication, an object-oriented mode of absorption or involvement with the domestic setting and its wider environment. And this particular deployment of empirical devices to perform participation brings ontology, the empirical, politics – and the public – together in a particular way, one that not only brings to mind recent accounts in STS but also can be distinguished from them.

Figure 2. Installation of a ground heat pump at Hedgerley Wood, 11 October 2005.

No doubt the most familiar way of establishing the relation between the empirical and the public in STS is through reference to a slogan of empiricism that 'seeing is believing': to witness an experiment is to be constituted as its public (see Shapin and Schaffer, 1989). This slogan invokes an epistemic understanding of empiricism, proposing as it does that knowledge is principally a matter of sense perception. Taking issue with such a narrow, human-centred understanding of empiricism, STS scholars have added social, technological, literary and political accounts of how this type of empirical 'belief' actually comes about in scientific and technological practices. Recent studies in STS and elsewhere have extended this account by arguing that empirical devices enable the performance of participation in 'an ontological way', proposing that in experimental settings participation itself is mediated by things, technologies and matter rather than by the epistemic means of discourse and ideas (Barry, 2001; Girard and Stark, 2007; Latour, 2005a; see also Marres, 2007). These works insist on the material efficacy of empirical technologies in facilitating public participation.[17] Devices like PowerPoint presentations and architectural models successfully draw people in: they are effective because they engage actors not just through their senses but as embodied beings (Barry, 1998). Ontological accounts tend to concentrate on establishing the engaging power of things: they argue that there is an important material substrate to the empirical; that as long as empirical technologies are understood as acting primarily upon the senses – they are there to present the evidence on which basis people may form opinions or act – their capacities to engage people materially tends to go under-acknowledged. In my examples from eco-show homes, however, the material powers of engagement of empirical technologies are not under-acknowledged. Here, empirical devices are deployed to *explicate* the engaging capacities of material things, as in the case of the labelled thermostat or the

bathwater heated by a ground pump (on explication, see Muniesa and Linhardt, 2011; see also Woolgar, 2005).[18] This implies a different understanding of the relation between the empirical, politics, ontology and the public.

Accounts that emphasize the implicit material power of empirical devices preserve an important feature of the classic distinction between the empirical and ontology. Ontology is classically defined as what transcends the empirical, whereas the empirical is supposed to involve a limitation to what is observable. Materially sensitive accounts of empirical devices problematize this distinction, as they highlight how such devices do not just facilitate observation but also intervene materially in the organization of phenomena. However, these accounts uphold a key assumption of empirical ontology: they suggest that material effects occur outside of the empirical framework strictly speaking, insofar as they characterize them as latent and implicit. By contrast, if we approach empirical devices as instruments of explication, which may help to articulate the normative capacities of things – that is, their capacity to facilitate environmental participation – in public, there is nothing implicit about the material effects they enable. In the first case, the material efficacy of empirical devices is posited outside the empirical frame and below the plane of democratic forms. In the second case, empirical devices allow for the display of material efficacy inside the frame of the empirical setting, and arguably these devices assist in the specification of material engagement as a distinctive mode of public involvement. It is a bit of a headache, but politics, ontology, the empirical and the public have to be taken in at once.

Experimentalizing ontology: the normative variability of objects

Why refer to this particular way of bringing politics, ontology and the empirical together as 'experimental' ontology? To be sure, an empirical approach to political ontology also focuses our attention on experimental settings, as a site where entities are enacted, interin reality are made or the composition of the world is durably affected. For this reason, indeed, these ontological interventions could be called 'experimental' just as well. However, one reason for reserving the word 'experimental' for the more openly political interventions under discussion here is that they involve tentative articulations of uncertain forms of public life: they carve out forms of participation that do not necessarily have a solid reference in prevailing understandings and theories of the public (see on this notion of the experiment, Jimenez, in press; Kelty, 2005). An empirically equipped setting like the eco-show home, then, makes possible an experiment in the 'materialization' of participation: to establish *as a viable proposition* the enactment of public engagement – a key form of democratic life – by material means (a thermostat, a home and taking a bath). In this last section, I want to add one further explanation for why this opens up an experimental take on political ontology, an explanation that insists on the democratic potential of material settings.

A demonstrational site like the eco-show home, one could argue, helps to render political ontology *variable*. I mentioned in my introduction that the commitment to render ontology empirical and to render it political often go hand in hand, in STS as well as elsewhere. One way to explain why the two movements should occur together is to point

to this third operation upon ontology: to render ontology empirical is to render it *variable*. To say that the question of 'what exists' is partly settled in empirical practices is to render ontology dynamic; the composition of the world must now be considered changeable. On a general level, this means that empirical ontology challenges a classic feature of theoretical ontology. Ontology has often been taken to describe the stable features of the world, with the empirical connoting the merely temporary upheavals in the fleeting world of appearances, to use the philosophical parlance.[19] Ascribing to science and technology the capacity to transform the composition of the world, STS has claimed that ontology must be understood in more dynamic terms. And it is this changeability of what exists that renders ontology political, for if what exists may vary, current states of affairs may be strengthened, contested and undone through intervention.[20]

It has been debated, in STS as well as elsewhere, how exactly this ontological variability is to be understood. Classic arguments in ANT about variable ontology focused on what we might call the 'constitutive variability' of the world. As discussed, work in this area has characterized science and technology as special agents of ontological transformation (Hacking, 2004; Latour, 1999). More recent studies have foregrounded what we might call 'performative variability' on the ontological level: there is variation in what the world is made to be in different practices (Law, 2009; Mol, 2002). Ontology is variable insofar as a given object is enacted differently across different practices in space as well as time. Arguably, this latter form of ontological variation can be observed in eco-show homes too. The homes I have discussed come in very different shapes and sizes – from a refurbished Victorian social housing property to a newly built prefabricated 'affordable home', to a rural, privately owned home, and so on. As such, these homes enable very different enactments of sustainable living and of environmental participation.[21]

The Highbury Green Living Re-fit enables a rather disciplinary type of environmental living, as its domestic setting is invested with punitive powers of engagement (Hobson, 2006). As mentioned, the thermostat may not go beyond a certain temperature, and a smart meter makes it possible to detect so-called bad practices like opening a window (the humorous presentation of these possibilities makes little difference to the normative capacities thus articulated). In the stories coming out of Hedgerley Wood, by contrast, the investment of the setting with captivating abilities takes on a rather more enchanting aspect. As enticingly warm bathwater brings home the point of a newly installed heat pump: this eco-show home arguably enables an embodied, affective mode of engaging with the environment (Murphy, 2006). In yet another case, a terraced Victorian house in East London subjected to an extreme eco-refurb, the eco-show home was equipped to demonstrate the bureaucratic and political obstacles encountered during the renovation process. During a building permission party in said house, residents hung the transcripts of negotiations with Hackney Council on the wall, including references to neighbours who had objected about the visual pollution caused by the solar photovoltaic (PV) panels they had proposed for the roof.

Eco-show homes, then, enable a spectrum of different forms of environmental participation. This performative range of the device seems key to its affordances as a political instrument: to curate an eco-show home is not just to intervene in the realm of environmental policy as if from the outside, but to add a proposition to those already in circulation about what constitutes environmental housing from the inside out and an attempt to

elaborate and differ from other such propositions (Marres, 2012b). However, eco-show homes do not just enable variations among the enactments of environmental participation. They also facilitate a different type of ontological variation, the normative variability of objects themselves.

An example can help to make this clear. The London-based filmmaker and lecturer Polly Nash maintained a blog on which she recounted her efforts to live on a minimum energy budget for the duration of 1 month. Hosted by a South London community project, the Climate Action Network of Herne Hill, and inspired by an environmental living manual produced by 'The Ministry of Trying to Do Something About It', the blog details Nash's practical efforts to radically cut down on domestic resource use (water, electricity, gas), providing minute descriptions of the resulting shifts in everyday routines. In the last entry, Nash looks back on the experiment:

> Some of the things I have done during this period have been marginally more time consuming, brushing the carpet for one, filling up buckets and moving them from room to room, but I spend less time in the bath room washing […] I have stopped running the tap without either a carton, a cup, a pan or a bucket underneath or at the very least the plug in. Rather than automatically turning the tap to wash my hands, I reach for the margarine tub and scoop out some old water from a bucket and pour it over them. I see no reason why not to continue with this. I only wish we could get a water meter. (Polly Nash, Ration me up blog, 30 April 2009[22])

The blog post features a photo zooming in on a brush in Nash's hand cleaning a carpet, providing a quite literal illustration not only of the myopic vision that environmental living is sometimes said to induce, but also, arguably, of the material awareness enabled by a setting like this (see Figure 3).

Figure 3. With brush, Polly Nash, Ration me up blog, 30 April 2009.

On one level, this account provides another example of the occasions provided by demonstrational homes, including homes like Nash's, made demonstrational to explicate the normative capacities of things. Material activities like brushing the carpet and washing one's hands highlight the captivating power of things and their ability to facilitate environmental awareness or a heightened sense of the setting, of the stuff involved in their and our maintenance and of the wider material, technical and social conditions for everyday life.[23] In eco-show homes, things may acquire a normative charge, and this may be indicative of a particular kind of ontological variability, one in which the normative charge of objects varies. In the accounts above, mundane activities like bathing and cleaning come to resonate with wider environmental concerns such as CO_2 emissions and the need to live with scarcity. Material practices that are marked by their utter ordinariness here acquire a more exceptional capacity to clarify the environmental conditions of life. Furthermore, in these examples, material entities also gain a certain liveliness: scooping water and taking a bath are themselves marked by a peculiar dynamism, and this 'happening' nature of everyday material things seems crucial to their ability to captivate actors and resonate with the issues at hand.[24] These accounts of environmental living then put on display a distinctive type of normative variability internal to objects – the freshly heated bathwater, the scooped water – and this variability seems to feed quite directly into the enactment of environmental engagement by these material means.[25]

Political and cultural theorists have recently invoked 19th-century theories of vitalism in order to account for the engaging capacities of things (Bennett, 2010; Hawkins, 2011). Proposing terms like the 'vibrancy of matter' (Bennett, 2010), they have directed attention to the quasi-animate capacities of supposedly inanimate things, insisting that this is critical to the capabilities of material entities to play a political or moral role. Significant about the above demonstrations of environmental living, in this respect, is that here the liveliness of things is invoked with the aid of empirical devices. They suggest that liveliness may indeed be key to the normativity capacities of things but that this may be an *acquired capacity*. The dynamic normativity of objects on display in eco-show homes is highly artificial in the sense that its explication depends on empirical devices, like the diary note (blog post) and photography. The normative capacities of things, including their vibrancy, can here be characterized as an accomplishment of the setting.[26] We are dealing here with an experimental type of normative variability.

To understand material powers of engagement as artificial is also to say that these powers can never be taken for granted. During the tour of the Highbury Green Living Re-fit, a visitor made an enjoyable attempt to undo the performance of the engaging gadget, commenting on our tour guide's presentation of the smart OWL electricity meter: 'Yes, I got one for Christmas, but didn't unpack it yet'. And this was July. However, this artificiality or 'under-determinacy' of material engagement does not necessarily detract from its normative efficacy (Michael and Gaver, 2009). Rather, it suggests a particular account of what it means for things to have political capacities, for this is not a given or fixed feature or a property of things. It is a capacity acquired with the aid of auxiliary devices. The experimental status of the engaging object does not detract from, but instead adds to, its allowances for participation.

An experimental approach to political ontology questions the wisdom of assigning political capacities to a given set of entities once and for all and of fixing

political ontology in this way. It suggests that political and moral roles for entities, human and non-human, are enabled by experimental means and may be lost when no longer supported. In this, experimental ontology differs not just from theoretical ontology, but also from empirical ontology.[27] Empirical ontologies foreground variations in either the composition or the performance of reality, thereby revealing that there is a political dimension to ontological change. However, in detailing how ontologies vary in practice, empirical ontology did not entirely free itself from the suspicion that it tried to describe the structure of the world, to fix what exists in a conceptual framework. It proposed a variable ontology. Experimental ontology, like empirical ontology, is firmly committed to recognizing the variable normativity of things, but it seeks to account for their normative capacities as themselves accomplished by experimental means and as in themselves variable.

Conclusion

Examining a setting like the eco-show home helps explicate differences between two versions of political ontology, the empirical and the experimental. In demonstrational eco-homes, we can observe attempts to perform through empirical means political phenomena like environmental participation, but this is not the only thing going on. Enactments of participation in eco-show homes challenge an empirical approach to political ontology, insofar they undo a distinction that this approach tends to uphold between constituting and constituted phenomena. In eco-show homes, entities that are often assumed to enter only in the constitution of normative phenomena – mundane objects like windows and a thermostat – equally figure as *constituted* political objects. In this setting, non-humans are expressly equipped with democratic capacities to facilitate environmental engagement, and they contribute to the articulation of a distinctively material form of participation. In this respect, the device of the eco-show home brings into view two salient features of experimental ontology as opposed to empirical ontology: the redistribution of political ontology and the normative variability of objects.

First, empirical ontology relocates ontological work from theory to practice, but experimental ontology proposes further that this work is distributed among entities and actors that each operate across conceptual and empirical registers. Eco-show homes, that is, do not just provide an empirical setting for the performance of normative phenomena, which non-empirical ontologists are inclined to posit on the plane of theory. Rather, the work of articulating a distinctively material mode of public participation is here accomplished in a distributed way, as the material setting, social actors, technologies and the visiting researcher/theorist all contribute to it. It is not the case that empirical practice does the work of theory; rather, in this setting, empirical and theoretical work is shared among differently positioned actors to the point that this distinction between the conceptual and the empirical becomes blurred and unstable. This is evident in that it is hard to say in final terms whether it is the empirically equipped living room, the brochures handed out by the tour guide, the visiting sociologist or all of the above that define participation as a material practice. Second, demonstrational eco-homes also help to clarify another issue of importance to both empirical and experimental approaches: ontological variation. Eco-show homes direct attention to a particular type of variation that to my knowledge has not received that much attention from empirical ontologists, which is the

normative variability of objects themselves. As in the case of the bathwater and brush discussed above, in eco-show homes everyday things may acquire and resonate with the power to engage. As I have tried to show, an experimental apparatus such as that of the eco-home is crucial in enabling such a variable normativity of objects.

From these two salient features of experimental ontology, something important follows for the understanding of the problems that non-humans pose for democracy. One could say that the setting of the eco-show home facilitates two critical operations upon this problematic. First, this setting helps to dissolve problems of non-humans for democracy. Here, material objects are made to play active and visible roles in the enactment of engagement, and in this way, eco-show homes help to prove that this is not an impossibility: absorption in material settings and activities – from bathing to brushing – is central to the very enactment of environmental engagement. And as they demonstrate this publicly, these settings contribute to the normative project of the insertion of non-humans into democracy. However, this does not necessarily mean that the problem of non-humans is solved in these settings. To the contrary, eco-show homes also offer many articulations of the problems that non-humans pose for democracy. Here, much more clearly than in many other settings, we can pose the question of whether and how material practices serve as traps in which human actors are held captive by trivial, immediate concerns, as in the Islington Green Living Retro-fit. How can an activity like cleaning your carpet with a brush rather than a vacuum cleaner be taken seriously as a contribution to environmental change? Environmental living experiments offer a wealth of observations to demonstrate the fundamental importance of mundane activities, and this by virtue of their very ordinariness, ensures the generalizability of observations made in this setting: for every electronic device in our homes, there are a billion similar ones being switched on in other homes around the world. But this does not mean that eco-homes 'solve' the problems of material participation; they enable their articulation.

Eco-show homes are not just spaces where a more substantial role for non-humans in the enactment of participation is currently being carved out. They equally offer settings for the articulation of problems of material participation, and perhaps democracy. Should material absorption in the setting be welcomed or not in the enactment of environmental engagement? As we have seen, eco-show homes facilitate many different kinds of normative approaches to material participation, from the disciplinary to the affirmative, and as such they are normatively unstable settings. The point of adopting an experimental political ontology, I want to propose by way of conclusion, is to welcome this destabilizing effect. It will not necessarily solve, in and of itself, problems of democracy, but in the analysis of participation, we have become too accustomed to fixing phenomena in terms of their necessary or sufficient features or by locating them on this or that level. Gomart (2002) has characterized experiments as devices for producing indetermination, for suspending and/or undoing established ontologies. Especially with regard to participation, it seems important to learn to value experimental indetermination. In this connection, the rush to overdetermination – to identify the procedure or apparatus that can secure public engagement and to codify a given device as either democratic or not – has been particularly strong.

We then deploy for analytical purposes the experimental capacity of a setting like an eco-show home to produce indetermination. Environmental participation as a phenomenon

is here rendered normatively unstable, and this can help us to examine its political potential. Again, this does not solve the problems that things pose for democracy; it repositions them. Theoretical ontology recognizes the problem that things pose for democracy and tries to solve it by theoretical means. For instance, it might provide a conceptual formulation of the political agency of humans and things that demonstrates that the two are not mutually exclusive. Empirical ontology does not so much solve but dissolve the problem in a double move. It proposes that (1) the problem is predicated on a false assumption that action originates in the naked individual and (2) there is no real need to reconstruct theories of democratic participation to accommodate non-humans, as they already contribute to its enactment in practice. Experimental political ontology offers a different approach. It proposes that the investment of non-humans with political capacities and their insertion into democracy are projects of experimental settings. Experimental ontology rejects the idea that the problem of non-humans for democracy is merely a problem of theory. It is also a problem of practice, and we should not assume any simple distinction between the two. In this way, experimental ontology simply elaborates a point long advocated by empirical ontologists, which is that attempts to conclusively separate the empirical from the theoretical, and to bracket the one while dealing with the other, do not do justice to what happens in practice.

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Notes

1. This article builds on Chapter 5 of Marres (2012a).
2. Whether the connection between the politicization of non-humans and the empiricization of ontology is necessary or desirable is the subject of debate. Here I simply observe that the two manoeuvres are connected in recent work in science and technology studies (STS). As I will discuss in the following, I am more invested in the experimentalization of ontology than its empiricization. For that reason, I do not want to make too much of the aforementioned debate here.
3. I consider a very particular set of non-humans: everyday environments, technologies and objects. I have thus excluded from consideration a broad range of non-humans, such as animals and disastrous natures, like volcano eruptions because, as I have argued elsewhere (Marres, 2012a), to experimentalize political ontology is also to recognize that each setting or object may require its own political theory. Accordingly, the account presented here is by no means exhaustive.
4. These studies find inspiration in a variety of intellectual traditions: phenomenology (Merlau-Ponty), post-structuralism (Foucault) and post-structuralist approaches in feminism (Butler), radical empiricism (Deleuze), the American transcendentalists (Thoreau) and so on.

5. It is certainly not the case that an ontological perspective on science, technology and society is without implications for participation. On the contrary, partly as a consequence of the ontological turn, science and technology should be understood as inherently participatory (Marres, 2009). Accounts of science and technology as socio-technical-material modes of ordering have emphasized that lay actors and audiences play a far more active and important role in the societal domestication of science and technology than epistemic and instrumental perspectives have led us to assume. Classic ontological perspectives on science and technology, then, precisely opened up debates about participation, emphasizing the need to recognize a widened range of actors as participants. However, these earlier contributions on the whole did not translate into attempts to rework formal concepts of public participation in democratic theory along ontological lines.
6. A reader of an earlier version of this article asked whether a performative account of 'what exists' in itself does not also constitute an ontological theory. This is certainly a relevant suggestion, but the problem is that it encourages us to reduce performativity to a theory. In this article, I want to distinguish between a theoretical approach and an empirical approach to the specification of 'what exists' – and, indeed, an experimental one. Performative perspectives in STS have been key to the development of the latter two.
7. One could argue that it is not just in relation to politics and democracy that actor–network theorists distinguish between a constituting ontology and a constituted ontology. Much work in actor–network theory (ANT) assumes a more general distinction between constituting ontology and constituted ontology. It distinguishes between, on the one hand, the proliferating human/non-human associations that contribute to the enactment of social and political life and, on the other hand, the plane of constituted reality that consists of enacted phenomena, like the economy, nature, society and so on (Latour, 2005b). Indeed, this type of conceptual schema makes it possible to say that phenomena are performed in empirical practice. (Which is also to say, the use of the constituted/constituting distinction in ANT is part of a performative understanding of ontology. What exists is at least partly the consequence of what gets performed or enacted into being.)
8. This research was made possible by a Marie Curie European Fellowship, entitled Re-constituting Citizens, hosted by Mike Michael at Department of Sociology, Goldsmiths, University of London.
9. Elsewhere I have discussed the relevance of social studies of public demonstrations to the analysis of eco-show homes as devices of environmental politics (Marres, 2009, 2012a).
10. One could ask why the formatting of participation should be defined as 'ontology': Such a definition is helpful I think, insofar as it situates material participation in relation to the wider shift from epistemology to ontology discussed above. Material participation is a phenomenon that allows us to examine what it means to account for politics, public life and democracy in terms not of knowledge and representation but those of intervention and experiment.
11. The poster text quoted above provides an especially *transportable* account of how this setting articulates environmental participation. However, the more complex assemblage of the setting (living room, social housing, triple glazed windows and thermostat) is the relevant operator of articulation here, and I therefore refer to the poster on a door (next to the thermostat, in a living room, of a social housing terraced home in Highbury Islington and so on). On the importance of the setting as an operator of performance, see Woolgar and Lezaun (2013).
12. During the question and answer session at the end of the tour, someone asked whether tenants would benefit from the energy savings made in these social housing properties. The tour guide did not give a clear answer, suggesting this matter had not been resolved or perhaps even received much attention.

13. I am drawing here on the holistic philosophy of science of Pierre Duhem and the more recent uptake of concepts of distributed agency in STS. Following Duhem, I am insisting on the distributed nature of experimental outcomes: it cannot be conclusively decided whether they are an effect of theory, empirical data or the experimental apparatus. However, where Duhem made an epistemological argument, I argue that this idea of the distributed nature of experimental effects also has implications for an ontological account of public experiments, that is, an account that focuses on the role of settings, devices and objects in the specification of political, social and moral phenomena (Marres, 2012a).
14. Brochure, 'Green Living, Case study of a Victorian flat's eco improvement', United House, 2009.
15. Phil Clark, The refurbishment challenge: airtightness, 7 September 2009. Available at: http://zerochampion.building.co.uk/2009/09/07/the-refurbishment-challenge-air-tightness/ (accessed July 2011).
16. 'The Day Arrives', The Greening of Hedgerley Wood, Tuesday, 11 October 2005. Available at: http://www.hedgerley.net/greening/?p=55 (accessed July 2008).
17. Am I saying that there is some special connection between ontology and materiality? In the introduction to this special issue, Woolgar and Lezaun question whether ontological accounts should necessarily privilege the material dimension of things. I disagree with them on this point: to make a move from epistemology to ontology is to shift from a preoccupation with the 'representation of the world' to a focus on 'intervention in the world'. This is to move from a situation in which it is possible to speak of things being 'merely' material (as discourse is the primary plane of normativity) to one in which materiality emerges as a crucial register of normativity.
18. Eco-show homes arguably provide a public stage for the conferral of capacities of engagement to things, suspending a singular answer to the question of who or what is doing the engaging (Marres, 2009). Is it the ground heat pump that is engaging the inhabitants of Hedgerley Wood or is the blog engaging us as readers or do these operations presuppose one another? Is it the bathtub or the issue of climate change that draws us in or both? In generating such confusion, the eco-show home arguably enables an environmentalization of participation. That is, perhaps we can follow here David Oswell's (unpublished communication) intriguing suggestion that participation in domestic settings literally takes on an environmental aspect. It takes the form of a milieu. To use a trope that is often used in STS, the capacity to engage is here distributed among heterogeneous entities, to the point that it would not be quite accurate to attribute it to a singular actor or cause (Suchman, 2005). However, here I am less interested in these constitutive politics of engagement and so will not explore this further.
19. In classical philosophical ontology, there is plenty of dynamics too, of course, as in Heraclitus' 'everything flows' or Lucretius' ontology of the swerve, according to which worlds come about through contingent encounters of moving atoms. However, as Hans Blumenberg (1996) has argued, these classical ontologies themselves provided the solace of endurance. In Lucretius' philosophy, the spectable of dynamic ontology is observed by contemplative man, standing on the shore staring out to a rocky sea. Blumenberg describes the dissolution of this external philosophical standpoint in modern and late modern times, and experimental ontology can be understood as an attempt at constructive affirmation of this situation.
20. This feature of experimental variability also returns in work on civic epistemology, as in the variation among national experimental cultures studied by Jasanoff (2005). However, such work does not generally take an interest in ontological variations explicated with the aid of experimental devices.
21. Studies of sustainable architecture tend to foreground this variation, with analyses focusing on different types of environmental housing and the different concepts, values or visions

of the environment, sustainability and ecology that they embody. Some are 'carbon-neutral' while others are 'locally sourced', and some are gadget-rich while others derive energy savings from their design, and arguably each of these features invokes a different larger vision of the sustainable future (Guy and Moore, 2005). These studies, however, tend to examine material settings for the values expressed in them and are thus not necessarily interested in the normative capacities of material entities as such. I discuss this elsewhere (Marres, 2012a).

22. Day Thirty, final day. Herne Hill Climate Action Network, Saturday, 24 April 2010. Available at: http://www.hernehillcan.org/rationmeup-blog/day-thirty-final-day (accessed July 2010).
23. These projects draw on very different experimental traditions, including the positivistic tradition of empirical building research (Ganzevles, 2007; Murphy, 2006) and the countercultural genre of the experiment in living (Marres, 2012b). We should of course be careful not to attribute too much coherence to these initiatives.
24. I use the term lively here in a thin sense – to refer to a sense of activity, eventfulness and dynamism of materials in use. In the examples I discuss here, its manifestation critically depends on the experimental apparatus (see Lury and Wakeford, 2012).
25. Elsewhere I have described how practices of electricity meter reading, with the aid of smart meters, put on display the capacity of electricity to engage users (Marres, 2009). The brush and the buckets of the Herne Hill experiment seem to play a similar role. That is, the domestic setting emerges as immensely captivating, resonating with issues of austerity, resource scarcity, climate change and so on.
26. This kind of normative variability of the object is not necessarily something that relies on human action to invest meanings and capacities into objects. Participation cannot be relegated to either the subjects or objects involved. As mentioned, however, here I am not primarily interested in this constitutive aspect of the politics of engagement.
27. See Marres (2012a) for a more extensive account of an experimental approach to the politics of humans and non-humans. There I characterize this approach as non-exceptionalist, proposing that non-humans, like humans, must rely on a performative apparatus in order to intervene politically.

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Author biography

Noortje Marres is a Senior Lecturer in Sociology and Director of the Centre for the Study of Invention and Social Process (CSISP) at Goldsmiths, University of London. She was trained in the sociology and philosophy of science and technology at the University of Amsterdam, and her doctoral research was concerned with issue-centred theories of democracy in technological societies. She has recently published a monograph *Material Participation: Technology, the Environment and Everyday Publics* (Palgrave, 2012).