Material Semiotics

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Introduction

Material semiotics is a set of approaches to social analysis that includes actor-network theory, feminist material semiotics, the successor projects to both these traditions, and a range of related lines of work in disciplines including social and cultural anthropology, cultural studies, post-colonial studies, and geography. There are substantial differences both between these traditions, and among the authors within each tradition, and it has also changed radically since it came into being in the 1980s.

Material semiotics is a set of tools and sensibilities for exploring how practices in the social world are woven out of threads to form weaves that are simultaneously semiotic (because they are relational, and/or they carry meanings) and material (because they are about the physical stuff caught up and shaped in those relations.) It assumes that there is no single social structure or form of patterning because these material and social webs and weaves come in different forms and styles. Instead its tools and sensibilities are used to explore a wide range of topics which include: *how* such processes of weaving are achieved or fail in practice; *where* those threads come from; their *character*, and what they *exclude*; their productivity or *performativity*, including the ways in which they shape the elements that make them up; the *agendas* that they carry; the *multiplicity* of the different realities that they enact; how they *interact*, conflict with, or ignore one another; how they *colonise or are colonised* by other webs; how they produce *domination*; and how such forms of domination might be *resisted*.

This is a very general description, and while it is not wrong it needs be qualified because it is also misleadingly abstract. This is partly because the tradition is diverse. So, for instance, at least in their origins, feminist material semiotics and actor network theory had different

conceptions of both the semiotic and the political. It is partly because material semiotics takes social inquiry to be contexted and situated which means that impartial overviews are impossible. But most of all, it is because the approach works through *cases* in which *theory and the empirical cannot be levered apart*. For this reason, this entry is written through case studies in order to give a sense of how material semiotics works as a set of varying but overlapping *methods, sensibilities and concerns* in empirical-and-theoretical practice. The choice of cases reflects my own trajectory in actor network theory and its successor projects as these have interacted with feminist material semiotics. It also reflects my concern with large scale and political issues of domination and the supposed theoretical and philosophical heresies of the approach. Another author would have made the cut differently, and much – including most of its history – has been excluded.

Since material semiotics is best understood as a web of partially overlapping cases, I have mimicked this in literary form by writing the entry as a patchwork. I have set 'case studies' and intellectual controversies ('scandals') apart from the main text, and there are also 'sandbox' asides: a series of small linked texts that explore the arguments of the main text for a single case. Smooth explanatory narratives are often valued in social analysis, but material semiotics assumes that social practices are complex and do not necessarily cohere. If the social world is a patchwork, it is not obvious that smooth narratives best describe it.

Sandbox: fishy ethnography

Hedvig and I have been sent to catch escaped salmon fry. Wearing overalls and wellington boots, as we walk the long cool hall in the hatchery she tells me that while 99.999% of the fry stay in the big round tanks, a tiny number escape through the fine mesh where the water flows out of the tanks and are washed through the pipework to the pool in front of a big filter in the corner of the building. And this is where we're headed.

When we get there, we lift a section of floor to uncover the pool. We can see the escaped fry darting around and trying to hide under little ledges and overhangs. We step down into the gap in the floor and start catching the tiddlers with our nets and dropping them in the bucket. The more we catch the more difficult this gets, and since the work space is small we laugh apologetically as we try to avoid poking each other with the long handles of the nets. Perhaps, I think, this was really a one-person job, and Hedvig was just being kind to let me come along. Anyway, the few remaining tiddlers are elusive, and we can't catch every last one. But when we have caught most we clamber out, drop the flooring back into place, and return with a bucket of water full of fry.

Weaves

This sandbox describes a patterned *material semiotic web* of practices that somehow or other holds together. One way of starting to think about this is to list its elements. These include: *people* (Hedvig); *animals* (salmon fry); *tools* or artefacts (nets); *skills* (catching fish); *architectures* (the floor); *technologies* (the filter); *words* (talk); and *electricity* (we are not fumbling in the dark.) Note that these bits and pieces are *materially heterogeneous* (people, fish, technologies, clothes, words, concerns). This is important because material semiotics does not confine itself to a narrow understanding of 'the social'. Rather than simply talking about people or human collectivities, it includes the 'materials' of the world, for the latter are seen as equally 'social'. A second step is to observe how these different elements weave together. So (for example) Hedvig does this, I do that, the fish do something different, and the filter is also acting – in relation to the fish. This is important because the core sensibility of material semiotics is to explore how the heterogeneous elements of the social-and-material overlap, influence one another, and generally *fit themselves together* or not (for whether this happens is an empirical matter). It is, in short, to trace how they pattern themselves in weaves, webs, or networks, and to explore the consequences of their patterning. (The metaphors or 'web', 'weave' and 'network' resonate with different agendas, and it is wise not to get too committed to one in particular).

> ### Case study: the Scallops of Saint Brieuc Bay
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> In an early study Michel Callon (1986) (who devised the term 'actor network') wrote about a fragile set of material and semiotic relations involving fishers, fisheries scientists, and scallops in Brittany in France. He set off by describing a crisis. Scallops, a culinary delicacy, were being overfished and were disappearing from Saint Brieuc Bay. Then he identified two important actors: scallops on the one hand, and fishers on the other. Next, he described how a third set of actors, Japanese fisheries scientists, appeared on the scene with a theory. They believed that scallops might breed and grow on specially created collectors – though these would need to be protected from fishing. After discussion, the fishers agreed to fish elsewhere, while the scientists built and installed their prototype collectors. Time passed, and it gradually became clear that they, they scientists, were right. The scallops liked the collectors, and had started to breed, produce larvae, and grow.
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> Callon's story ends with a sting in the tail. One winter's night just before Christmas, the fishers abandoned the agreement, tore up the fabric of this new web and stripped the nursery of its scallops.

This first case study is about webs, broken webs, materials, semiotics and human and non-human actors. It is also about how actors are shaped in the webs in which they find

themselves. (These new shapes didn't stick, but both scallops and fishers were reconfigured along the way.) This tells us that these webs of relations are *performative*: that they *do* things. It also shows that in principle webs are *fragile*. This is another common material semiotic assumption. You cannot build a network, lock it in place, and throw away the key. It has to be done again and again and again if it is to hold. *Everything is a process*. Other observations. One, we are no longer in the realm of ethnography: Callon collected documents and interviewed participants, and most material semiotic studies similarly work with a wide range of empirical materials. And two, he is articulating relations spread out across time and space which has implications that are both interesting and problematic. It is interesting because it tells us that each new scene will bring forth new actors, new webs, and new scenes. So it is problematic too, because this tells us that *webs never end* and that *every actor is its own web*. Filters, people, hatcheries are all networks.

This commitment to the endlessness of relations worries some, and there are certainly other ways of imagining the world (Strathern 1996). But if one chooses to work in this way there is still a thoroughly practical question that needs to be solved: when is it time to stop tracing those webs?

> ## Scandal: humans and non-humans
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> *Material semiotics works on the assumption that 'non-human actors' can indeed act. This is controversial. Critics say that fish (or machines) cannot act. So how to think about this?*
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> *One response is methodological. It is to say that knowing humans and non-humans on similar terms is <u>useful</u> because it opens up empirical questions about which 'actors' are doing what to which other 'actors', with what effects. In this way of thinking the scandal isn't a scandal. It's an empirical tool. Everything becomes an 'actor' not because people aren't human but because this is methodologically useful.*
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> *To work in this way is to adopt what is sometimes called a 'flat ontology'. Ontology is the word philosophers use to talk about is what there is in the world. A flat ontology is one that assumes there are no <u>essential</u> distinctions between different kinds of things. Things are different, yes, but this arises in practice in the weave of relations. Many forms of social theory work differently. If you assume that people are essentially different from animals or technologies, then material semiotics is a scandal.*
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> *Such flat ontologies are found in various traditions including French post-structuralism (Deleuze and Guattari 1988). But remember that for material semiotics philosophy is not a foundation, but simply another possibly useful resource for thinking.*

Concerns

Webs are endless, so when should we stop following these? And which webs should we look at anyway? These are questions that can only be answered if we know at least roughly *what we are trying to achieve*. This is one of the reasons material semiotics is so diverse. It isn't linked to an ambitious theory that hopes to describe fundamental social mechanisms. Instead, the empirical-and-theoretical concerns of material semiotic authors differ widely, and they adapt and use the toolkit in very different ways. The lesson is that we need to attend to *concerns* if we are to understand or practise material semiotics.

> Case studies: different concerns
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> One. In his scallop study Callon's concern was to show that it is productive to treat human beings and animals in the same terms. These concerns explain both his choice of actors and relations.
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> Two. Material semiotics was first crafted to explore how scientific facts are created and made valid. So, for instance, Bruno Latour (1988) showed how anthrax vaccination was first 'constructed' in an esoteric weave in Louis Pasteur's Paris laboratory, but only became effective when farms around France were reorganised to mimic those laboratory relations. His argument is that scientific knowledge is true, but only when the appropriate webs have been put in place.
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> Three. Many material semiotic studies explore how power is done. How did Portugal, an insignificant European nation 1400, became an imperialist power a century later? I argued (Law 1986) that this was the performative effect of a web of maritime technologies, navigational instruments, charts, ephemerides, military technologies, navigational skills, market relations, state administrative procedures, and inter-state rivalries. Together these made a network of long-distance dominance.
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> Four. If the world is a fragile weave of changing relations, then why do webby objects not fall apart? Some argue that this is because particular webs hold their shape as they move (Portuguese ships). Others have suggested that some objects hold together because they are woven in fluid and flexible ways. This was Marianne de Laet and Annemarie Mol's (2000) argument as they traced the weaves of a water pump in rural Zimbabwe. These changed their shape as the pump moved to the villages, because when it broke it was repaired by local people in ingenious *ad hoc* ways. It was precisely this adaptability that allowed it to travel.

The argument is that material semiotics explores webs in their empirical-and-theoretical complexity, but *how it does this depends on the concerns that inform its studies*. Those concerns suggest where it might be sensible to start or how to choose a case, which parts of

the endless weave to trace, and when to stop. The cases I've touched on in this box are mostly taken from early actor network theory (the feminist-informed case of the pump is a partial exception) and illustrate some of the concerns that informed that work: how it is that scientific knowledge or technologies achieve their form and power.[1] But there are many other possibilities.

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Sandbox: fishy concerns

If we were concerned with gendering, we might ask how this is being done in the scene in the hatchery. A youngish woman and an older man are splashing around in a confined, awkward, and potentially bodily-encroaching space. There are gender relations being worked out here. And if we were then to trace these, we might follow the threads to look at the weave of other gender-relevant hatchery relations, divisions of labour, employment practices, forms of hiring, legalities, modes of comportment and locker-room talk.

But there are other possible concerns. The ethnographer is in some ways senior to the woman, but at the same time the woman is an expert in her work while the ethnographer is a visiting novice. Alternatively, we might be interested in the webs of infrastructure (water, power, supply of salmon fry) implied in the scene and upon which it depends. Yet again we might think about economic relations (lost fry count as money down the drain), and trace the weave into balance sheets, costs, and the economics of a medium sized enterprise in a global economy.

None of this is wrong. Material semiotics is a set of tools and sensibilities that may be used to explore a wide range of concerns. This tells us that that are *many different webs that might be followed*. But one thing is clear. Since we cannot trace them all, we need to decide which are the most important for our study.

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In material semiotics there have been lively debates about what is worth following, and what is not. Feminists have observed that the world looks different if you start from the periphery rather than the centre (Star 1991), and have complained that in its earlier versions actor network theory often did the former (Pasteur, the Portuguese) instead of criticising power. Then again, many case studies, perhaps inspired by the work of Michel Foucault, have asked what happens when we *reframe* how we think about the world. (All the case studies above fall into this camp. Human and non-human symmetry? Objects as weaves? Scientific facts as valid only in special places? Technologies as fluid?) The argument

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[1] For a recent account of actor network theory see Michael (2017). For more on science, see Latour (1987, 1998); on colonial technology Akrich (1992) and for a recent postcolonial study of a fluid technology see Beisel and Schneider (2012).

is that reframing is its own potentially powerful form of intervention, political and otherwise, because it shows that the assumptions embedded in current arrangements could be otherwise. How does scientific knowledge dominate particular social and material weaves? Does this have to be how it is? Is biology destiny? These are framing questions and political questions too, and I return to them below.

Narratives

The case studies I have cited above come mostly from actor network theory. But in the 1980s alongside this there was another powerful tradition, that of feminist material semiotics. Over the decades the two traditions have interacted and influenced one another, but in the first instance feminist material semiotics was both more obviously (capital P) Political than actor network theory, and it attended much more centrally to the significance of language.

So, for instance, Donna Haraway argued that narratives, tropes or figures of speech bend relations. Words necessarily select and organise what we know and do and feel and see, and there is no such thing as a neutral language. But what we *can* do is to set forms of language against one another by creating figures of speech to bend the weaves of the social into better forms (Haraway 1990). Consider the term 'objectivity'. This usually implies detachment: to be a part of something is to be subjective – it is to be partial rather than impartial. But since we are irredeemably situated, located in a material semiotic weave, there *is* no detachment. However, what we can do is to bend what we mean by the word 'objectivity'. So Haraway argues for 'a doctrine of embodied objectivity that accommodates paradoxical and critical feminist science projects: Feminist objectivity means quite simply *situated knowledges*.' (Haraway 1988, 581) This is narrative web-making of a different and subversive kind. She also bends the trope of the 'cyborg'. This emerged with the mid-twentieth century American military dream – or nightmare – of an enhanced masculine all-seeing and all-powerful being (Haraway 1990). Against this she imagines an alternative feminist cyborg. Rather than being centralised, like the uneasy political alliances of subjugated groups this is an imperfect and embodied set of partial connections endowed with split vision and therefore the privileged recognition that total knowledge and total mastery are simultaneously dangerous and impossible.

> Case study: *Primate visions*
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> Haraway (1989) also explores how primates have been understood and represented in American culture as reflections and refractions of particular masculinities. Psychologist Harry Harlow was mid twentieth director of the Primate Laboratory at the University of Wisconsin. In an experiment exploring (and creating) maternal deprivation, his laboratory invented 'the pit of despair' which isolated monkeys from

all social contact. In another it concluded that the 'surrogate mother', a crude cloth-covered wire frame with the caricature of a face and a teat was all that was needed for infant rhesus monkeys to avoid maternal deprivation. And it also devised a 'nuclear family apparatus' in which macaque 'family' 'couples' were held separate and sexually monogamous, while their infants were able to mix and play with one another.

In the 1950s US the heterosexual and patriarchal nuclear family was under stress. With women entering the workforce, who would run the home, cook the meals, and provide child care? Harlow's experiments about maternal deprivation, and the 'nuclear family apparatus' reproduce and reflect the fears of patriarchy. But these experiments are sadistic too. For Haraway sadism is not about pain, but the pleasure derived from dominatory forms of vision that reproduce and objectify the viewer/dominator in whatever he is viewing. Her argument is that the suffering simian is endlessly involved in the production of an abstract human man. And finally, she mobilises another feminist trope, the notion of self-birthing: that is, the desire of a male hero (Harlow) to give birth to (an immortal version of) himself and escape the imperfection of having been born of a woman.

This is a distinctively feminist version of material semiotics. It asks up front: *what kind of social-and-political work do we want to do*? What kind of differences do we hope to make? So, in *Primate Visions* Haraway uses feminist and anti-racist political imaginaries to trace, articulate and criticise the mish-mash of patriarchal narrative tropes woven through primate research. She also uses this case to suggest that patriarchy is complex and not especially coherent. Deliberately overloading her text with different narratives of patriarchy, her message is that while the latter is powerfully embedded and reproduced in science, *it is not a single thing*. Though neither, to be sure, is there a single 'correct' way of knowing primates. This, then, is one of the take home lessons of feminist material semiotics: that all forms of knowing are situated.[2]

Scandal: theories and social orders

Material semiotics works without a unifying explanatory scheme. It may work with large categories (patriarchy) but does not articulate these into general theories. This upsets those who assume large scale social phenomena are best explained as the effects of fundamental social mechanisms.

[2] For further examples of feminist material semiotic interventions see Singleton (1996), Barad (2007) and Myers (2008).

It is possible to treat this difference is as a methodological trade-off. Since big theories know how the world works at least in general, the concerns for those committed to these are clear. The down-side is that this renders them less sensitive to alternative weaves. Understood in this way, the issue is whether you prefer the comforting clarity of putting all your analytical eggs in one basket – or not.

Another way of thinking about this is to ask what we mean by 'theory'. Some theories are modest (labelling theory). But as I have just noted, many have larger ambitions (Marxism, structural functionalism, world systems theory) because they seek basic mechanisms that are taken to be at work behind social complexity. Material semiotics resists this idea, the notion that there is a single social order. Instead, it multiplies orders. Yes, there is patriarchy, but it comes in endless different non-coherent forms. Yes, there are scientific realities, but there are many of these too. To put it in philosophical language, material semiotics resists explanatory reductionism.

Poststructuralist philosophers assume that there are multiple orders (Foucault 1979, Serres 2007). And so too did so-called post-modernism. In one version the latter said that there is no 'grand narrative' running through society: that there is no single large organising principle. Instead there are many 'narratives', (Lyotard 1984). This argument is not popular in part because it sometimes ignored the realities of domination. But the counter-argument is that if multiplicity is a way of dominating, then it would be politically and analytically wise to attend to how this works.

Multiplicities

Material semiotics resists reductionism and assumes that the weaves of social life are messy and multiple (Law 2004). It also says that since weaves are performative, *different realities are being woven into being in different practices*. Including different natural realities

Case study: *The Body Multiple*

Annemarie Mol (2002) traced how surgeons in a Dutch hospital diagnose and treat lower limb arteriosclerosis. In their surgery this disease is pain on walking. On radiographs they see it as narrowed places in arteries. Doppler measurements talk to them of an increase in blood velocity. And in the operating theatre it is a grey-white paste to be scraped out of blood vessels.

Mol argued that there are two ways of thinking about this. If you start off by assuming that there is a single reality out there in the patient, then you will say that different diagnostic techniques offer *different perspectives on a single disease*. Mostly this is what we assume, and it is reinforced by a powerful narrative. This says that muscle pain in the surgery is caused by decreased blood flow which is caused by

the narrowing of the blood vessels (seen on the radiographs) where the blood flows quickly past the obstruction (detected on the doppler), which can then be surgically removed (the grey-white paste in the operating theatre.)

But it is also possible to do without this assumption. Instead you can say that the different practices *are weaving different but overlapping versions of arteriosclerosis*. Mol does the latter and talks about *a body multiple* because the different webs are enacting different realities that are *also overlapping* (as they do in the textbook narrative or in medical case conferences.) Her argument is that the 'body multiple' is a set of different bodies that hang together. Or perhaps better, *it is a body that is more than one and less than many*.

Haraway explores the intersections of patriarchal narratives in simian research. These are not the same but (often) work to sustain one another. Mol is tackling a related problem. Her different weaves are not different perspectives on a single reality but are *generating different realities that likewise overlap*. This is a counterintuitive idea, but it is central to material semiotics. If webs have performative effects, then unless those webs are identical, the realities that they weave into being will be different. But it is also important because it suggests the possibility of an *ontological politics* (Mol 1999). We have come across ontology already: Callon was working with a 'flat ontology'. Here, however, it is not Mol but the surgeons who are working with ontology. They are juxtaposing different realities. So an ontological politics is a *politics about what is, what should, and what might be realised*. The argument is that realities are being enacted in particular ways in particular practices, so in principle they might be enacted differently. In sum, an ontological politics asks how realities were crafted in the way that they were (Asdal 2008), and what alternative realities might be fashioned if the webs were woven differently (Murphy 2017). Mol and Haraway work in different idioms, but both are insisting that reality is not destiny. (See also Stengers (2005) and Latour (2013).)

Case study: dementia

Different laboratories enact dementia in different ways, but the disease is often located in the brain. For instance, in Alzheimer's disease it is frequently related to the presence of tangled amyloid brain plaques. Huge scientific resources have been committed to understanding the causes and the consequences of those plaques and trying (thus far with only marginal success) to find ways of intervening in their formation.

Ingunn Moser writes about this biology (2008), but she is also interested in non-biomedical ways of practising dementia including the Marte Meo method. This is a way of communicating with those who have lost the ability to talk. '"We have verbal language as our tool to take control of incomprehensible matters. People with

dementia do not. But even if a person has dementia this does not mean that it is empty in there. You just have to find her language." And: "They have not sailed off and totally disappeared into the darkness. Their emotional life is still there even if their brain is impaired."' (Moser 2008, 103-104).

These are the words of a Marte Meo practitioner who has been trained to communicate with dementia patients. It is not how most people communicate, but communication is possible, even so. And, importantly, patients are happier when this is achieved, though this also takes effort and resources and it isn't easy

As Moser traces the webs and relations that generate multiple dementias she is making two important arguments. First, she is saying that biomedical dementia soaks up so many resources that it squeezes non-biological versions of the disease. Alternatives such as the Marte Meo method are being suffocated. So she is arguing that rather than simply reducing this disease to biology, governments should also be investing in alternative dementia realities. This is ontological politics in action: it is about pressing one kind of reality rather than another. But she is drawing on other feminist-inspired material semiotic work in health and illness (Mol 2008) to make an additional analytical and political point. This is that care (within and beyond health) is best understood as an unfolding and uncertain social and interactional phenomenon. The argument is that good care takes the form of weaving webs that reflect ever-changing circumstances and concerns in which there are no final resolutions, and there is no possibility of overall control. Instead it is best understood as a *process of tinkering* with heterogeneous elements and different concerns (medication, dignity, communication, pleasure) that do not necessarily sit well together. It is, in other words, a never-ending process of finding the least worst way of living with imperfection day by day, week by week, and month by month (Pols and Limburg (2016), Mol, Moser and Pols (2010).) This is a feminist intervention because once again care is being contrasted with the dream – the mirage, the nightmare – of complete knowledge and total control.

Scandal: on altering realities

To talk of multiple dementias points us to another scandal: the idea that <u>when material semiotics talks about alternative realities this makes it sound as if inventing these is easy</u>; that we are simply able to wish better worlds into being. But (here's the objection) this is nonsense because neither physical nor social realities can be wished away. So the scandal is that ontological politics trivialises the power of reality.

Two responses. The first is that this is a misunderstanding. No-one working in material semiotics thinks that it is <u>easy</u> to undo domination or create different physical realities. Many realities are deeply embedded in ramifying weaves of practice spread over time and place (brain plaques) and it is difficult or impossible to

undo those realities and the practices that go with them. Instead, the approach underscores the time and effort that this might take.

But what it is saying, second point, is that realities are not given in the order of things; it is saying that they might in principle be different. That, for instance, biology is not destiny. This means that there are places where it might be worthwhile pushing other realities, other biologies, other natures.

Of course, if you are committed to the perspectival idea that there is a single reality behind the complexities of experience then you will not find this persuasive: you will not work with ontological politics.

Natures

But if biologies are enacted, then where does this leave nature? Or the distinction between nature and culture?

Sandbox: fishy divides

The weaves of the hatchery separate domesticated from undomesticated salmon. Each tank has a set of filters. The few fry that get round those filters end up in the pool in front of the second filter. Together these filters keep domesticated salmon and their wild cousins apart. But if you are concerned about the distinction between domesticated and wild salmon you can trace how this divide is woven in endless other practices. For instance, there's a concrete wall a meter high round another hatchery. This was built to stop the fish being washed out of their tanks and into the river in a flood. On the fish farms out in the sea domesticated salmon are separated from wild fish by nets. If you go with sports fishers and they catch a salmon, they practise the distinction too by looking for the physical stigmata of domestication (ragged fins and gills, different colouring.) Sometimes these signs are not obvious, so they may send a scale sample to a laboratory where technicians tease farmed and wild salmon apart using genetic markers. And if you shift your focus to the state you will discover a legal weave of regulations that are intended to pen in aquaculture and keep domesticated salmon separate from those that are wild. (Law and Lien 2018)

In an age of environmental crisis there are many case studies in material semiotics that explore how nature and the natural world are done, how they are distinguished from culture, and the political and analytical implications of this divide (Latour 2004, Hinchliffe 2007, Haraway 2008). As with the salmon, the argument is often that the division between nature and culture is enacted in distinct but partially overlapping material semiotic practices. This offers a point of leverage for an ontological politics (think of arteriosclerosis,

or dementia): it becomes possible to imagine how better natures might be woven. But while the material semiotic analysist might not want to separate nature and culture, what if this is being done by others in their practices? What might the consequences of this be?

> ### Sandbox: fishy natures
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> Like many other indigenous people, the Sámi of Arctic Scandinavia do not divide nature from culture. As they fish or hunt they encounter other powerful beings which may be human, animal, geographical (lakes), meteorological (snow storms), or extra-human (sacred places). Sometimes those beings are dangerous and sometimes they are benevolent, but either way they need to be treated with moral and practical respect. For instance, it is necessary to care for lakes and rivers by removing brushwood and leaves, or by clearing stones. It is important to catch only the fish that are needed, and to offer thanks and blessings to lakes.
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> Though practices such as these have worked sustainably since prehistory in harsh Arctic environments, they are now under pressure. For instance, there is overfishing of salmon by outsiders, and fishing, including Sámi fishing, is being squeezed by stiff new environmental restrictions. These are underpinned by conservation biology which here understands nature in terms of threatened salmon stocks and biodiversity. There is controversy and resistance, but in this view, nature needs to be protected from fishing, while conservation biology speaks for and enacts nature. The consequence is that biology is turned into destiny, and nature becomes a form of social control. (Law and Joks 2019)

This case points us to colonial conflict, and I will return to this below. But it also helps us to see what 'nature practices' are doing when they are woven. First, such practices take it for granted that *culture needs to be kept apart from nature*, and they help to (re)enact that division. The assumption is that culture (for instance in the form of salmon farming) may interfere with nature. So, nature is being set apart and *nature untouched* is being done. Second, these practices reproduce a particular version of the natural world. In this, the physical phenomena in the world are different in kind to those that inhabit the social world. There is no room in the natural world for motives or intentions, benevolent or otherwise. This is nature disenchanted. Whatever is happening is being generated by causal environmental mechanisms. And then third, it is assumed that it is the task of authorities such as environmental scientists to uncover those mechanisms. Once again, biology is being rendered as destiny (Latour 1993).

How to think about this well? Here we need to tread very carefully. In the face of environmental destruction, it will often make sense to mobilise an ontology that draws a divide between (a version of) threatened 'nature' and the depredations of the economic and the social. And as I noted above, it may also make sense to favour one version of

biological nature as a better alternative to other more dominatory biological realities (Murphy 2017). But not always (Lorimer 2015). And this 'not always' tends to become important in colonial contexts where the webs of nature-as-destiny dominate the practices of indigenous people such as the Sámi who have lived perfectly well for centuries without a nature-culture divide. (Blaser and de la Cadena 2017, de la Cadena and Blaser 2018). So how might 'nature practices' and the non-binary weaves of indigenous people be put together in ways that are less destructive? There are various ways of thinking about this, but material semiotics suggests we might attend to the mundane practicalities in a *politics of how*.

Practicalities

Case study: firing across difference

Helen Verran (2002) describes a workshop about setting fires for environmental purposes in Arnhemland in the Australian Northern Territory. This workshop was an encounter between mostly white environmentalists and the traditional Aboriginal owners, the Yolngu. Everyone agreed: firing is needed. And the environmentalists were positive. They wanted to learn about 'traditional ecological knowledge'.

Despite the goodwill the workshop was an exercise in miscommunication. The environmentalists and the Yolngu spoke different languages, both literally and metaphorically. As the environmentalists sat listening, the Yolngu elders negotiated among themselves, talked about sacred places, told stories about ancestral beings, and rehearsed kinship relations. Then the women went digging and distributing yams, while an elder went off in a vehicle to light the first fires without alerting the environmentalists that this is what he was going to do. The environmentalists, who had hoped they would learn something about when and how to set fires to help safeguard ecosystems, were dismayed. Though they were eager to learn, what had happened looked vague and arbitrary, a hopeless mix of actions and cultural myths.

How to think about this? The participants were working across epistemic and ontological *difference*, and Verran says that no postcolonial encounter will be successful unless this is recognised and respected. At the same time (another requirement for a successful postcolonial encounter), there was also *sameness*: they were dealing with a common problem about when and how to set fires. So far so good. But Verran introduces a third requirement for success. Warning against making big abstractions about difference (these simply reify that difference) she says that it is also important for all concerned to attend to *how knowing is done in practice*. Here she treats knowing practices as embodied and heterogeneous rituals. Environmental scientists work with quadrants, rulers, time series and Linnaean relations. Yolngu work with songs, narratives, dance, and recursive kinship relations.

> Their knowledges are different because their rituals are different. Her argument is that we need to stick with the practicalities and teach ourselves to be sensitive to *how* knowing is done moment by moment. And if we do this it will sometimes be possible to *devise rituals, forms of practice, that work across difference* for all those concerned.

This is the lesson. To work well across difference, we need to be completely down to earth. Instead of concealing or ignoring how we come to know the world because this is simply a means to an end, we need to place such knowledge practices centre stage. If we do not do this there will be misunderstanding. Indeed, as with the Sámi, there will probably be colonial domination (see also Bonelli (2012).) In one way this is very straightforward. It is simply about carefully attending to the unfolding webs of the material semiotic. At the same time, it is also exceedingly difficult. This is partly because crafting rituals of sameness and difference will often fail, and has in any case to be worked out instance by instance. But primarily it is difficult because it is about attending to small-scale and unspectacular mundanities, to specificities. ('Specificities', not 'mere details'.) As with the focus on care that I touched on earlier, this takes us to the core sensibility of material semiotics: the need for lively sensitivity to the practical ways in which, moment by moment, heterogenous processes unfold and reweave themselves. The argument is that working well across difference, postcolonial and otherwise, demands a crafted sensibility to what we might think of as *a politics of how* (Verran 1999, 2001, Law et al. 2014).

Afterword

Material semiotics is not a school or a theory. Instead it is a movement in social science which cultivates a set of sensibilities to practice, to process, to the weaves of materiality and narrative, to the irredeemably situated character of those weaves (its own included), to difference, and to the idea that there is no single machinery at work behind the complexities of the social. As a part of this, it almost always avoids abstraction and works its theory through cases. This means that there is no short cut: it has to be approached through its case studies. At the same time its sensibilities are productive because its authors work in a wide variety of ways with many different concerns. Unsurprisingly, its literatures are diverse, filled with debates, discussions and disagreements. They are also porous: where material semiotics begins and ends as it weaves together with other traditions is a matter for (not very interesting) debate. And as I also warned in the Introduction, this entry is necessarily selective and situated. There are large literatures that I have not explored. So for instance, there is nothing here about markets and economics, the arts, the practical management of science and technology, and not so much about disabilities, normativities or

eating.[3] Instead, the cases that I have described reflect my own trajectory and interests. As is obvious, your own concerns and therefore your material semiotics will probably be different.

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[3] On markets see for instance, Callon, (1998), Muniesa and Callon (2007) and Çalişkan and Callon (2009, 2010), on music see Hennion (2015); on science policy see Callon *et al.* (2009); on disability see Callon and Rabeharisoa (2004) and Moser (2005); on normative complexities see Pols and Limburg (2016) and Heuts and Mol (2012); on the politics of matter see Abrahamsson *et al.* (2015); and on eating see Mol (2012), Yates-Doerr (2012), and Bertoni (2013).

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