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The Politics of 'Actor-Network Theory'

What Can 'Actor-Network Theory' Do to Make Buildings More Energy Efficient?[1]

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Abstract

This text discusses controversies surrounding theoretical, practical, and political implications of 'actor-network theory' ('ANT'). Since its inception around 1980, 'ANT' has been applied in an immense number of empirical studies, both within and outside the field of science and technology studies. But it was also rejected as radical chic without substance and/or as theoretically and politically unacceptable in perhaps as many instances as it was accepted. Implicit in both the application and critique of 'ANT' is the assumption that it can be treated as a 'black-boxed' set of notions and rules containing certain strengths and weaknesses. Proposing to treat black-boxed 'ANT' as useful provocation, I discuss what this kind of 'ANT' can and cannot do for me in my own empirical research on energy efficiency in buildings. In the second part of the text I turn from 'black boxed' and well-defined 'ANT' to 'ANT in the making'. In recent and ongoing work Bruno Latour, John Law, Annemarie Mol, Vicky Singleton, and others (in alphabetic order) answer to critiques of 'ANT's' political implications. The authors share an interest in the development of a non-essentialist foundation of politics, which neither turns into crude functionalism nor into hollow relativism. Concluding this text, two of the proposals made here, 'political ecology' and 'ontological politics', are compared and discussed in the context of my own research.

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There is life after constructivism –
constructive STS studies contributing
to a better society.
(Bijker 1993, 132)

Only a Sith deals in absolutes.
Obi-Wan Kenobi

1 Choosing the Genre

One of the founding fathers of 'actor-network theory' ('ANT') teaches us that it is not by coincidence that academic writing usually starts by evoking a 'well established fact'. This fact, if really 'well established', according to Bruno Latour (1987), acts as black box, which is built on other 'well-established facts', and so on. The more boxes there are stapled onto each other the more difficult it becomes for the dissenter to disconnect them all and to expose their inner workings. And, Latour maintains, if there is no dissenter there is truth.

In this text, although I will also describe how 'ANT' is used as a black box, I will not naively treat it like one. I cannot trust that this box will remain sealed. This is partly due to its lack of general acceptance, even in my field – Science and Technology Studies (STS). But this is also very much in line with what those who are usually treated as proponents of 'ANT' say about what 'ANT' is and what it can be. Along with them I am equally interested in 'ANT in the making' as in 'ANT' as a tool, which can be applied to understand the world.

Through use of one of the more notorious principles from 'ANT' I will observe 'ANT's' "world-building activities" (Latour 1999b: 21) when and where they happen. And there are, of course, many more occasions where they happen than just when the accredited proponents of 'ANT' talk or write. I will start with those who perform 'ANT' and who do so claiming to know what it is they are performing. I found such accounts of what 'ANT' is good or bad for in its 'applications', such as in empirical studies – mostly from outside STS – which in fact use 'ANT' as a 'black box'. But even more sure about what 'ANT' can do and particularly about what it cannot do are the critics of 'ANT'. Their descriptions are the second source I draw on for looking at 'ANT' as a properly bounded object. All these accounts – be they angry or sympathetic – have one effect: they stabilise 'ANT' as ANT (without single quotes), as a network of people, techniques, and material institutions, which is able to travel unchanged through time and space, also outside STS. Only if there is ANT, can it be applied or criticised. This particular version of 'ANT' is what I will explore in the first part of this text, which will be concluded by discussing what it can do for me in my research on energy efficient buildings.

Then, I will turn to those who are criticised and held responsible for 'ANT'. It is a very different 'ANT', which we encounter here. These are scholars who attempt to publicly 'bury ANT in its coffin' (Latour 1999a), declare 'ANT's' adoption to be 'optional', and its perspective to be 'multiple', 'mobile', 'mutable', 'contingent', and 'ambivalent', to quote Vicky Singleton's answer (1998) to the critique (Radder 1998) of one of her analyses (1996). Again I will ask what this unstable 'ANT' can do for me, but since I am dealing with 'ANT in the making' then, this cannot be an application or critique from outside any longer. Here I accept the invitation to partake in the creation of 'ANT' and will try to find out what it could mean to me in my work.

Part of this trial has already begun. It should be clear by now that from the very beginning I was using an Actor-Network perspective on 'ANT' itself. I invite the reader to see which kind of

insights such a perspective can render.[2]

2 Criticising and Applying 'ANT'

The most prominent example for 'ANT according to its critics' is probably the so-called "epistemological chicken debate".

According to the work of Collins and Yearley (1992) 'ANT' is only 'seemingly radical'. They describe the extended symmetry principle[3] of the 'The French School' as requiring great daring, but as actually being "essentially conservative – a poverty of method making it subservient to a prosaic view of science and technology" (Collins and Yearley 1992a: 323). In a footnote (note 14 on pp. 315-6) they take a couple of quotes from Callon's classic text on the scallops and fishermen of St Brieuc Bay (1986) and rephrase them in 'less radical' wording. They state that there is nothing new in it but the vocabulary. In a later article, which seemingly closes the debate (Collins and Yearley 1992b), they seek a middle ground and present themselves as pragmatic scholars more interested in changing 'the relationship between science and technology and other cultural endeavors' and understanding 'what can and cannot be delegated to machines' (ibid.: 388). 'ANT' – according to them – is much more interested in establishing a consistent system, which once established would not make a difference at all (ibid.: 384). Though more related to what Latour or Callon actually write, this also alludes to 'ANT's' pied piper-like attraction, stressing the emptiness behind the daring attitude.

Bruno Latour is often introduced as brilliant raconteur, whose style is "extremely entertaining and creative, but it does not always bear close scrutiny when rigour is sacrificed for repartee" (Scott 1991: 11). In invectives like this, the object 'ANT' becomes an instrument in the cunning hands of seductive Frenchmen, who seduce through 'sparkling writing' (Collins and Yearley 1992b: 384, note 10) with a 'French accent' (Fuller 2000: 8), promising conceptual unity which – stripped of its rhetoric – leads to nothing. The emperor has no clothes and nobody, according to 'ANT's' critics, is able to see that.

So let's turn to the seduced. In a quick and dirty survey of 18 recent (1998-2004) applications of 'ANT' from outside STS, I encountered a limited number of reoccurring themes and patterns of the use they make of 'ANT'.[4] The most obvious use of 'ANT' in these papers concerns the notion of networks. Here, we find a tendency to focus on *social* networks so that the analyses turn into stories of how an actor was included in or excluded from a social network, and how technologies and other non-humans were involved in these struggles (e.g., Colwyn Jones

[2] Unfortunately, due to the approach I have chosen here and also to restrictions of space I cannot provide a proper introduction to 'ANT'. Therefore, I have to assume at least some knowledge about 'ANT', especially in the second part of this text. As introduction I usually recommend John Law's easily accessible 'Notes on the theory of the actor-network' from 1992 (http://www.lancs.ac.uk/fss/sociology/papers/-law-notes-on-ant.pdf). A slightly outdated annotated bibliography of 'ANT' can be accessed here: http://www.lancs.ac.uk/fss/sociology/css/antres/ant.htm (last update 2000)

[3] Latour (1993) extends Bloor's symmetry principle, which states that 'all beliefs are on par with one another with respect to the causes of their credibility' (Barnes and Bloor 1982, 69; Bloor 1976) to also comprise a symmetric treatment of humans and non-humans.

[4] This is and cannot be an exhaustive study of 'ANT's' reception. I invite the readers to compare their own encounters with 'ANT in the wild', with the observations presented here.

and Dugdale 2002; Davies 2002; Harrison and Laberge 2002; Pouloudi et al. 2004; Zackariasson and Wilson 2004). Another, but related storyline I encountered in these applications, works the other way around. Here 'ANT' is used by technologists dealing with technical networks to include humans – the users – into their research (e.g., Atkinson 2000; Braa and Hedberg 2002; Dunning-Lewis and Townson 2004/2005).

This is, mind you, not to say that they apply 'ANT' in a wrong way. The argument is rather that we can ask along with Collins and Yearley whether this kind of research, which uses 'ANT', can be rephrased using more traditional sociological language without losing anything but the radical chic.

Is, thus, 'ANT's' most important contribution its use of the buzzword 'network'? Is it really just rhetoric? Not every critic rejects 'ANT' as a whole. Dick Pels, for instance, seeks a middleground between 'ANT's' position and other more traditional conceptions. He tries to define where 'ANT' has gone too far, and where exactly it might be better not challenge established notions about the world. Pels, thus, ascribes the object 'ANT' the role of an useful agent provocateur, who has to step back after "the Great Wall is levelled in order to make room for many lesser fences" (ibid.: 296-7). According to him it "was the radical demarche advocated by Callon and Latour concerning the dualism of Society versus Nature", which opened up room and which now can be filled with 'lesser fences' when we "settle with a weaker asymmetry, or a weaker notion about the permeable boundary running between humans and nonhumans." (ibid.: 297)

Pels' project is of interest here, because it makes explicit another use of 'ANT', which can be found in applications from outside STS. Using 'ANT' social scientists are allowed to talk about technologies and technologists likewise become entitled to talk about humans. The Great Walls between the social and the technical, but also other dualisms, such as the one between macro and micro, between agency and structure are levelled by 'ANT' resulting in openings for crossing those boundaries. And indeed, turning again to applications, 'ANT's' anti-essentialist critique of dualist thinking is most often mentioned. Typically, this is evoked in order to correct a perceived onesidedness in the respective field. David Featherstone, for instance, studying an embargo enforced on shipping on the Thames in 1768, uses 'ANT's' rejection of the global-local divide to "unsettle a tendency to confine subaltern politics within bounded spaces and open[s] up possibilities for following more dynamic trajectories of subaltern political activity" (see also Jenkins 2000, 308; Featherstone 2004, 702). The structure-agency dualism is critcised by way of 'ANT' by Anna Davies (2002, 190) and Jaquelin Burgess and her colleagues (Burgess et al. 2000, 123) add 'nature or society', expert or lay knowledge', and 'science or culture' as dualisms which they plan to overcome by means of 'ANT'.

The critique of any kind of essentialism is of course the very definition of constructivist thinking. Also more specifically 'essentialist dualisms' have been criticised at length within other theoretical approaches. For the 'science or culture' chasm one could refer to almost all of STS theory including Collins and Yearley. For rethinking the 'expert or lay knowledge' dichotomy Bloor's (1976) symmetry principle works well enough. The 'agency or structure' problem can be solved for instance with the conventional sociology of Giddens' structuration theory, and the literature trying to overcome the global-local divide is abundant.

So, what explains 'ANT's' appeal to be used against dualist notions? I propose that it is its promise to get rid of all of them – at once – while providing a tool which can be applied pragmatically

and intuitively. Particularly 'ANT's' network metaphor guarantees its applicability, making it an anti-dualist 'Swiss Knife' useful as agent provocateur in a broad variety of settings – from 'wet-land agri-environment schemes' (Burgess et al. 2000), 'internetworked after-sales service' (Zackariasson and Wilson 2004), 'computerized medical record systems' (Lehoux et al. 1999), 'Australia's country towns (Herbert-Cheshire 2003) to 'meat consumption and meat production in the U.S.' (Gouveia and Juska 2002), and 'reflex anal dilatation' (Collins et al. 1998).

For now we can conclude that 'ANT' – when used as black box – provides handy tools, which help to criticize dualistic thinking. But where does that lead? Exactly what type of descriptions of the world are we capable of making with this kind of black-boxed 'ANT'?

3 Making Buildings More Energy Eefficient – Black Boxed 'ANT' in Action

At this point I leave applications and critiques by others and turn to my own research. I have a particular problem in my work and I want to know what the anti-dualistic 'ANT' can do to help me.

Since 2002 I have worked in an interdisciplinary research project aiming at improving energy consumption in office buildings. The research group consists of architects, engineers and STS scholars, all in all some 30 researchers of which a majority has already worked as consultants. The starting point of this project was the recognition that energy consumption for basic services in buildings is high and still increasing, despite the fact that there exists technology which could contribute to dramatic savings. There is hardly any reason not to implement these technologies, given considerable cost-savings, political considerations and overall environmental benefits of decreased energy usage.

One main focus of the project is to improve technologies like solar cells, CO2 heat pumps, insulation, energy storage, and better use of daylight through better building envelopes. Additional to the research on individual technologies, the project deals with missing integration, missing user acceptance, and lack of implementation strategies. As a STS researcher I am responsible for two work packages, one about users and one about implementation. Though the bulk of work is confined within the individual work packages, which are organised along disciplinary boundaries, there are regular common activities like workshops and presentations. I made it a point to attend as many as possible of these and visited 13 of my colleagues in their offices interviewing them about what they thought what the actual problem was. At these occasions it soon became clear that there are at least two very different types of experts (see also Berker 2005).

On the one hand there are those who were principally open to a broad inclusion of every other relevant group. One of the actual techniques promoted in this group is called 'integrated design process' (Larsson w/o year), which calls for a more thorough planning with the inclusion of several different groups in an early phase of the building project. Technology is involved in this as a tool for collaboration as well as through a couple of normative notions about how a more energy efficient building should look like, when it is designed in an integrated way. Particularly the building envelope and the physical location of the building is relevant here, both in terms of energy consumption and in that it is a variable, which is difficult to change at a later date. According to my colleagues,

'integrated design processes' can lead to buildings that hardly need any heavy HVAC[5] installations. Ventilation and cooling is taken care of by an intelligent setup of the building from the very beginning. One underlying set of values evoked in this group concerns 'natural' ways of building. This means above all that fewer technologies should be involved. Examples for these 'natural' technologies are 'natural' ventilation[6] utilising natural draught and the more efficient use of daylight.

The other group is much more hesitant when it comes to including other groups into the design process. In a set of techniques bundled under the label 'continuous commissioning' they hope to improve building automation using computerised real time surveillance of every single parameter which is relevant to energy consumption and comfort in the building. These systems are 'intelligent' in that they learn from the occupants and adapt the parameters, continuously guarding the optimal state of the whole system. Manuals describing the process (e.g. FEMP 2002), recommend some limited inclusion of local technicians, but the actual 'continuous commissioning' is done by a specially trained engineer. Technological choices following from this, favour HVAC systems which are as reactive to new target parameters as possible, so that the theoretical optimum is reached quickly. The notion of 'natural' as it is present in the first group, is missing completely here.

A lot of discussion between both factions circles around the question of how much technology is necessary in order to reach a 'good', i.e. comfortable, functional and energy efficient building. The rift between two groups, I was told, is common in the building sector and can be held responsible for poor integration between technical installations and the rest of the building, which should be aligned in order to provide for optimal energy efficiency. The usual way of dealing with different goals is strict division of labour, and to a certain extent this was also what happened within our project. When the project, after three years, entered its final phase this current year, the project leader decided that money should be provided as extra incentive for interdisciplinary work, which lead to pragmatic collaborations for instance around how 'continuous commissioning' and 'integrated design' could complement each other.

To conclude the description of my participant observations: Technologies and techniques which could help to save energy do not travel well from the laboratories to a building's everyday life. Additionally there are two visions of how these technologies and techniques are to be implemented in real life buildings and building projects. Thus, we have two different visions of energy efficient office buildings.

So, what can 'ANT' do for us in this situation? According to the key tenets of 'ANT', the two visions present in the project are political in that they reflect an attitude of relating the environment, technologies, experts, janitors, building owners and occupants to each other. More specifically described in the jargon of 'ANT': these visions each consist of notions of how the 'actants'[7] present in the building (and also: being the building) should be 'translated'. Put this way, the antagonism between

[5] HVAC=Heating, ventilation, air conditioning

[6] Natural ventilation is hardly ever 'natural' in the sense that it does not involve mechanical ventilation; the correct term would be 'hybrid' ventilation, but 'natural' is used equally often.

[7] 'Actants' are humans and non-humans provided with their agency by the relations in which they exist. This term was introduced to replace the notion of 'actor' which is usually imagined to be human.

the two groups within the project (and presumably also beyond it) cannot be about 'nature' versus 'technology'. The second group 'enrolls'[8] CO_2, how quickly it heats up and how long it stores energy; the first group tries to capture draught's cooling powers. No difference here in the eye of 'ANT', but different strategies whose outcome will depend on whether the 'enrolment' of a sufficient number of human and non-human entities will succeed or not. And this is actually the way my colleagues deal with the conflict as well. In those interdisciplinary groups, which were installed recently, pragmatic negotiations take place about which human and non-human entities 'enrolled' by one group can be useful for the other.

In 'ANT's' terms the goal of establishing new and more energy efficient technologies and practices is the same as establishing new irreversible translations of as many heterogeneous 'actants' as possible (building owners and CO2 and draught and end users and janitors, etc). Here lies one contribution of 'ANT', to remind the engineers and architects of what they are doing anyway i.e. relating a broad set of things and people to each other. And this is also the first use of 'ANT', which was presented above as strategy found in applications from outside STS. If we refuse *a priori* distinctions like the one between nature and technology, social science is no longer forced to impose categories onto the practice of the actors. This is, in the situation given here, particularly useful for taking part in the project's everyday work. Since there is nothing wrong with more energy efficient buildings – quite the opposite – together we now can build a brighter future.

But are we not loosing something here? Is this not a 'poor method' which looses any specificity from a social science approach? Are we not giving up valuable distinctions, such as for example nature and technology? Where is the critical edge?

In fact, maybe there is actually not much to be said at all without taking at least some dualisms for granted. Latour's writings are full of modest gestures pointing into this direction:

> "ANT does not tell anyone the shape that is to be drawn – circles or cubes or lines – but only how to go about systematically recording the world-building activities of the sites to be documented and registered" (Latour 1999b: 21).

This conceptual modesty suits the theory very well, which, first and foremost, promises to follow the actors, but it is also one of the most criticised aspects of 'ANT'. Here, my doubts are shared by critics of 'ANT' to which I will now turn again, preparing the ground for the second part of this text:

Steve Fuller identifies 'ANT's' modesty with "the Mode 2 conception of policy-driven 'postdisciplinary' research, which welcomes the university's permeability to extramural concerns." (Fuller 2000: 9) He is not exactly fond of Mode 2, which, according to him, serves 'more centrally located clients' and delivers 'on a platter those on the social periphery' (ibid.). He says:

> "Under such a regime [of Mode 2 contract research], if researchers do not provide quality information about their subjects to clients, they will be quickly replaced by someone more willing and able to do so." (ibid.: 11)

The argument that 'ANT', with its disregard for 'broader patterns', always has to take 'the winners point of view' (Radder 1992: 161) has two aspects. First, it is part of a larger group of po-

[8] In 'ANT's' jargon this word is used to describe a crucial stage when a new 'actant' is included into a network (see Callon 1986).

litical objections, which are only then valid if shared political goals can be assumed, e.g. not to betray 'those on the social periphery', not to take 'the winners point of view', and instead to take an openly "evaluative stance towards social consequences of technology" (Winner 1993: 368), for instance against the "militarization of science and technology, especially in this century" (Radder 1992: 151; see also Winner 1993: 370-1). Second, it accuses 'ANT' to impose restrictions on the researcher, which render the research irrelevant, because s/he can only know what the actors know, and has no presumptive categories which could help to see the researched in a new light.

Turning to 'ANT' and how it is performed in its applications also supports this kind of critique. The majority of the texts that were presented above have 'management', 'planning' or 'organisation' in its title or in the name of the journal where they were published. I have insisted on the productive aspect of these efforts to make management of humans and non-humans more effective, which I found in the deconstruction of dualisms. However, this does not help in the situation in which I find myself in the Smartbuild project. Ironically, the only dualism I can think of here, which may be worth deconstructing, is the one between the technical and the social. It can be said that particularly in 'continuous commissioning' there are fantasies of managing people through 'smart' technology and only through technology. The humans within the building then become reduced to being a problem, dubious delegates, who should be controlled by 'smart technology'. To reveal this one-sidedness is a line of reasoning I have used before (Berker 2005). Overall, however, we have to accept that the heterogeneity of energy efficiency in buildings is sufficiently acknowledged in the work of my colleagues. The relative strong presence of social scientists (including myself) shows that besides the technology there is a genuine interest in non-technical aspects. This hardly comes as a surprise, since 'ANT' has taught us that successful engineering is always about managing both humans and non-humans. And finally, as a researcher who works at a STS department with the name 'Center for Technology and Society', I am hardly crossing disciplinary boundaries, when I do research on technology *and* society. The anti-dualistic vigour of 'ANT', thus, cannot contribute much for me in the Smartbuild project.

Is helping to organise, to plan, to manage energy efficiency more efficiently through engineering the only thing we can learn from 'ANT'? And if so, what do I have to contribute which is different from the knowledge how to engage as many humans and non-humans as possible to support the diffusion of my colleagues' favourite technologies? Do I find the black box empty after others have opened it before? Where is my own vision between or beyond the vision of architects and engineers? This is the problem I am facing and it seems that black boxed 'ANT' does not lead me closer to a solution.

4 'ANT' as Critique

Judging from their reactions to this kind of critique – maybe from the fact that they react at all – we can assume that those who are criticised – Latour, Callon, Law, and other scholars held responsible for 'ANT' – are not content with this version of black-boxed 'ANT'. In the second part of the text I turn to recent (and not so recent) developments of 'ANT', which answers the critiques presented in the first part. 'ANT' is shifting here; it becomes less clear what it actually is and when it is revised it is also becoming polyphonic. I will focus on two of these versions of 'ANT in the making', and try to make clear where they are different, and where they agree.

4.1 Political Ecology According to Due Process

First there is Bruno Latour's project of a political ecology (Latour 2004). When things and animals and humans all have the same ontological status then two directions are possible. First, humans are treated like things, which is the negation of any politics. Or secondly, human rights could also be extended to non-humans. The latter option is exactly what Latour's political ecology does, extending of the liberal right of representation to everyone and everything (Lee and Brown 1994: 788).

According to Latour we already live in the age of political ecology:

> "Not many years ago, when we were contemplating the sky above our heads, we thought of nothing but matter and nature. Nowadays, when we look above our heads, we watch a sociopolitical imbroglio, because, for instance, the depletion of the ozone layer brings together a scientific controversy, a political dispute between North and South, and gigantic strategic moves inside industry." (Latour 1994: 796)

For Latour the task is now to deal with these socio-political imbroglios without taking shortcuts following outdated divisions between the social and the natural, values and facts, and of course humans and non-humans. Latour (2004) describes a new parliamentary order in which those representing nature and arte/facts (scientists) and those representing humans and values (politicians) work closely together. Together with other groups like economists, diplomats, and also sociologists they have different tasks in this common enterprise, whose goal is to include facts and artefacts in an open way into the 'collective'[9]. This basically means to assign them a place, meaning, and value after an evaluation done in consultations by the members of the collective. Latour insists that all this has to be done according to 'due process'[10]. This is what distinguishes his vision from the status quo, and could therefore also be called his political message: Neither politicians, nor scientists, nor economists, nor any other group should be allowed to make decisions on their own as to which fact or artefact will have which place, meaning, and value in the world we share. All these different groups become involved in a process, which he calls the 'collective'.

Is this the answer I was looking for? In Latour's political ecology, new and more energy efficient technologies would have to go through the same 'due process' as any other object. According to Latour, there are constantly new challenges to the 'collective'. Those challenges in my example would be the threat of climate change as well as the general depletion of natural resources. All of this is closely related to energy consumption among others in buildings. The question now is what this means for the 'collective' or whether it should meaningful at all. There are many different versions of what to do and all of them ground in a particular understanding of what is 'actually' happening. Within the Smartbuild project we have seen two different proposals, but there are of course, many more. Latour calls this stage the stage of 'perplexity'. 'Due process', now, is the method with which the 'perplexed' collective 'in due course' finds ways to deal with them, discussing options, risks, and value hierarchies, and finally building institutions

[9] Latour defines the 'collective' as the *process* in which associations between humans and non-humans, facts and artefacts are collected (cf. Latour 2004: 238).

[10] This term is borrowed from the Anglo-Saxon judicial tradition (cf. Hyman 2005 for an introduction).

fixing what it means to live together with climate threat and no oil left. A process is legitimate, according to Latour, when it does not leapfrog over important steps, like the one he calls 'consultation', where relevant other 'actants' are heard, and 'hierarchy', where the new 'actants' are ordered according to their value for the collective.

In the light of Latour's 'due process', the Smartbuild project's task cannot be to foster the new objects from the cradle to the grave. It would be exactly what Latour describes as 'undue' process if the group of scientists gathered and, provided with laboratories and other more or less powerful tools, would seek shortcuts excluding other relevant entities like existing buildings and their installations, other routes to energy efficiency developed at other places, janitors, end-users and so forth. These have to be included and altogether the collective will decide which of the new objects proposed by the engineers, social scientists and architects of the Smartbuild project will finally be implemented. This is 'ANT' turned politically democratising the business of 'heterogeneous engineering' (Law 1986).

Thus, the members of the Smartbuild project are once again reminded that they are dealing with a broad set of entities, and so far there is nothing new in this. The good news however, is that now they are not alone, that they are relieved from the duty to do all the things that they are not trained to do. Instead they are supposed to do what they are good in, using their instruments to continuously displace and change their point of view (Latour 2004: 138) in order to see and record those new things and relations, which the rest of the collective is not able to see. Scientists, maintains Latour, have the power to discover new entities before they are well-defined members of the collective. Their task is to be the spokespersons for these entities and to present them to the collective, which then through consultations has to come to grips with how to proceed. In this model a social scientist's task is not to know what, for example, energy efficiency is or should be in lieu of the actors,

> "[b]ut to inquire into what binds us, we can count on the human sciences' offering the actors multiple and rapidly revised versions that allow us to understand the collective experience in which we are all engaged." (Latour 2004: 225-226)

In this sense, besides producing these 'rapidly revised' versions, which will help 'us' to understand how 'we' can build and live more energy efficiently, it could also be my task in the Smartbuild project to remind my colleagues not to give in to expectations which drive them to *build* the houses which they are now *envisioning* closing the debate all too early.

4.2 From Warm and Light Reversibility to the Margins

The journey is not yet at an end, though. We have seen that Bruno Latour, in line with his model of a political ecology, invites us to revise his proposition. Drawing on other versions of 'ANT's' political project, proposed by Bruno Latour, Michel Callon, John Law, Vicky Singleton, Annemarie Mol, and others (in order of appearance), I will use the reminder of this text to do exactly that.

The common starting point for these alternative propositions is a different understanding of the relation between reversibility and irreversibility of translations and, thus, about stability of associations and their change. Half of the 'due process', which Latour is advocating, is about destabilisation of established associations in the stages of 'perplexity' and 'consultation' and thus about destabilisation of the collective itself. But the other half is about re-ordering and stabilising the collective and the appealing entity, which in

'ANT's' relational logic is one and the same thing.

The question of how change and stability come about is already an important topic in the early life of the object 'ANT'. In 1981 Michel Callon and Bruno Latour place themselves (the sociologist, that is):

> " [...] in the warm, light places where black boxes open up, where the irreversible is reversed and techniques return to life; the places that give birth to uncertainty as to what is large and what is small, what is social and what technical." (Callon and Latour 1981: 301)

This is the foundation of 'ANT's' anti-dualistic perspective: when entities are not yet fixed, nothing can be taken for granted about their essence, and those who are dealing with them, heterogeneous engineers, but also sociologists and others, make a mistake when they treat them as if they were already stabilised as nature or as technology or as social, and so forth. A text by Callon – published ten years later – moves this description of the theorist's place over to a distinction between different types of networks distinguished by the degree of their reversibility. He states that some networks contain more of these 'warm and light' places than others, while some networks are more stable than others:

> "[...] the more numerous and heterogeneous the interrelationships the greater the degree of network coordination and the greater the probability of successful resistance to alternative translations." (Callon 1991: 150)

This kind of irreversibility, according to Callon, is always accompanied by standardisation and normalisation of interfaces which enable the heterogeneous associations to resist alternative translations (Callon 1991: 151). There are highly standardised networks in which a great number of heterogeneous actors are completely and thoroughly acted by the network. Not much to see for 'ANT' scholars here but a lot of tightly locked deep black boxes and powerful 'immutable mobiles' which enable 'action at a distance' from powerful 'centres of calculation'. But Callon (1991: 152) maintains that there are also networks where translations are constantly done and undone. These networks are characterised by "strategy, the negotiation and variation of aims, revisable projects, and changing coalitions." (Callon 1991, 154).

This is the background for Susan Leigh Star (1991) when she criticises 'ANT's' politics in a text published in the same collection. She argues that irreversibility is never reached for every node of a network, that "[s]tabilized networks seem to insist on annihilating our personal experience, and there is suffering." (Star 1991: 48) In this quote Star, who is representing symbolic interactionism in STS (cf. Clarke and Star 2003 for an overview), reintroduces the human subject through the container of personal suffering. The quote, however, also contains a notion, which can be turned critically against 'ANT' without leaving its premises. If no network is ever stabilised for every 'actant', then there are always groups of entities at the 'margins'[11], which then have to deal with the black boxes, which were closed in ways that do not allow them to become 'proper' entity.

The political question now is, how 'ANT' deals with these unstable regions within stable networks. The process which Latour calls the 'collective' is kept moving by exactly the tension between those already included into the collective and those outside, which are 'appealing' to the 'collective'. 'Due process' means that there is a time in

[11] For more background on Star's critique see also her work on boundary objects, which *per definitionem* are marginal (Star and Griesemer 1989).

the early life of a new member ('actant') of the collective, where it is not yet fixed. But later on there is also a time – the time of 'consultation' – where the 'actant' becomes translated into something more fixed and then, after it has been placed in a 'hierarchy' is embedded in an irreversible way ('institutionalised'). 'Due process' means exactly that no shortcut is taken from reversibility to irreversibility (or vice versa), that the transition between these two states takes place in an open and politically legitimate way.

Here Star's objection is valid. What about those members of the collective that are neither outside the process called the 'collective', nor inside, but systematically and continually stuck between reversible and irreversible translations? In other words: what about the places, where associations neither yet exist nor are successfully stabilized, which are not beginning, but not ending either?

4.3 On being Allergic to 'Continuous Commissioning' and 'Integrated Design'

Susan Leigh Star uses her own allergy to onions as an example. This constantly causes trouble for her since she is forced to live in networks which are stabilised around *not* being allergic to onions. We can now ask who and what is excluded by the visions of my colleagues. Who and what would be incommensurable to the versions of networks they suggest?

Both engineering visions, which were presented above, are equally about 'human/nonhuman mingling', but there are conspicuous absences of certain humans and non-humans.

'Continuous commissioning' does produce a lot of data from sensors all over the building. To analyse this data and to draw the right conclusions, special expert knowledge is necessary, which my colleagues have, but no one else has. Particularly absent is local knowledge owned by building managers and occupants and which usually is difficult to access by external experts. In 'continuous commissioning' this is replaced by data, which is suitable for advanced methods of calculation.

The architects' idea to focus on thorough planning in early stages of the process ('integraded design') excludes systematically all those groups, whose possible contribution is based on daily experience within the building, again mainly maintenance personnel and occupants. This is firstly because early in the building process it is not yet clear who exactly will move in. But there is also a more fundamental problem having to do with the different character of knowledge needed early in the process. For instance, the literature in participative design (e.g. Kensing and Madsen 1991; Greenbaum 1993) notes that it is difficult for lay people to read and understand abstract representations, such as construction drawings, without special training. And the more decisions which are taken early on, the more the building will be the domain of experts and less controlled by those living and working in the building at a later date.

All this is perfectly 'normal' in terms of 'ANT's' description of how translations are stabilised. Both visions of energy efficient buildings allow experts who reside in 'centres of calculation' to control basic parameters of the building, a control which was before in the hands of locals such as for example janitors or the occupants.

That this can be a source of tension and conflict became particularly clear when 'continuous commissioning' was presented at a workshop earlier this year, where a large group of facilities managers and janitors were present. It was obvious that they felt threatened, because their expertise of working with today's HVAC systems would be rendered worthless when these new systems were introduced. When they understood that 'continuous commission-

ing' is not yet ready for broad implementation their reaction was a mixture of relief and malice. This kind of passive resistance is, in fact, something architects and engineers complain about a lot. Those janitors in the accounts of experts become an inert mass which is resistant to *any* change.

The solution, according to Latour's political ecology, is to engage them, to make them the local associations, which are needed to build the larger ones. If that does not succeed, then *either* they *or* the 'continuous commissioning' and 'integrated design process' have to leave the 'collective'.

But with Star we can now ask, what about those janitors, who live on in the niches and gaps that exist between the newly established facts and artifacts, after 'continuous commissioning experts' have replaced their function? Even though they may be too old to learn the new routines they do not just disappear. Or, if 'continuous commissioning' and 'integrated design' are successfully obstructed by the resistant locals: what about innovations which never fully succeed, but which do not vanish either? More generally (and more solemnly): what about those who hardly survive at the margins, those who suffer from mysterious diseases which do not appear in treatment schemes and never will, those who would love to be proper members of the 'collective' (even as a patient in one of its institutions) if they only could manage to fit in? Political ecology à la Latour only knows of them that they are 'failed' objects, which are encouraged to try again: "It is sad, but in 'due process' it was decided that energy efficiency is a greater good than your expertise, you see?"

Those failed objects may vanish from the collective's (bad) conscious but they do not stop to exist and 'there is suffering', which is 'othered' in political ecology once more. Political ecology in its desire to pacify inclusion and exclusion – to say it mildly – does not understand these objects at the margins very well.

4.4 New Objects: Fires and Fluids

This critique of 'ANT's' difficulties with the Other is not new, its most poignant version perhaps being Lee and Brown's lucid analysis of 'ANT's' inner workings from 1994. I tried to argue in the previous sections that political ecology's inclusion and exclusion in 'due process' cannot be a satisfactory answer.

But there are other answers. Referring explicitly to Star's argument, John Law (2000) suggests that early 'ANT' followed its research objects, 'heterogeneous engineers', too closely, so that those excluded by these system builders would become excluded one more time in the description made by the social scientist. He concludes that 'ANT' indeed was too much interested in functional networks, which then only can be analysed as a success or a failure.

The question he asks then is whether this kind of crude functionalism is a necessary result of abandoning fundamental categories like nature, society, and so forth. His answer is "no". He finds visions of a "non-foundational but material relationality that is not functionalist" in Donna Haraway's work (1988; 1991b; 1997), and also in Annemarie Mol's description of multiple bodies (Mol 2002). This has since become the starting point for a quest to find a way to describe other kinds of objects, which – according to 'ANT's' relational materiality – also means to describe other kinds of associations.

In terms of reversibility/irreversibility, the task is to find a way to understand translations which are reversible, but which are irreversibly so, constituting objects which are neither stabilised, nor fractioned into an arbitrary multiplicity. John Law and Vicky Singleton (2005) call two of these object types 'fluid objects' and 'fire objects', leaving

open the question if there are more types. They are best described by example. There is first a 'fluid' technology, as exemplified by the Zimbabwean bush pump, which was analysed in depth by Marianne De Laet and Annemarie Mol (2000). The pump was designed by an engineer, but he has written its adaptation to its surroundings into the apparatus. Its parts are easily replaceable and can be patched with other unforeseen parts. Additionally, the pump is designed in a way so that the respective local community is actively involved in every implementation and in maintaining the pump. The engineer stays actively involved in the development and includes improvements he observes. In 'ANT's' terms this pump is not an 'immutable mobile' but still traveling while adapting its shape to the surrounding. This is its fluidity, which gives it a certain degree of multiplicity, but not in a way whereby it looses its shape completely. It is not *one* but neither *many*.[12]

The other kind of objects, called fire objects, also travels. But it does so in unpredictable, disruptive, discontinuous ways. The example for such an object, which is used by Law and Singleton (2005) is alcoholic liver disease, which they found to be defined by a couple of 'generative absences'. They found that alcoholic liver diseases in practice are constituted by absent alternatives imagined by the practitioners (e.g. abstinence or hard drug abuse, etc). Another generative absence is that the therapy depends on absent conditions outside the reach of those who want to help, for instance, a satisfying social life or work. And finally there is the absence of alcohol itself, which is generative in practices surrounding this disease. All this makes alcoholic liver disease a 'messy' object (Law 2004), which is difficult to study and understand, because not only the practitioner but also the researcher deals with absences s/he cannot know about, but which are constitutive nevertheless.

The difference between fluid and fire objects is that fluidity presupposes that the absent Other is smoothly included in a controlled way (the engineer is still there somewhere), whereas in the case of the fire object the Other is taking control over the object in an unpredictable way.

Turning to my project for the last time, energy efficiency can be described as fire object, because it is generated by the *absence* of energy consumption. Therefore, efficient practices 'in the wild' appear unpredictably here and there. Both versions of energy efficiency, which were presented above, exclude the locals and their specific knowledge trying to replace them by technical and organisational means. According to them, the same technology, the same strategy should be applied in every building.

However, the uses of energy are maybe too multiple, too uncertain, too open-ended, to be thoroughly controlled from afar. We may therefore ask if fluidity would be a 'better' way of pursuing energy efficiency? In terms of calculable efficiency the answer is probably "no". A perfectly aligned network of all relevant 'actants' will in fact be energy efficient. Then, energy efficiency is turned into a proper object and other entities, such as for instance the local janitor and his/her knowledge are excluded from the associations which constitute the building. Those low-energy or even zero-energy buildings, which already exist today, in which everything revolves around energy efficiency demonstrate exactly this: that cases where energy efficiency is aligning the building's contingencies and

[12] 'Fluid objects' share this feature with 'boundary objects' (cf. Star and Griesemer 1989). The focus, however, is not on how these entities relate social worlds to each other, but on how their fluidity allows them to travel through ever-changing associations.

multiplicities are – energy efficient. In real world buildings this is not the case and therefore a more fluid approach may have its virtues, dealing better with the fire object energy efficiency, which slips through the fingers of those, who wish to make it a constant, definite, and unambiguous entity.

5 A World of Bastards?

In the ontology of Latour's political ecology, failed objects are expelled during the course of the 'due process'. Distinguishing between different kinds of 'failed' entities and elevating them to the state of 'proper' objects with defined traits – such as fire objects and fluid objects – we postpone their eviction.

Fire objects, despite the difficulties one encounters trying to account for something which is defined by an absence, do not have to be a bad thing. Near the fire, where bastards of reversibility and irreversibility thrive, there may also be 'warm and bright' places still to discover. Fluid and fire objects may be special cases, which call for special attention. John Law, however, argues through reference to his own and to Annemarie Mol's (2002) research, that the inconstancy, multiplicity, and indefiniteness (Law 2004: 145) of the Other can be found everywhere in real-life practices, which are, therefore, in principle 'messy'. According to him this 'messiness' a by-product of Euro-American metaphysics, which defines 'proper' objects as definite, constant, singular, or in other words tries to convert the bastards to legitimate children and does exclude those who won't fit into the picture. This leads him to call for new methods of scientific work that are able to deal better with this kind of Otherness without trying to extinguish it from both method and the real world.

To account non-inclusively, non-exclusively, and non-instrumentally for the often surprisingly robust bastards of the reversible and the irreversible gives us access to a whole new world of objects, which were invisible before. When we are looking for them, we suddenly encounter a host of bastards, such as *ad hoc* improvisations, which sometimes last longer than any carefully crafted 'immutable mobile' (and nobody fully understands why) or 'zombie objects' which should be dead but do live on, because they are just too monstrous to die.

Whether we want a world ruled by definiteness, constancy, singularity or – on the contrary – a world, which is filled by indefinite, multiple, ever-shifting bastards, all this becomes a question of 'ontological politics' in the end. This is Annemarie Mol's (1999) term describing the relation between ontology and politics, which becomes a relation of mutual constitution if constructivist non-essentialism is taken seriously. John Law calls a politics which aims at definiteness, constancy and singularity a "class politics of ontology which is bad" and continues to say that "[g]reater permeability and recognition of fluidity and all the rest, overall this cannot be a bad" (Law 2004: 149).

Can it be a bad thing? To be sure, there is a whole host of fears which is be fuelled by fluidity[13]. Put more generally, the endless struggles for stable national, group and individual identity in modernity have all their indefinite, multiple, dissolving Other, be it 'eternal Jews', overflows of migrants, or other forms of overwhelming difference. And they sometimes fight these Others to their last breath. At the same time, in modernity more bastards of the known and the unknown were created than in any historical period be-

[13] For me, the most vivid description of what fear of fluidity can do is Klaus Theweleit's classic psychoanalytic study of male fascist torturers' fantasies (Theweleit 1987).

fore. The restless urge of the moderns to meet the unfathomable Other, to reach the boundary of the kn/Own and to cross it, is what makes them tick.

Bruno Latour offers a way to deal peacefully with the Other by including and excluding it according to an open, political, and thus 'due' process. Law's, Mol's, de Laet's, Singleton's and others' political option is different. They want us to find new methods of living together peacefully with the Other without 'including' it at the price of excluding others.

Both versions of 'ANT's' politics share the same goal, to help us to live together without referring to essences and dualisms. They differ in the place they situate themselves, which gives them a different vision[14]. From the very beginning and extending to today[15], Latour places the social scientist at the warm and light sites where all is reversible and where therefore 'rapidly revised' suggestions of how we can live together can be proposed and discussed. Other theoreticians have moved from there to the margins, where they found suffering, but also new insights into ontological consequences of non-essentialist thinking.

So, what can 'ANT' do for us? It can help to dissolve dualisms of all kinds, but it also has accepted the challenge to help us to live in the resulting world of fluidity. Whether it succeeds is subject to the efforts of all those who are willing to collaborate.

And on a very final note: What has using 'ANT' methods and concepts in this text done for me (and hopefully also for the reader) in order to get to grips with 'ANT'? I think I have succeeded not to privilege either the applications of 'ANT' or 'ANT in the making'. The traditional way would be to use the applications against the theory or criticising the application for the (wrong) use of theory. The uses of 'ANT' which I found in the applications were anti-dualistic, while the uses of 'ANT in the making' were about living together in a world in which all kinds of essentialist dualisms are already gone. I guess both belongs together.

[14] Situated and therefore 'partial vision' as opposed to 'the view from nowhere' is discussed by Donna Haraway (1991a).

[15] In his 'Introduction to Actor-Network-Theory', traditional sociology (i.e. all non-'ANT') is given the task to work "with what has been already assembled" (Latour 2005: 12), while 'ANT' takes care of the rest.

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