

## **Multiple Enactments?**

### **An Actor Network Theory approach to studying educational research practices**

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## Introduction

Actor Network Theory (ANT) is one of the more controversial approaches in social sciences. It arose in the early 1980s out of criticism towards the more traditional Sociology, which tended to disregard the role of the material and the natural in the constitution of 'social reality'. In ANT terms, the social is not seen as the 'glue' holding society together, but as something made up of essentially non-social components (human, non-human, animate, inanimate entities) constituting networks of relations and being constituted by them. (Latour 2005, 4-5; Law 2007.) The main aim of ANT is to overcome the subject-object divide, the distinction between the social and the natural worlds and to see the reality as enacted. Over the years the ANT approaches have developed into various directions in the hands of different thinkers and disciplines. The aim of the paper is to disentangle some of the conceptual messiness of ANT<sup>1</sup> while considering the potential of applying a strand of the approach in my PhD study, which is linked to an interdisciplinary (Education and Computer Sciences) research and development project Ensemble<sup>2</sup>. The project studies case based learning in a number of disciplines in Higher Education and the potential of semantic web applications for enhancing that learning. The PhD study focuses on following the research team as they work on studying cases in the discipline of Archaeology, and as they translate these findings into semantic web applications for the use by the discipline.

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<sup>1</sup> On a personal note, ANT and I were formally introduced in the weeks preceding the start of my PhD. The intensive study that ensued from the first emails my PhD supervisor sent listing some central readings on the approach did not lead me towards a new 'perspective' on the world around me, but more profoundly, has forced me to adopt a new worldview entirely. Rather than thinking about the complexity of reality in terms of multiple perspectives on a single underlying 'thing', it now emerges as multiple in itself, being created and enacted into being in material-semiotic practices. Getting to this point has involved a variety of networks, actors and actants – books and articles, different incarnations of Actor Network Theory, the internet, empirical data, my supervisors and the other members of the research team, childminders, EasyJet, M8, office space, digital recorders, cups of coffee, Amazon and Royal Mail, to list a few. These have caused (and in some cases prevented) frustration and irritation, anxiety and excitement, joy of discovery, laughter, sleepless nights, prolonged periods of concentration, (a building project in my garden), and ultimately, learning to engage with the world in a new way. This paper is one outcome of this ongoing journey into and within the heterogeneous, messy, multiple and fluid semiotic-material network that is usually denoted by a single name 'Actor Network Theory'.

<sup>2</sup> See [www.ensemble.ac.uk](http://www.ensemble.ac.uk) for more information

The Ensemble team is large and distributed; the team consists of 16 team members who are based across five institutions in the UK with some members in the United States and Australia. There are six research settings currently engaged between the two lead institutions of the project. Although the project as a whole forms the (networked) context for the study, the PhD follows primarily the six researchers involved in carrying out the work related to the discipline of Archaeology.

The key research questions are:

- How is an interdisciplinary research and development project carried out, enacted, in practice?
- What are the necessary networks that both carry and delimit these practices but also enable them to come into being through enactments?
- What kinds of realities are being enacted through these practices?

The paper will first sketch out the development of the approach(es) from their era of inception in Paris in 1978-82 by Michel Callon and colleagues, through its momentary - and relative - 'stabilization' in 1990s ('ANT 1990') to the more recent diaspora of approaches, studies that could be conceptualised as post- ANT ('ANT thereafter') (e.g. Law, 1999, 10; Law 2007<sup>3</sup>; Mol 2007). The paper then proceeds to discuss a number of central concepts of ANT including the notion of *network*, the nature of the various nodes in networks (*actor*, *actant*, *intermediary* and *mediator* (Latour 2005)) before finally giving more detailed attention to the elusive concept of *object* (Knorr Cetina 1999; Law 2002; Law 2007; Law and Singleton 2005; Mol 2007). After that the ideas of enactment in producing multiple objects (and thus ontologies), as suggested by Annmarie Mol (2007), and the nature of *practice*, with emphasis on knowledge practices are considered. The paper finishes with a proposal for a theoretical framing for the PhD study.

### **'What is this thing?' – Origins of Actor Network Theory**

Actor-network theory originally emerged as a critique against the traditional sociology, which disregarded the role of the material, the non-human, in the constitution of the social,

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<sup>3</sup> No page numbers in this document.

and relied on the 'explanative power of the social context' (Latour 2005, 4-5). Thus, the main barrier for trying to get to grips with ANT is its general terminology, which while familiar in form, in practice carries a different meaning to that more generally used in Sociology. Furthermore, in the few decades since its inception, the approach has evolved into different strands and the usage of concepts seems to vary from one person to the next and between different case studies (e.g. Callon 1987; Latour 1999; Latour and Venn 2002; Law 2002; Law and Singleton 2005; Mol 2007; Nespors 1994; Pels et al. 2002.)

John Law (2007) divides Actor Network Theory in two major phases, that of ANT 1990 and ANT thereafter. Until mid-to-late 1990s the social sciences, including the ANT approach, tended to regard phenomena as stable and structured. In 1990s the approach found a momentary stability only to splinter into a variety of approaches in the noughties.

According to Law (2007) the principles of ANT 1990 emerged from four different origins. The first principle, in which networks consisting of humans and non-humans became the centre of attention, was a study by Michel Callon into an introduction of an 'electric vehicle' in France. The vehicle project failed, leading Callon (1980 quoted by Law 2007) to ask how it was possible to describe fragile, yet inflexible, heterogeneous, socio-material systems. That was the starting point for the idea of actor-networks.

The second principle of ANT - that of *symmetry* - arrived through science studies. Initially the symmetry referred to epistemology, the nature of knowledge (false or valid, and the need to assess that) (Bloor 1976, Kuhn 1962, Latour 1993 quoted by Law 2007). Later on this changed to denote the idea of ontological *generalised symmetry* between human and nonhuman beings. Michel Callon (1987) applied this approach in his study of fishermen, scientists and scallops. Importantly, Latour has later qualified this controversial idea by emphasizing that symmetrical in ANT terms means that no *a priori* assumptions of *asymmetry* are made between intentional human action and causal relations of the material world (Latour 2005, 76).

The third principle can be traced back to philosopher of science Michel Serres (1974 quoted by Law 2007) via Latour and Callon, and it introduces the central concept of *translation* into ANT. Serres used this metaphor to describe the overcoming of boundaries between two

different orders, or order and disorder. Callon (1987), using the principle of generalised symmetry mentioned above, was able to 'domesticate' all the different actors (scallops, fishermen and scientist) 'in a process of translation, that relates, defines and orders objects, humans or otherwise' (Law 2007, Callon 1987). Thus both humans and non-humans are treated without *a priori* judgement of the role they play in the networks. Translations are about continual displacements and transformation of subjects and objects, and he also emphasises the insecurity, fragility of the translations and their susceptibility to failure (Callon 1987, 18-19).

The fourth principle Law (2007) puts forth is that ANT should be understood as *an empirical version of post-structuralism*. This idea, he says, has similarities with Foucault's work (actor networks could be seen as scaled down versions of discourses – Law 2007), yet can usefully distinguish itself from 'those forms of post-structuralism that attend to language - - alone' (Law 2006, 4). Therefore it would be possible to treat the research practices as types of material-semiotic discourses.

So is ANT approach a theory or a method? John Law (2007) – clearly in 'ANT thereafter' mode - characterises ANT as:

'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 enactments of those relations. Its studies explore and characterize the webs and the practices that carry them.'

Interestingly, the word 'theory' is not mentioned above; instead ANT is described in terms of 'tools', 'sensibilities' and 'methods of analysis'. ANT is thus both a tool, that is, *a research method* to gather data with and *a method of analysis*, a way of making sense of that data. Law would prefer to call the approach *material-semiotics* for it maps network relations that are both material (between things) and semiotic (between concepts). Many relations are both kinds and part of a single network<sup>4</sup>.

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<sup>4</sup> Wikipedia, accessed 28.01.09

Law's characterization does bring up elements that most ANT approaches share; that the social and the natural are divided through enactments, along with the subject and object, human and non-human, as well as the idea of networks as both the location and the mechanism of what generates the reality (cf. e.g. Latour 2005). What is different here in comparison to the earlier versions of ANT is the idea of the enactment of network relations (which are also objects) in practices, and that nothing has 'reality or form outside' these. This was a difficult concept to grasp, as it goes against the standard view of Euro-American metaphysics, which sees entities as independent of each other and having properties, and 'reality independent of our perceptions, as anterior, definite, singular and universal' (cf. Law 2004, 23-25). Space does not allow for a full debate here, but *what concerns science* and the more collective world generally, scientific facts or *particular* realities 'are produced along with the statements that report them' (Law 2004, 38). However, these can *appear* to be independent, anterior, singular and so on, which in itself is down to them having been produced in (scientific) practices; they are a consequence of the method that produced them. (Law 2004, 38). To me, the important distinction to keep in mind here is that Law and colleagues are talking about scientific practices and realities; as *individuals* we can experience the world as independent of our perceptions, as anterior and so on in the daily encounters in the networks in which we operate. (Law 2004, 31).

### **Some central concepts of ANT: networks and its nodes**

The conceptualisations of networks in the ANT literature are numerous. They can be seen as associations between actors and actants; a trace that is left behind by a moving agent (Latour 2005, 132) or as something within which 'things' circulate; or as connections between humans (social networks), as 'fluid and contested definitions of identities and alliances that are simultaneously frameworks of power' (Nespor 1994, 7) or fluid spaces (Law 2002; Law 2007). Networks can also be seen 'organising physical space, as producing and constitutive of material spaces of social practices and as channels of communication' (Nespor 1994, 16). Furthermore, networks can be traced (to some extent), described (Latour 2005), they can be cut (a methodological move) (Strachern 1996 quoted by Law 2007), or be seen as enacted (Mol 2007, Law 2007). Most importantly, they can be seen as contextualizing and generating the social and natural worlds (Law 2007). However, taking

networks as a 'thinking tool'<sup>5</sup> as suggested by Latour (2005), provides space for conceptualising networks both methodologically and analytically through the various suggested material, social and discursive configurations.

Networks consist of nodes that are connected together, be it by association or by more concrete links. There are a number of interrelated concepts which, depending on the situation, can be similar, the same, overlapping or completely different from one another.

These are:

- Object vs. Subject
- Actor/ Actant
- Mediator vs. Intermediary

Moving away from the subject-centred understanding of the social has made the 'object' one of the central concepts of ANT. It is also one of the most troubling ones. In more classical ANT, an object is often defined as a stabilization of networks of relations. The object will remain the 'same' so long as those relations hold together and do not change; everything participates in holding everything together. (Law 2002, 91-92.) More recently, objects have been defined as network relations enacted in practice (Mol 2007; Law 2004). They can be larger and varied, like a curriculum and they can be small and more tangible, like a hammer (cf. Latour & Venn 2002, 250). They can be concrete (like a piece of technology) or abstract (speech), animate (a scallop) or inanimate (a book). They can be networked, or fluid, or stable or enacted.

Agency is an important issue in understanding the nature of actors and actants. This relates to the aforementioned idea of *generalised symmetry*: both human and non-human *actors* (that is, subjects and objects) are understood as having the potential for 'agency'. Agency, however, is not the psychological understanding of human intentionality, capacity to act and make decisions, but that of a capacity to cause an 'effect', to make a difference to a state of affairs. If there is no visible effect, there is no agency. (Callon 1987; Latour 2005, 52-53.) Thus term *actant* denotes a *non-human actor*, or an object with a capacity to cause effects (Latour 1999, 303).

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<sup>5</sup> In this way 'network' becomes two-tier concept denoting both a thing and a tool.

While actant highlights the capacity of a nonhuman actor to cause effect, an intermediary takes a specific role: it is an actor, an object or an event that is a mere carrier of information or force without transforming it. Its output is entirely defined by its input: A in, A out. This is a dissemination notion of change. Mediators, on the other hand, are specific. They transform and modify meaning; A becomes B, or B, C etc all the way to Z. This is a translation notion of change. Being an intermediary or mediator is a quality assigned to or adopted by an object or an actor. An actor that has been a mere intermediary, say, like a postman, may turn into a mediator if they decide to decant the contents of their postbag into the nearest bin. (cf. Latour 1999, 307; Latour 2005, 39) But if it is actants that make actors do things, what is the actant in the above example, which turns the actor from an intermediary to a mediator? What made the postman so frustrated in his job that he threw the bag into the bin? Was it the argument he had with his boss in the morning? (And what caused that in the first place?)

John Law and Vicky Singleton (2003) examine the nature of objects in four different ways: objects as

‘volumes of in Euclidean space; as stable networks of relations; as fluids that gently reshape their configurations; and finally, as generative links between presences and absences that are both brought, and cannot conceivably be brought, together.’ (Law and Singleton 2005, 11).

They examine these from the point of view of alcoholic liver disease, whose bearers’ trajectories they were trying to trace but failed. The reality of alcoholic liver disease proved too messy, which led them to wonder if their methodological tools were unfeasible. They state that object is an object even if due to the insufficient methods used it could not be detected or known (Law and Singleton 2005, 3).

In Euclidean space an object is understood as stable, three dimensional and concrete. It is able to move (or to be moved) across three dimensional space from A to B, like a ship, or a scientific instrument (immutable mobile Latour 1990 quoted by Law 2006; Law 2002; Law & Singleton 2005, 3). ‘Object remains an object while everything stays in place and the relations between it and its neighbouring entities hold steady’ (Law 2002, 93). Apart from

being a fixed object, the Euclidean entity is also a *network object*. Network space is syntactical and holds the object together conceptually. The object is immobile within that space, while simultaneously holding physically together in Euclidean space. That enables it to move from A to B. (Law 2002, 95; Law and Singleton 2005, 3.) It is questionable whether abstract entities could be seen in Euclidean terms. However, as Law and Singleton point out as 'many objects putatively located in physical space can only be detected *in a network of relations* that makes them visible' (like disease, learning or identity) (Law and Singleton 2005, 4).

Law brings up a third type of space, *fluid space*, investigating it using the metaphor of topology and homeomorphism, and by thinking of the continuity of objects in space (and time?) (Law 2002, 97-98). The idea of fluidity has arisen as response to the criticism faced by the earlier version of ANT where the networks and objects were understood as fairly rigid (Law and Singleton 2005, 5). The objects described in Euclidean or network space, Law says, have nothing to do with fluid space, *as apparently fluid objects lose their homeomorphism when they are fixed in a network*. Or in other words, in Euclidean and network spaces an object that changes is 'broken while it is being deformed' (like smashing a plate). (Law 2002, 98-99.) Seeing objects as fluid and attending to their mutability (deLaet and Mol 2000; Law and Singleton 2005, 5) allows objects to be seen 'the same' yet changing across space. The point here is gradual, gentle change over time. He bases this analysis on the example of the Bush pump and its variations in different contexts or compositions of parts etc. (deLaet and Mol 2000; Law 2002, 99; Law and Singleton 2005, 5.) In addition, I would argue for the fluidity of networks too. Perhaps it is networks that change around objects in order to maintain them? An example of this would be an organisation that constantly has to reconfigure itself in order to exist. It makes sense for both objects and networks to be seen as fluid for objects are parts of networks, and networks constitute objects. (cf. Law and Singleton 2005, 6.)

The above treated three conceptualisations of object were not enough in explaining the alcoholic liver disease, so Law and Singleton look at a fourth type of object, the '*fire object*'. In this, the object is present, but that presence depends upon series of absences, realities that cannot be brought to presence and are thus 'othered'. (Law and Singleton 2005, 11.) Its point is that we are unable to understand objects 'unless we also think of them as sets of present dynamics generated in, and generative of, realities that are necessarily absent'.

These objects are transformative, but unlike the gentle and gradual transformations in the case of fluid objects, the changes are jerky and consist of jumps and discontinuities (Law and Singleton 2005, 8).

Another addition to the array of objects comes from the work of Annmarie Mol (2007) who sees *objects as multiple and as enacted in practice*. The object she is following is a disease called Atherosclerosis, which appears as symptoms and which becomes enacted as a disease in a multiplicity of hospital settings. Mol attempts to get away from the idea of multiple perspectives on a single object, treating objects instead as 'things manipulated in practices' (Mol 2007, 4). She argues that by focusing on the practices, bringing them into the centre of attention as the location within which the objects are manipulated or enacted, the single object emerges and disappears from one practice to the other. Through this the object, the *reality multiplies*. No object is singular, according to Mol, they are 'more than one, less than many'. (Mol 2007, 4-5.)

By looking at objects as enacted in practice their nature and the possibilities present in that situation, in the act of enactment, multiply as well. The reality is messy. Everything is localised, fluid and unstable. Given this state of affairs, how then does reality, the single disease, hang together, despite being multiple, Mol asks. This is down to relations existing between the different enactments; e.g. shared procedures or vocabulary, translations of instruments from one setting to the next, pieces of paper, x-rays, people moving between settings etc. –these prevent the multiple object from falling apart. (Mol 2007, 5.)

Mol (2007, 121) states that 'when one object is enacted, another one maybe included in it'. Expanding on this, and referring to Law's fire objects above, it could be argued that enactments of objects simultaneously exclude other enactments; they form oppositions, contradictions or they arrange to support or reinforce the other enacted objects. Mol says that objects may have complex relations (2007, 149); I would argue that they also articulate with other enactments across and in time and space. Diseases (as well as any other objects, e.g. identities, human rights, road maps) become 'reproduced' or 're-performed' over and over again and this links them into the practices of a profession. The way in which practices come about is something Mol does not discuss in her book.

Furthermore, when an object is enacted in a practice, while it excludes other enactments, it is possible, as well as likely, that simultaneously or in parallel, several other objects are/become enacted; either purposefully or as a 'bi-product' of the first enactment (cf. Mol 2007, 149-150). So I'd like to argue, that through enacting an object, not only the object comes into being, but the practice itself is enacted, becomes visible, is reinforced, re-produced. It is linked to a series of other enactments of the practice on personal level, within the institution and as widely as this practice is, well, practiced<sup>6</sup>. The object and the practice are thus interlinked. An object that is enacted in practice, according to Mol (2007) is performed anew within each context and through each enactment, yet somehow the object, more than one, less than many, 'hangs together' as the 'same'; 'no object is singular'. Is it thus through understanding objects as enacted in practices that allows for all the different configurations of object to co-exist and apply at the same time?

## Practices

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<sup>6</sup> On a personal note: Following the ideas of Mol, who sees objects as enacted in practice, I wonder if this act of writing the present text itself is an enactment of... what? Of my reading and understanding of ANT, or of research practice, of practice of being a PhD student, or of using a computer as a thinking aid? All of these practices are present at once in this act of writing, here and now, and they link me to the practices of doing research or being a PhD student that span universities and research institutions world over, in the past, present and most likely in the future (cf. Latour & Venn 2002, 249-250 folding in the garland of time). The same goes for the other culminating practices present in this act of writing, and naturally this is only by way of mentioning a few. So by sitting down in front of my laptop, having read books and articles on Actor Network Theory that in themselves relate to other texts and thinkers, I am enacting the approach in practice. A multiplicity of objects and practices become enacted at once, but only some are given priority in a given situation. And yet, at the same time as the act of writing is 'folding' me into the multiple practices and enactments of being a student and doing research (cf. Nespor 1994, 16), I am also separating myself from them. My present act of writing is unique. It has not happened before. I have not typed these words down before, nor thought these particular thoughts (as it happens) before they actually hit the screen. Even if the practices are the 'same' they will be different too (cf. Mol 2007, 149), because every enactment is really a re-enactment (unless it is so unique it is the first ever), but the environment may be different, the student may study a different topic, in a different language, on a computer of different make and so on. So the end result will not be identical to anyone else's enactment of practice or their objects. This is also what eventually changes the practices; the repeated enactments and re-enactments work simultaneously to sustain and to change the practices. The changes may happen very gradually. The processes are mutually inclusive (see Mol 2007, 146).

*Practice* has conventionally been seen as habitual, normative, and routinized, a set way of doing things (Knorr Cetina 2001, 175; Rouse 2001, 190). If we take Mol's view (2007) of objects coming into being through enactments in practices, then it would be feasible to argue that practices arise out of series of enactments. For an enactment to become practice it has to be performed repeatedly. This process inevitably allows the practice to a) multiply and b) change, very gradually. If it happened quickly the practice would change, and that would make it a new practice (cf. object breaking and becoming a new one). Furthermore, practices produced and reproduced through enactments become linked to the network that constitutes it: this enactment here links us to all the other people engaged in this practice now, as well as to everyone else who was been involved in it historically, and will be in the future.

Talking of habit or routine implies a *history*. Practices, even if they would not be seen as having a particular foundation, arise out of *something* (cf Pulkkinen 1994) rather than nothing. Furthermore, if a practice is a 'routine' or 'a norm' then this implies that there is something holding that practice, that network, in place. This links to John Law's (2004) discussion of Hinterland of scientific practice – 'If new realities 'out-there' and new knowledge of those realities 'in-here' are to be created, then practices that can cope with a hinterland of pre-existing social and material realities also have to be build up and tolerated' (Law 2004, 13). The hinterland forms the 'historical background' upon or out of which new practices evolve or are built. Law (2004) explains in detail how new, uncertain scientific discoveries become stabilized into scientific statements in scientific practices, and become part of the backdrop for the future developments in science.

Practices are naturally present in every sphere of life. What is of concern here, however, are the scientific practices. Understanding practice as habitual or normative appears somewhat limiting when thinking of the dynamism of research work. Karin Knorr Cetina has introduced a more creative and constructive understanding of practice (e.g. when carrying out complex, non routine social scientific processes), which 'allows for the engrossment and excitement – the emotional basis – of research work'. She characterizes research work as *knowledge-centred or epistemic practice*, which is 'internally more differentiated than current conceptions of practice as skill or habitual task performance suggest'. (Knorr Cetina 2001, 175-6.) Central to this conceptualization of practice is yet another type of object -

*knowledge or epistemic objects*, which (I paraphrase this to tie in with Mol's view) are enacted into being specifically in knowledge-centred/research practices. These objects are partial, always 'wanting' and are characterised by their 'lack of completeness of being and their non-identity with themselves'. These characteristics articulate with those of *fire objects* introduced by Law and Singleton and allow for the dynamic aspect of research work. In order for researchers to want to ask further questions and move forward in their work, the knowledge objects need to be seen as incomplete or partial. This (seeing epistemic objects as incomplete) in turn leads to understanding ontology (or multiple ontologies) as continually unfolding. (Knorr Cetina 2001, 176; 185)

## Conclusions

So far in this paper I have discussed the various understandings of central concepts of Actor Network Theory. This discussion links to my PhD study, which empirically examines the practices of researchers engaged in an interdisciplinary research and development project Ensemble that investigates case based learning in Higher Education and the potential of semantic web applications for enhancing that learning. So, what to take forward from this discussion of central concepts of ANT for my study? The following ideas have emerged as most useful:

### 1) Material-semiotics

This is an alternative name for Actor Network Theory promoted by John Law, as the approach ultimately maps network relations that are both material (between things) and semiotic (between concepts). In this configuration the approach emerges as an analytical tool, way of making sense of the data. The data collection methods themselves will be more traditionally ethnographic, but for instance interview schedules for thematic interviews are inspired by ANT/material semiotics way of understanding the world. To me the theory one uses in their research necessarily permeates the research process, or it should do, for the approach one takes will, or should, inform the data collection strategies and analysis alike.

### 2) Principle of symmetry

When studying the research team and their engagement with Archaeology, I will take into account also the material and other non-human aspects of their work and the networks

they are involved in. This means abstaining from making any *a priori assumptions of asymmetry* between the human and non-human entities in these networks. Thus, e.g. a computer as well as a researcher is assumed an equal capacity to make a change to the state of affairs, that is, cause an effect or impact. I will emphasize here, as we learned earlier in the paper, this principle *does not* rob subjects of their capacity for intentional agency or the ability to make decisions and act upon them. Only this capacity is not given a priority status and it is not the principle source of action. When subjects exercise agency, for instance, decide to use this piece of equipment instead of that, the decision is taken in relation to those networked relations the person is situated in and that are relevant at that moment.

### 3) Heterogeneous nodes and networks as mutually constitutive

As the discussion has shown, networks and their nodes are not clear cut entities. Objects, as well as networks, in my understanding, can either be tangible things or more abstract, less bounded entities. For instance, Ensemble can be conceptualised as a network, or as a node located in a much bigger network; it can be seen as an actant, with a capacity to cause effect: 'Ensemble attended a conference'. Again, Ensemble itself will consist of nodes, culminations of networked relations. Some may be very temporary indeed, some more durable. Thus networks and objects appear as mutually constitutive of each other. Whether we look at an object or a network is a matter of scale of observation.

Mol sees objects as coming into being through enactments in practices. I argue that they are also simultaneously (however temporary) stabilizations or culminations of network relations. 'Research practice' is ultimately a very abstract entity. It becomes detectable in the network relations that make it visible, and that happens through enactments.

### 4) Enactment of network relations and multiple realities

Phenomenological, perspectivalist (Law 2004) point of view understands the world as a singular with multiple view points on it. Ensemble would be viewed as a single thing with several different interpretations of what it is like, with the assumption that it is possible to gain a single interpretation on it, once the differences have been explained away. However, if we follow Mol's idea of multiple enactments, the project and the practices engaged multiply. For instance, my reality, my enactment of the project Ensemble as a PhD student,

is different from those of the researchers or the Principle Investigators in the team. We are all part of the one project called Ensemble but we enact it differently. We are linked to this one network as part of our individual networks, and we bring influences from them into this one, and vice versa. As Mol so succinctly puts it, Ensemble is 'more than one, less than many'; it hangs together by association (more on this discussion see Mol 2007).

#### 5) Practice

The two understandings of practice discussed above – practice as habitual or routine, and as dynamic and creative - are both present in research work at the same time. The hinterland of scientific practices form a more stable network, a background or a context, within which the more dynamic epistemic practices have space to emerge, and where multiple and unfolding realities become enacted. The interdisciplinary work of Ensemble has this all: there are existing research practices which the researchers from different disciplinary backgrounds bring with them and which they have to negotiate with each other in the new setting; there is development work with partial, emerging objects and unfolding ontologies; the project has no existing practices, yet, as it is so new. But by the end of the three years it may well have a practice that has become more routinized and part of the hinterland.

The discussed concepts and ideas from Actor Network Theory or Material Semiotics provide a fruitful approach for studying research practices in the interdisciplinary setting of our project. The ideas derived here could usefully be applied in other educational settings concerned with practices, be it in teaching, learning or research.

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