

Actor Network Theory and Material Semiotics¹

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1. Introduction

Actor-network theory is a disparate family of material-semiotic tools, sensibilities and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. It assumes that nothing has reality or form outside the enactment of those relations. Its studies explore and characterise the webs and the practices that carry them. Like other material-semiotic approaches, the actor-network approach thus describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines, animals, 'nature', ideas, organisations, inequalities, scale and sizes, and geographical arrangements.

In this chapter I explore this definition, expand upon, and qualify it. I start with four qualifications.

First, it is possible to describe actor-network theory in the abstract. I've just done so, and this is often done in textbooks. But this misses the point because it is not abstract but is grounded in empirical case-studies. We can only understand the approach if we have a sense of those case-studies and how these work in practice. Some other parts of social theory (for instance symbolic interactionism) work in the same way and arguably that's how natural science is too: theory is embedded and extended in empirical practice, and practice itself is necessarily theoretical. This means that if this chapter is not to betray the actor-network approach it needs to subvert the definition above by translating it into a set of empirically-grounded practices.

Second, the actor-network approach is not a theory. Theories usually try to explain why something happens, but actor-network theory is descriptive rather than foundational in explanatory terms, which means that it is a disappointment for those seeking strong accounts. Instead it tells stories about 'how' relations assemble or don't. As a form, one of several, of material semiotics, it is better understood as a toolkit for telling interesting stories about, and interfering in, those relations. More profoundly, it is a sensibility to the messy practices of relationality and materiality of the world. Along with this sensibility comes a wariness of the large-scale claims common in social theory: these usually seem too simple.

Three, I've talked of 'it', an actor-network theory, but there is no 'it'. Rather it is a diaspora that overlaps with other intellectual traditions. As I have already hinted, it is better to talk of 'material semiotics' rather than 'actor-network theory'. This better catches the openness, uncertainty, revisability and diversity of the most interesting work. Thus the actor-network successor projects are located in many different case studies, practices and locations done in many different ways and draw on a range of theoretical resources. How much those studies relate to one another is chronically uncertain, but this is better read as a sign of the strength of material semiotic sensibilities than as a weakness. In short, actor-network theory is not a creed or a dogma and at its best a degree of humility is one of its intellectual leitmotifs.

Fourth, if all the world is relational, then so too are texts. They come from

somewhere and tell particular stories about particular relations. This implies the need for a health warning. You should beware of this chapter. I hope that it works and is useful, but it comes from somewhere, rather than everywhere or nowhere. It treats the actor-network approach and material semiotics in a particular way. It proposes and seeks to enact a particular version of this animal. Beware, then, of this chapter, but beware even more of any text about actor-network theory that pretends to the objectivity of an overall view.

In what follows first I offer a particular account of the intellectual origins of the actor-network approach. Second, I characterise what I call 'actor-network theory 1990'. This is the version, with all its strengths and weaknesses, that tends to find its way into textbooks. Then I briefly comment on reactions and responses to this animal. And fourth, I explore aspects of its diasporic creativity since 1995.

2. Origin Stories

If the actor-network approach started at a particular time and place then this was in Paris between 1978 and 1982. The term, devised by Michel Callon, appeared around 1982, but the approach is itself a network that extends out in time and place, so stories of its origins are necessarily in part arbitrary. They lay claim to and include a particular version of the past created for particular purposes. In this section I tell four stories about its origins. My contention is that much of actor-network theory 1990 can be understood as a product of their intersection.

2a. Engineers, Managers and Systems

It is obvious to most engineers that systems are made not simply of technical bits and pieces but also include people. Managers know this too, and those who study engineers and managers not infrequently end up thinking similarly. All are 'system-sensitive' with a strong sense of relationality. An example.

In the late seventies and early eighties Thomas Hughes, historian of technology, wrote about Thomas Edison, engineer and manager, and his new New York electricity supply network. Hughes showed that this was an artful combination of transmission lines, generators, coal supplies, voltages, incandescent filaments, legal manoeuvres, laboratory calculations, political muscle, financial instruments, technicians, laboratory assistants and salesmen. In short, it was a system, and it worked because Edison engineered the bits and pieces together. Hughes emphasises that the architecture of the system was the key. Its individual elements, people or objects, were subordinate to the logic of that architecture, created or reshaped in that system. (Hughes: 1983)

Edison was successful, but the world of engineering is also filled with failures. In 1980 Michel Callon wrote about one of these: the 'electric vehicle'. The French electricity monopoly utility, EDF, concluded that the age of hydrocarbons was ending and proposed an electric vehicle powered by accumulators or fuel cells. EDF would make the motor, Renault the car body, and consumers would adapt their lifestyles. In fact the electric vehicle was never produced. The catalysts in the fuel cells got contaminated and failed.

Renault didn't fancy the technical and economic demotion implied by the plan. And the town councils didn't want to buy the electric-powered buses that were supposed to popularise the new technology. Callon's problem, which was to become the key problem for actor-network theory 1990, was: how can we describe socially and materially heterogeneous systems in all their fragility and obduracy? (Callon: 1980). This is the first context for actor-network theory.

2b. Exemplars and Laboratory Practices

Long before this Thomas Kuhn's The Structure of Scientific Revolutions (Kuhn: 1962) was the focus of fierce debate about the character of science. Did scientists use 'paradigms', pragmatic sets of intellectual and practical tools for scientific puzzle-solving? This was Kuhn's view. Or was scientific knowledge a representation of reality produced by a special scientific method? Such was the view of epistemology. In the late 1960s sociologists read Kuhn and created a sociology of scientific knowledge. A paradigm can be understood, they said, as a culture. Scientists acquire this culture and use it to guide their puzzle-solving practices. Successful puzzle-solving extends the culture, which thus reflects both physical reality and social practices. But success is a practical matter: the issue is, does the paradigm work or not? In this way of thinking the absolute truth of a theory is irrelevant. Indeed, there is no independent way of knowing it. This led to a methodological dictum, the so-called 'principle of symmetry': true and false knowledge, it was said, need to be explained in the same terms (Bloor: 1976).

Though actor-network theory is very different, it borrows from Kuhn and the sociologists of scientific knowledge. I'll return to the principle of symmetry shortly. First a comment on Kuhn. He said that scientists work through cases, exemplars. Knowing the formalisms isn't enough. You need to know what they mean in practice. Kuhn's book, a set of exemplary case-studies, exemplifies this. The sociologists of science worked through exemplary case-studies too. And the nascent actor-network writers, also within the sociology of science and technology, did the same. This is the basic methodological and philosophical principle that I mentioned in the introduction: knowledge lies in exemplars and words are never enough.

The sociologists of science studied scientists' meanings and their exemplary practices. They practised a version of interpretative sociology: creative actors, they said, use scientific culture to solve puzzles. But there are other ways of thinking about scientific practice. When Bruno Latour went to the Salk Institute in the middle 1970s his preoccupations were different. Drawing on the work of A.J. Greimas and ethnomethodology, he explored the semiotics of the practices that lead to scientific truth-claims. He noted that in the laboratory most claims about the world are vague and promiscuously mix the social and the natural. 'Jones told me that his PhD student saw this blip on the graph, and he suspects it might be a sign that ...' says a post-doc over coffee. A tiny handful of these suggestions subsequently get transmuted into the much harder statements about nature that circulate in scientific papers ('the figures in the table show ...'). Latour observed that by the time this has happened the

social has disappeared, along with almost everything to do with how the new truth was produced. With most of the messy relations gone we are left with nature, a textual account of nature, and a set of more or less formulaic statements about method that purport to explain why the latter reflects the former. The intermediate and heterogeneous relations of production are deleted to generate two quite distinct and separate domains: reality on the one hand and knowledge of reality on the other (Latour: 1993; Latour and Woolgar: 1986). It is a system of purification that depends on a heterogeneous web of relations that is subsequently effaced.

Latour does not talk of actor-network theory here, but many of its elements are present: materially heterogeneous relations analysed with semiotic tools; a symmetrical indifference to the truth or otherwise of what it is looking at; concern with the productivity of practice; an interest in circulation; and the predisposition to exemplary case-studies; all of these are signatures of actor-network theory.

2c. Translation, Order and Disorder

So how might we study relationality and its productivity? Latour used Greimas but he and Michel Callon also drew on philosopher of science Michel Serres. Serres writes about order and disorder. In his world there are patches of order in a sea of disorder. The most interesting places lie on the boundaries between order and disorder, or where different orders rub up against one another. Serres generates endless metaphors for imagining the uncertain messengers that pass between different orders or between order and disorder. Angels, parasites, Hermes, the North-West passage, all of these make precarious links between places that do not belong to the same world. The notion of translation is another of his metaphors (Serres: 1974).

To translate is to make two words equivalent. But since no two words are equivalent, translation also implies betrayal: 'traduction, trahison'. So translation is both about making equivalent, and about shifting. It is about moving terms around, about linking and changing them. Michel Callon articulated this in his study of the electric vehicle and his subsequent work on the scallops of St Brieuc Bay. The latter is another exemplary actor-network case-study. It is also notorious because Callon analyses people and scallops in the same terms. His 'generalised symmetry' applies not, as in the sociology of science, to truth and falsity, to epistemology, but to ontology, to the different kinds of actors in the world.

Callon describes how a science of scallops is created with its own researchers, a science that leads to an experimental technology for rearing young scallops. He shows that as a necessary part of the experiment, fishermen are tamed too: they agree not to trawl near the larvae collectors. This, then, is a web of relations that makes and remakes its components. Fishermen, scallops and scientists are all being domesticated in a process of translation that relates, defines and orders objects, human and otherwise. Callon adds that they hold themselves together but they do so precariously. All it takes is for one translation to fail and the whole web of reality unravels.

And indeed this is what happens. One winter night the fishermen invade the protected areas, trawl the larval grounds, and destroy the collectors. (Callon: 1986.) In short, translation is always insecure, a process susceptible to failure. Disorder – or other orders – are only precariously kept at bay.

2d. Post-structuralist Relationality

Precarious relations, the making of the bits and pieces in those relations, a logic of translation, a concern with materials of different kinds, with how it is everything hangs together if it does, such are the intellectual concerns of the actor-network tradition. However, this is a combination of concerns also found in parts of post-structuralism. My final contextual suggestion is that actor-network theory can also be understood as an empirical version of post-structuralism. For instance, ‘actor-networks’ can be seen as scaled-down versions of Michel Foucault’s discourses or epistemes. Foucault asks us to attend to the productively strategic and relational character of epochal epistemes (Foucault: 1979). The actor-network approach asks us to explore the strategic, relational, and productive character of particular, smaller-scale, heterogeneous actor-networks. We’ve seen this for the Salk laboratory and for the scallops. Here’s another example: Latour’s account of the Pasteurisation of France.

Pasteur, a hero of French science, is said to have revolutionised French agriculture. For instance, he discovered the cause of anthrax and created a vaccine for the disease. But how did this happen? Was he, as Hughes claimed of Edison, a great man? Latour rejects this because in a material-semiotic world all actions, including those of great men, are relational effects. To show this he charts how a network of domesticated farms, technicians, laboratories, veterinarians, statistics and bacilli was generated. He describes how they were shaped (in some cases created) in this network. And he shows how the result was generative. Farms were turned into laboratories, vaccines made from attenuated bacteria, cattle stopped dying of anthrax, and Pasteur became a great man (Latour: 1988b). All of which were the effects of a set of materially heterogeneous relations.

We are offered an historical account of particular translations through time rather than a diagnosis of an epochal epistemic syntax. Even so the logic is not far removed from Foucault’s. It can also be understood as an empirical version of Gilles Deleuze’s nomadic philosophy (Deleuze and Guattari: 1988). Latour has observed that we might talk of ‘actant-rhizomes’ rather than ‘actor-networks’, and John Law has argued that there is little difference between Deleuze’s ‘agencement’ (awkwardly translated as ‘assemblage’ in English) and the term ‘actor-network (Law: 2004). Both refer to the provisional assembly of productive, heterogeneous and (this is the crucial point) quite limited forms of ordering located in no larger overall order. This is why it is helpful to see actor-network theory as a particular empirical translation of post-structuralism.

3. Actor-Network Theory 1990

3a. Material-Semiotic Relationality

The date is arbitrary, it could be 1986 or 1994, but I'm trying to catch a moment when actor-network theory achieved recognisable form as a distinctive approach to social theory. A moment when the web of different origins described above had been woven together to craft a workable set of tools carried in a persuasive and well-documented set of case studies. A moment when an agenda, a vocabulary, and a set of ambitions became current. So what was 'actor-network theory 1990'? Here is another exemplary case-study.

How did the Portuguese reach India? How did they maintain their imperial control? Conventional histories talk of spices, trade, wealth, military power and Christianity. With some exceptions they treat technology as an essential but ultimately uninteresting infrastructure. Maritime history talks of innovations in shipbuilding and navigation, but is usually little concerned with the politics or economics of imperialism. In 1986 Law brought the two narratives together. He asked how the Portuguese generated a network that allowed them to control half the world. His answer was that ships, sails, mariners, navigators, stores, spices, winds, currents, astrolabes, stars, guns, ephemerides, gifts, merchants' drafts were all translated into a web. That web, precarious though it was, gave each component a particular shape or form that was to hold together for 150 years. He added that result was a structure of asymmetry. Like Pasteur's lab in Paris, Lisbon became an obligatory point of passage for a whole set of tributaries. Law also argued, following Latour, that the ships became 'immutable mobiles' circulating to and fro in space whilst holding their form and shape constant. This, he said was crucial to the success of the system (Law: 1986).

This study displays all the ingredients of actor-network theory 1990. There is semiotic relationality (it's a network whose elements define and shape one another), heterogeneity (there are different kinds of actors, human and otherwise), and materiality (stuff is there a-plenty, not just 'the social'). There is an insistence on process and its precariousness (all elements need to play their part moment by moment or it all comes unstuck). There is attention to power as an effect (it is a function of network configuration and in particular the creation of immutable mobiles), to space and to scale (how it is that networks extend themselves and translate distant actors). New for actor-network theory, there is an interest in large scale political history. And, crucially, it is a study of how the Portuguese network worked; how it held together; how it shaped its components; how it made a centre and peripheries; in short, of how differences were generated in a semiotic relational logic.

3b. The Erosion of Foundations

The single-minded commitment to relationality makes it possible to explore strange and heterogeneous links and follow surprising actors to equally

surprising places: ships, bacilli, scallops and scientific texts (Latour: 1987). It highlights practices off-limits or uninteresting to non-semiotic approaches: navigational innovations, biological bench work, the habits of larvae, the practices of farmers, food (Mol and Mesman: 1996). It does this by eroding distinctions in kind, ontological distinctions. In short, the toolkit can be understood as a powerful set of devices for levelling divisions usually taken to be foundational. These are demoted and treated as the effect of translations. Human and non-human, meaning and materiality, big and small, macro and micro, social and technical, nature and culture, these are just some of the dualisms undone by this relationality. Obviously this post-humanism is intellectually radical and often controversial. Let me, then, talk of some of these disappearing dualisms.

In actor-network webs the distinction between human and non-human is of little initial analytical importance: people are relational effects that include both the human and the non-human (think, for instance, of 'Pasteur') while object-webs conversely include people (ephemerades). Particular networks may end up being labelled 'human' or 'non-human' but this is a secondary matter. Here then, as with Foucault, there is a powerful if controversial non-humanist relational and semiotic logic at work quite unlike that of humanist sociology. It is obnoxious to those who take people to be morally special, and intellectually flawed for those who frame the social in terms of meaning and intersubjectivity (Collins and Yearley: 1992). For the latter a relational semiotics misses out on what it is that constitutes the social. More generally, humanists simply find it difficult to grasp the intellectual single-mindedness of this logic of relationality. Sometimes, for instance, they misunderstand its empirical studies as examples of foundational sociology, assuming that social categories are being used as an explanatory resource. But in the material semiotics of actor-network theory the social is also being reworked (Latour: 2005).

Again, the distinction between big and small is a relational effect. Callon and Latour (1981, 229) observe that '[i]t is no more difficult to send tanks into Kabul than to dial 999'. Their point is that the same relational logics apply at any scale. Whether we are 'big' or 'small', the largest part of the webs we draw on and allow us to act are hidden. An actor is always a network of elements that it does not fully recognise or know: simplification or 'black boxing' is a necessary part of agency. This implies that the notion of 'level' is also a relational effect. To put it differently, and following the Deleuzian logic mentioned above, there is no overall social, natural or conceptual framework or scale within which events take place: as webs grow they tend to grow their own metrics. But then, without a foundational macro and micro the distinction between macro- and micro-sociologies similarly makes little sense except as a performative effect of those sociologies (Law: 2000): class, nation state, patriarchy become effects rather than explanatory foundations. This is not that to say that they are not real – they may indeed be made real in practice – but they offer no framework for explanation.

Some of the other disappearing dualisms are less contentious. We have seen that the social and the technical are embedded in each other. This means that it

simply isn't possible to explore the social without at the same time studying the hows of relational materiality. Sociologists sometimes experience this as a diversion from serious social analysis. Why, they wonder, does actor-network theory obsess over material minutiae? Why doesn't it look at what is important? The response to this is the counter-complaint that many sociologies have little sense of how the social is done or holds together. They ignore the material practices that generate the social: ships, sailors, currents. They simply move too quickly to a non-material version of the social.

This leads back to another distinction mentioned above. Sociology is usually interested in the whys of the social. It grounds its explanations in somewhat stable agents or frameworks. Actor-network's material semiotics explore the hows. In this non-foundational world nothing is sacred and nothing is necessarily fixed. But this in turn represents a challenge: what might replace the foundations that have been so cheerfully undone? Is it possible to say

anything about network-stabilising regularities, or are we simply left with describing cases, case-by-case? Actor-network theory 1990 responded to this challenge in the only non-foundational way it could, by exploring the logics of network architecture and looking for configurations that might lead to relative stability. Arguably it did this in three different though overlapping ways.

3c. Durability After Foundations

Material durability

There is a straightforward way in which some materials last longer than others. It is easier to imprison people if there are prison walls while, unlike traffic patrols, sleeping policemen are never off duty (Callon and Latour: 1992). So the first argument is that social arrangements delegated into non-bodily physical form tend to hold their shape better than those that simply depend on face-to-face interaction. But note the caveat, 'tend to': everything is a relational effect. Prison walls work better if they are part of a network including guards and penal bureaucracies, while knotted bed-sheets or the sheer passage of time will subvert them. As with Bentham's panopticon, in the end it is the configuration of the web that produces durability. Stability does not inhere in materials themselves.

Strategic durability

Think again of the Portuguese maritime network. Over a long period the Portuguese experimented with novel designs for vessels suitable for exploration and exploitation. They also, and as a matter of explicit royal policy, created a system of celestial navigation. These were deliberate strategies to create a durable network. Equally important for network stability was the translation of strategies developed in other networks. Examples include the art of growing spices, and the desire of Arab mariners to avoid lethal confrontations. Such strategically durable configurations were translated whole and 'black boxed' into the Portuguese web. How they worked was of

little direct interest, though mostly indeed they were durable and reliable.

Do these options exhaust the strategic possibilities? The answer is, arguably not. In practice the actor-network conception of strategy can be understood more broadly to include teleologically ordered patterns of relations indifferent to human intentions. For the Portuguese examples include the actions of the currents and the winds in the South Atlantic that, year after year, more or less reliably pursued their own telos on an annual pattern. Again, with this third form of durability, the actor-network position resonates with that of Foucault who tell us that strategy is not necessarily located in human deliberation. In short, for a material semiotics teleology may not reside in human intentions.

Discursive stability.

Another case-study. How does an organisation hold itself together? This was Law's question in 1990 in his ethnography of a large scientific laboratory. He concluded that the managers worked in a series of different logics, four in number. Sometimes they were entrepreneurs, sometimes bureaucrats, sometimes Kuhnian puzzle-solvers, and sometimes they dabbled in charisma. Law argued that this was not a matter of individual character but of different modes of ordering that extended through people to include technologies and organisational arrangements. Enterprise, for instance, generated self-reliant individualism and demands for performance, organisational cost-centres, and management accountancy systems. Bureaucracy, quite differently, generated a Weberian respect for administrative due process, organisation as a set of competent offices, and an accounting system designed to prevent fraud (Law: 1994).

Law was borrowing from Foucault: the modes of ordering are mini-discourses. But what has this to do with stability? The answer comes in two parts. First, as Foucault insists, discourses define conditions of possibility, making some ways of ordering webs of relations easier and others difficult or impossible. In the UK in 1990 'enterprise' and 'bureaucracy' were standard ordering strategies easy to enact both because they were known to managers, and because they were standard ways of interacting with other organisations. Second, the fact that they are different also contributes to stability. This is because every discourse sets limits to its conditions of possibility so it cannot recognise certain kinds of realities. But those realities exist and they have to be handled. For instance, the laboratory needed bureaucracy but would have been strangled by red tape if this had been the only ordering mode. It likewise depended on enterprise, but would have run the risk of illegality if it had ordered itself in this way alone. It was the multi-discursive ordering of the laboratory that secured its relative stability. When one mode of ordering became problematic others might be more effective. And this was the third non-foundational way for understanding configurational stability developed within actor-network 1990, and it foreshadows the move away from centring that characterises much subsequent material-semiotic work.

4. Responses and Reactions

I've suggested that actor-network theory's refusal of essential foundations was unacceptable to many. Since this, and especially the issue of humanism and non-humanism, is primarily a metaphysical quarrel perhaps all we can do is to note the difference and move on. But there are other critical stories about actor-network 1990. Here are three. First, it was argued that its studies were often centred, managerialist and even military in character, attending to the powerful, sometimes in functionalist and masculinist mode (Star: 1991). Second, it was suggested that the approach effaced whatever could not be translated into network terms, so failing to recognise its own role as an intellectual technology of Othering (Lee and Brown: 1994). And third, it was argued that it was not very aware of its own politics, and in particular of the political agendas of its own stories (Haraway: 1997).

In response it is possible to offer counter-narratives. First, Latour's work on Pasteur shows the latter to be a network effect rather than a shaping genius. Law's managers are similarly treated not as heroes but products of multiple and decentred discourses. In both studies the authors are trying to deconstruct power by 'studying up' rather than down. Second, Latour's laboratory ethnography is an explicit attempt to reject the Othering of French colonial anthropology by applying its techniques (which he originally applied in the classrooms of the Cote D'Ivoire) to high status scientific knowledge. More studying up rather than down. If there is a difference between the West and the Rest it is, Latour tells us, not because the Rest is radically Other, but because the West has accumulated a series of small and practical techniques that generate cumulative advantage (Latour: 1990). Third, it is too simple to say that actor-network has no interest in the origins and construction of its own accounts. Steve Woolgar, who cannot quite be claimed for actor-network theory though he co-authored the Salk laboratory study (Latour and Woolgar: 1979), raised questions of reflexivity for science studies (Woolgar: 1991). Amongst others Latour and Law took up his challenge and wrote in reflexive mode (Latour: 1988c; Latour: 1996; Law: 1994) thus exploring what science studies writing does, what it helps to bring into being – a continuing preoccupation to which I return below.

I could go on: there are rebuttals to each of these counter-narratives. But let me ask what we are doing if we write like this. One response is that we are assuming that something called 'actor-network theory' deserves criticism or defence. But do we want to add succour to this assumption? I have argued that the approach is not a single entity but a multiplicity. I have also argued that it is embedded in case studies. If this is right, then general criticisms or defences of 'the approach' are likely to mistranslate its epistemic and practical import. A second answer takes the form of a question. How useful it is to live in an intellectual world defined by criticism, defence, and the desire to 'win' arguments? This is a complicated question but one way of translating it is to ask whether we really think that there is a single intellectual and political space to be 'won'. Perhaps if we wash away this assumption we might conceive of theoretical intersections differently: as a set of possibly generative partial connections. And this is how I will proceed. My interest is in how the material-

semiotic traditions have interfered with one another to articulate new intellectual tools, sensibilities, questions and versions of politics. The metaphor here is intellectually and politically polytheistic rather than monotheistic: there are, I assume, various truths and various politics. In the final diasporic section of this chapter I articulate a small number of these. Many others, for instance to do with bodies, passions, and spatialities, I exclude purely for reasons of space (Gomart: 2002; Gomart and Hennion: 1999; Hennion: 2001; Law and Mol: 2001).

5. Diaspora

5a. Enactment

Crucial to the new material semiotics is performativity. It is helpful to start with another case-study.

How are strawberries bought and sold? It is possible to drive out inefficiencies and create a perfect market? In Fontaine-en-Sologne in France in 1981 the answer to these questions takes physical and organisational form. In a two-storey building the ground floor is for those selling strawberries, and the first floor for those buying them. Crucial is the fact that buyers and sellers cannot see one another. Equally important is the fact that everyone in both rooms is attending to a single market transaction. This takes the material form of a large electronic display visible to all, which describes the lot being sold, and the level of the current bid. Both buyers and sellers can also see the auctioneer as he sits in his cabin. The prices start high and fall until the lot in question finds a buyer and the price is fixed. If it falls too low the seller can withdraw his strawberries. To repeat, buyers and sellers don't talk with one another directly. They aren't supposed to fix deals in private. The market is intended to be unified and transparent. In short, it is supposed to reproduce the conditions of perfect competition (Garcia-Parpet: 2007; Garcia: 1986).

This study doesn't belong to actor-network: its author was a student of Pierre Bourdieu's. However, it has been assimilated to material semiotics by Callon. Understood in actor-network terms it tells of the creation of a heterogeneous, material-semiotic reality that enacts an approximation to a perfect market (Callon: 1998a; 2007). This is instructive for a number of reasons: it tells us that 'the market' should not be regarded as a state of nature; it suggests, like economic anthropology, that markets will take different forms in different places (Callon: 1998b); and, most important for my story, it tells us that neoclassical economics is not real until it is enacted into being (MacKenzie, Muniesa, and Siu: 2007). In short, we are in the realm of performativity. Economics in theory is all very well, but economics in practice is different. And theory is only translated into practice if it is enacted – in practice. We saw this in the Salk Laboratory and for the Pasteurisation of France. Now we see it for economics. To understand markets we need to trace how the webs of heterogeneous material and social practices produce them. It is these that are performative, that generate realities.

Something seismic is happening here. A vital metaphorical and explanatory shift is taking place. We are no longer dealing with construction, social or otherwise: there is no stable prime-mover, social or individual, to construct anything, no builder, no puppeteer. Pasteur, we have seen, is an effect rather than a cause. Rather we are dealing with enactment or performance. In this heterogeneous world everything plays its part, relationally. The shift is easily misunderstood, but it is crucial. The metaphor of construction – and social construction – will no longer serve. Buyers, sellers, notice boards, strawberries, spatial arrangements, economic theories, and rules of conduct, all of these assemble and together enact a set of practices that make a more or less precarious reality.

5b. Multiplicity

The move to performativity has strange consequences. Here is another case study.

Annemarie Mol's book, The Body Multiple, describes diagnostic and treatment practices for lower limb atherosclerosis. The condition turns up in different forms in different places: in the surgery it presents as pain on walking; in radiography as appears as an X-ray photo of narrowed or blocked blood vessels; in the ultrasound department it takes the form of Doppler readings which detect increases in blood speeds at narrowed sections of vessels; and in the operating theatre it manifests itself as a white paste scraped out of blood vessels by the surgeon (Mol: 2002). It is tempting to say that these are different perspectives on a single disease. This, however, is precisely what Mol rejects. In material-semiotic mode, she argues that each practice generates its own material reality. This means that for atherosclerosis there are four actor-networks or realities rather than one. Then she says that how these relate together, if they do so at all, is itself a practical matter. Sometimes, and for a time, they may be co-ordinated into a single reality, but often this does not happen. So Mol's claim is simple but counter-intuitive. In theory the body may be single but in practice it is multiple because there are many body practices and therefore many bodies.

We have seen how the studies of actor-network theory 1990 describe the more or less precarious generation of realities. Mol has pushed this logic one step further by washing away a single crucial assumption: that successful translation generates a single co-ordinated network and a single coherent reality. Any such coherence, if it happens at all, is a momentary achievement. The logic is Serres-like: most of the time and for most purposes practices produce chronic multiplicity. They may dovetail together, but equally they may be held apart, contradict, or include one another in complex ways.

How do different realities relate together? How might we think of these partial connections (Strathern: 1991)? And then, a new question, how might this patchwork of realities be enacted in better ways? These are the questions that arise if we combine the insistence that realities are enacted with the discovery that they are enacted differently in different places. First the issue of how

realities relate.

5c. Fluidity

The answer is: in complex ways. We have encountered this question already in Law's account of the laboratory managers. Is the laboratory organised in a single way? No, says Law: there are multiple modes of ordering, multiple realities, and it works precisely because these are irreducible to one another (see also (Law: 2002)). The idea there are different logics is basic, too, to Latour who has written of different regimes of enunciation including religion (Latour: 1999), science, and the law. It takes feminist form in the work of Vicky Singleton on ambivalence in public health programmes (Singleton: 1998; Singleton and Michael: 1993). So this is one way of thinking about it. Realities hold solid by relating through discontinuity, or by Othering one another (Law and Singleton: 2005). But perhaps they also hold together because they flow into one another. Madeleine Akrich hints at this in her work on technology transfer: rigid technologies don't translate successfully from the North to the South (Akrich: 1992). Another case study builds on her work by exploring a fluid technology.

In the villages of Zimbabwe pure water is a problem. But one kind of effective pump is widely distributed and used in rural areas. Quite simple, it is manufactured in Harare and sold in kit form to village collectives. Before they install it villagers need to drill a bore-hole with a surrounding concrete apron. Then they attach the base of the pump to the apron and lower the most important working part of the pump, its piston, levers and plunger, down the borehole on the end of a long rod. Then a handle is attached to the head, and the pump is ready for use (de Laet and Mol: 2000).

The pump is a success. It is widespread, and the water that it pumps is cleaner than water from alternative sources. But it is also successful for two further reasons. First, it is very simple. Years of experience have gone into paring it down to a minimum. Second, and more important for my story, it is malleable. When the seals in the pistons fail the leather may be replaced with bits of rubber tyre. If the rods going down the well are too heavy, they can be replaced with lighter alternatives. If the bolts come loose it is surprisingly tolerant: often it just keeps on working. Mechanically it is malleable. And its success as a source of clean water is malleable too. Sometimes this is measured in bacteria counts, but more often than not the indicator is disease – or relative lack of it.

This is a fluid technology. It doesn't work by insisting on rigidity and translating every village into a design created in Harare. Neither does it work by forcing villagers to visit Harare for spare parts. Instead it changes shape – it is a mutable mobile rather than the kind of immutable mobile described by Law when he talked of the Portuguese ships. So as we read the study, first we learn something about objects: these may reconfigure themselves. Second, we learn that different realities may be loosely rather than rigidly associated. And third, we learn that material semiotics does not have to imagine a single

actor-network: that we have on moved from the core preoccupations of actor-network 1990. Webs may be partially associated in endless different ways but the need for a centre has gone.

5d. Realities and Goods

What happens when different enacted realities overlap? Charis Cussins takes us to the Amboseli National Park in Kenya. This is the question: how should the elephants be handled, and how should people relate to them? One of the issues is overgrazing. There are too many elephants in the Park. They need to be culled, or they need to be tolerated beyond the boundaries of the Park. But beyond those boundaries they damage Maasai agriculture. What to do about this? (Thompson: 2002)

There is controversy. On the one hand there are animal behaviourists. They've been studying elephants for a long time and think that these have rights that should be protected. They point to the international scientific journals where they publish their findings, and argue that that the Amboseli elephants are a unique scientific resource for animal behaviour studies. They think that culling is appropriate for management purposes, and they also think that while local people should be compensated for damage they shouldn't be allowed to kill elephants in revenge. Indeed, they are generally distrustful of the local people whom they think will act in ways that undermine conservation. For the same reason they are distrustful of economic development: other than safari tourism, conservation and development co-exist badly. In practice they want to keep most of the elephants in the Park most of the time, but they also want to rent buffer zones to allow some degree of migration.

On the other hand there are conservation biologists. They think that elephants play a key role in conservation: at the right density, neither too high nor too low, they foster biodiversity. They are less interested in knowledge published in international journals than in local ways of witnessing and authenticating links between elephant density and biodiversity. So, for instance, they drive visitors – scientists, tourists, wildlife managers and locals – from site to site so that they can see the differences in tree density. Then they think that both elephants and local people are stakeholders. Both are actively involved in conservation in practice, and both need to be involved and indeed to co-exist if long-term conservation is to be achieved. This will involve development and the creation of profitable forms of land use including tourism, some sustainable hunting, and the migration of elephants beyond the park.

This is material-semiotics at work. Two realities are counterposed, and those realities are heterogeneous, combining and enacting the natural, the social, and the political. But Thompson breaks 'the social' and 'the natural' down further. There are legal issues to do with rights and responsibilities. There are land use questions. There are economic concerns about development. There are scientific or epistemic tensions about the nature of proper knowledge. And then, finally and most important for my story, there are normative or moral issues. How should elephants and the Maasai be treated? What kinds of

beings are they?

We've seen that material-semiotics explores the enactment of realities, the ontological. We've also seen that it describes the making of knowledge, the epistemological. With Thompson's study this philosophical list grows again, for she shows that practices are also about the doing of goods. Goods (or bads), knowledges, and realities, all are being enacted together: this is one of the ways the material-semiotic sensibility leads us into the diaspora.

5e. An Ontological Politics

There is nowhere to hide beyond the performativity of the webs. But since our own stories weave further webs, it is never the case that they simply describe. They too enact realities and versions of the better and the worse, the right and the wrong, the appealing and the unappealing. There is no innocence. The good is being done as well as the epistemological and the ontological.

Actor-network 1990 knew this in theory (Latour: 1988a) though it sometimes forgot it in practice. It was forcibly reminded of its non-innocence by Donna Haraway in her own much more explicitly political material-semiotics (Haraway: 1991a; Haraway: 1991b). We make realities, she said. The only question is: what kind of difference do we want to make? Material-semiotic writers have responded to this question in different ways. Haraway uses tropes – most famously the cyborg – that interfere with and undermine politically and ethically obnoxious realities. Latour talks of 'ontopolitics' (Hinchliffe and others: 2005; Stengers: 1997) and of a 'parliament of things' where what is real, and how it might live together, are provisionally determined (Latour: 1993; Latour: 2004a). Mol talks of 'ontological politics' in the specific context of health care (Mol: 1999). STS feminist writer Moser defends practice-based versions of dementia (Moser: 2007). Post-colonial STS writer Helen Verran talks of the ontic softening that would help encounters between the realities of Western technoscience and indigenous knowledge systems (Verran: 1998; Verran: 2001). And Law, resisting the idea that the different versions of the real can be brought together at a single site of representation, offers methodological tools for partial connection (Law: 2004).

There are important differences in the scope and the character of these political visions, but most are specific. Such is what one would expect in the performative, multiple and partially connected world of material semiotics: there are no general solutions. Latour's non-modern constitution is perhaps an exception, but Haraway's tropic bending leads us to specific Politics with a capital P both with the cyborg and her subsequent writing on companion species (Haraway: 2003)). Mol's ontological politics is health-care located. Walking therapy is cheaper than surgery and often more effective in treating lower limb atherosclerosis. (More recently she has defended 'care' against individualist models for practising diabetes control (Mol: 2008)). Moser's interventions in dementia are also specific, as are Verran's post-colonial visions which have to do with counting in Yoruba classrooms, and land use and ownership in Australia.

But if the differences between these visions are important, so too are the

similarities. This new material semiotics insists that the stories of social theory are performative, not innocent. It also assumes that reality is not destiny. With great difficulty what is real may be remade. And it is with this thought, the possibility and the difficulty of living and doing the real, that I end. The relational semiotic diaspora insists that the good and the bad are embedded in the real, and the real in the good and the bad. To describe the real is always an ethically charged act. But, and this is the crucial point, the two are only partially connected: goods and reals cannot be reduced to each other. An act of political will can never, by itself, overturn the endless and partially connected webs that enact the real. Deconstruction is not enough. Indeed, it is trivial (Latour: 2004b). The conclusion is inescapable: as we write we have a simultaneous responsibility both to the real and to the good. Such is the challenge faced by this diasporic material semiotics. To create and recreate ways of working in and on the real while simultaneously working well in and on the good.

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