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Bruno Latour

Steve Matthewman

Driving Impulses

Bruno Latour has called himself an anthropologist, philosopher and sociologist. He often describes his overall project as an “anthropology of the moderns”, by which he means an analysis of contemporary civilization’s truth-generation sites: science, religion, law, technology and techniques.ⁱ That said, the foundations of his approach and the basis of his fame come from studies in science and technology. This will be our focus. This can be justified as the principles he identified in these early works have continued to inform his subsequent work. (In interviews he frequently says he pursued the same course of study over decades.)

At their simplest, Graham Harman suggests that Latour’s principles can be distilled down to four points relating to actors, irreduction, translation and association:

1. Actors: everything which exists is an actor. All actors must be treated in the same way.
2. Irreduction: nothing can be reduced to, or replaced by, something else.
3. Translation: since there can be no stand-ins or substitutions real work is required to influence other entities.
4. Association: strength or weakness is a function of alliances and associations. It is the task of social science to trace these connections.ⁱⁱ

Latour’s work begins as a challenge to the sociology of science but it ends up by challenging the entire social science enterprise.

Key Issues

Latour spent two years in Côte d’Ivoire in lieu of military service. While there he worked for the French research institution ORSTROM. In the postscript to the second edition of *Laboratory Life* he noted that he was constantly called upon to explain differences between rational modern western and traditional African “minds”.ⁱⁱⁱ Why were African schoolboys in technical schools unable to produce drawings in three dimensions? Rather than write them off as scientifically illiterate primitives, Latour looked to a more obvious reason: they were being asked to draw things they had never seen, such as complex engines. This prompted an interesting thought: what would science look like if the tools of anthropology were turned on it? The question was far from trivial. ‘Whereas

we now have fairly detailed knowledge of the myths and circumcision rituals of exotic tribes', Latour and Woolgar wrote, 'we remain relatively ignorant of the details of equivalent activity among ... scientists, whose work is commonly heralded as having startling or, at least, extremely significant effects on our civilisation'.^{iv} Thus came about a book, amongst the first, to treat some of the most powerful people in our world like any other strange tribe. Latour and Woolgar "went native", living amongst the scientists at the Salk Institute, a centre for biological research founded by the polio vaccine's developer. Instead of taking them at their own word they observed the scientists' everyday practices and world-views.

The subtitle of the second edition of *Laboratory Life* dropped the word "social" to become *The Construction of Scientific Facts*. Latour felt that interest in the social denotes a corresponding lack of interest in things. Ever since Émile Durkheim, Latour felt critical sociologists have stressed social projections rather than material properties. Technologies are considered neutral intermediaries that do no work, rather than as mediators exerting real agency. Latour distanced himself from this stance. For him, any successful construction relies on nonhuman and human agents. Here, we can start to see the importance his theoretical intervention (typically known as actor-network theory, hereafter ANT).

As Latour explains, there have been four waves in the study of Science and Technology.^v The first, personified by figures like Durkheim, had it that scientific facts were objective and therefore unamenable to social explanation. The second wave, associated with such scholars as Robert K. Merton, offered a sociology of scientists, a superficial interest in the context of science (for instance career patterns and research ethics). The third wave suggested that the cognitive and technical aspects of science were also open to sociological scrutiny. Sociologists like David Bloor and Harry Collins argued that the discipline's tools could be as successfully applied to science as they were to other social phenomena, in other words sociologists should see science as a social activity and scientific knowledge as not simply true and rational but as socially constructed. That is to say they became very interested in the processes by which some things came to be accepted as true. Latour and fellow actor-network theorists argued that the superficial and deep aspects of science could not be studied unless sociology and social theory were fundamentally recalibrated.

Enter Actor-Network Theory

The traditional argument within the sociology of science was that external reality exists, it is fixed, and scientists get better at approximating it. Following Thomas Kuhn scientific work was seen as a

series of cognitive constructs understood with reference to social interests. These could link to such things as funding levels, or prestige and seniority within the field. That they could be identified implied that they, too, are relatively fixed. ANT's novel intervention was to argue that when natural scientists are in dispute they negotiate what the physical and social worlds are like: 'the activity of scientists and engineers and of all their human and nonhuman allies is the cause, of which various states of nature and societies are the consequences'.^{vi} Scientific controversies are all about telling stories and recruiting (human and nonhuman) allies to your model of the world.

Latour outlined seven rules of method for studying scientists and engineers:

1. Study science and technology in-the-making.
2. Do not judge a statement on its own merits. Look to its transformations by others (how claims are subsequently advanced and challenged).
3. "Nature" results from the settlement of scientific controversy; as such it cannot settle disputes.
4. "Society" is the consequence rather than the cause of stability; it only emerges when humans and non-humans are tied together in durable chains of association, hence the requirement for symmetrical treatment of all of the enrolled humans and nonhumans to determine the resolution of controversy.
5. Make no prior judgement of the composition of science and technology (we cannot know ahead of time which alliances will form, which interests will triumph). Be agnostic about the boundaries of scientific and technological activity. Track what is tied to each claim. Look to what is enrolled.
6. Irrationality does not refer to logical failure or a break with the social order; it is applied to those impeding network-formation.
7. Avoid purely cognitive or social explanations. Successful sciences and technologies rely upon successful network extension.^{vii}

He also distilled his approach down to six related principles:

1. The fate of facts and technologies, whether valued or denigrated, is determined by subsequent users. Their qualities are not intrinsic; they are the result of collective action and decisions.
2. Scientists and engineers enrol allies (and speak on their behalf) to advantage themselves against others.

3. Science, technology and society are not discrete entities. Whether looking at facts, technologies or people we are faced with chains of association, some stronger than others.
4. The more arcane science and technology appear the more they extend beyond the laboratory walls as they require significant resources and allies.
5. There is no “great divide” when it comes to minds. Irrationality is a label applied to enemies.
6. The history of science and technology should be seen as the history of resource mobilisation within networks permitting action at a distance.^{viii}

ANT is challenging as it does not entertain the idea of fixed frames of reference or the notion of foundations upon which the social world is built, and it makes no distinction between human and nonhuman actors. It also dispenses with most standard social science dualisms: ancient/modern, micro/macro, subject/object, society/technology, and nature/society. While sociologists typically make an ancient/modern distinction, ANT refuses to. Differences can be explained by scale, complexity (the number of nonhumans involved) and the length of chains of action. Modern society, for example, ‘translates, crosses over, enrolls, mobilizes more elements which are more intimately connected, with a more finely woven social fabric, than the former does’.^{ix} The micro/macro split also makes no sense to ANT for the same reason. Scale relates to the actor’s achievements.^x Significance is to be found in chains of association, the size of networks, the number of elements tied in. ANT eschews the subject-object dichotomy and their setting within something called society. In their place Latour proposes associations of humans and nonhumans within a collective.^{xi} The society/technology dichotomy also collapses under empirical scrutiny because entities exchange competencies, and because humans and nonhumans alike exert agency. The division between ‘things-in-themselves’ and ‘humans-among-themselves’ is therefore senseless.^{xii} The two are always combined. Instead of asking ourselves is something social or is something technological we should be asking: is it a weaker or stronger association than others?

Instead of thinking about essential differences in binary opposition, ANT’s explanatory framework stresses the stability and durability of actor-networks. This explains what keeps society together.^{xiii} To answer this question ANT attends to two things that customarily escape the social theorist’s attention: the role of nonhumans, and the work done to make associations possible. Things and people, nature and society have a shared ontology, for which ANT provides a shared vocabulary. Actant often replaces actor in their accounts as actor suggests a strictly human agency, actor-network replaces social relations, delegation replaces social roles and translation replaces interaction.^{xiv} This seriously challenges the social sciences as usually practiced.

The Challenge to the Social Sciences: A Sociology of Associations

All is well with the social sciences, Latour quipped, except for two words – “social” and “sciences”. Sociology seems to be based on identifying category error. The sociologist’s job is devoted to putting people right: “You think that it is X”, says the sociologist, “but it is *really* Y”. “Y” will perform a social function. Irrespective of what they study, then, the *real thing* always turns out to be something else. So when sociologists claim ‘to comprehend something they have left aside what the *thingness* of this thing actually is! Either they destroy what they study or ignore ... it’.^{xv}

For Latour the paradigm case is religion.^{xvi} Sociologists of religion argued that beliefs, rituals, and miracles performed purely social functions. Nothing was happening in the hereafter; no action could be attributed to a higher source. Everything was happening here on Earth right now. Religious practices were dismissed as mere fetishes, false objects of belief, and replaced with the true objects of society (which is where the real object always comes from). Sociologists knew that the true function of religion was to give society its cohesion, and mask its hierarchical structure. Durkheim explained (away) religion as a tool of social solidarity and control, Marx famously dismissed it as “the opium of the people”.

Latour urges a rethink of customary social science explanations, suggesting we confront the thingness of things. In answering the question of when does the social scientist come on the scene, he said the following:

If a cyclist falls off his bicycle because he hits a rock, social scientists confess, they have nothing to say. It is only if a policeman, a lover, an insurance agent or the Good Samaritan enter the scene that a social science becomes possible, because we are now faced ... with a string of socially meaningful events. Not so for [ANT] practitioners, who deem sociologically interesting and empirically analysable, the very mechanisms of the bicycle, the paving of roads, the geology of rocks, the physiology of wounds and so on, without taking the boundary between matter and society as a division of labour between the natural and the social sciences.^{xvii}

The last line illuminates the argument. Latour sees society as an assemblage of people and things in combination. The social has material and symbolic bases. We noted his principle of irreduction: ‘a general feature of *all* objects ... is that they are so specific that they cannot be replaced by something else for which they are supposed to be a stand-in’.^{xviii} Everything has “unique adequacy”. This causes us to rethink our standard notions of society. Such is ANT’s task. “Society” has to be

composed, made up, constructed, established, maintained and assembled. It is no longer to be taken as a hidden source of causality which could be mobilized so as to account for the existence and stability of some other action or behaviour'.^{xix}

For ANT, objects are the point of difference between humans and other primates. Without them society could not exist. Structuring effects are not possible by social means alone. ANT severely doubts that a purely social relation has ever been observed. Latour gives the example of speeding in cars. We can tell people not to speed, we can pass laws to fine those caught speeding, and we can train police officers to catch speeders. But, says Latour, verbal commands carry little weight, and police officers are neither omnipresent nor always on duty. By contrast, speed bumps are. They are more effective at slowing drivers than verbal commands or an occasional police presence. If they fail to reduce speed they damage their vehicle. This is but one way in which social control is ceded to things.

ANT, then, looks at the social anew. The social is not a stable and homogeneous type of thing, a domain of reality which is always already present. It is a series of heterogeneous assemblages. These stabilized chains of association are often more durable, reliable or docile than human agents alone (as our speed bump example showed). What we think of as the social is the effect of these heterogeneously composed networks. Society, technology, and agency are network-effects.

We can summarise Latour’s challenge to standard sociology thus (but we should note that not all sociologists would agree with his take on “standard sociology”):

	Standard sociology: Sociology of the social	Critical Latourian sociology: Study of associations
Interest in	The purely social	The collective: heterogeneous associations
Social science work	Social aggregates: social as thing	Tracing associations: social as connection
Society	Transcendental (sui generis) Specific domain: already composed as single whole	Potentially endless assemblies: has to be constructed/maintained
Social order	Vertical: Metaphorically constructed	Flat: Literally constructed
Focus	Humans actors Institutions, e.g. parliament	Human and nonhuman actors Socio-technical assemblages, e.g. politicians, administrators, texts, buildings
Power source	Located behind actions, found in social aggregates	Located within actions, no “behind”
Explanations	Based on substitution: false objects of belief for true objects of society Reliance on generic categories, e.g. efficiency, rationality	Based on translation: accept no stand-ins. Insistence upon specific networks/bodies of practice

Table 1: Traditional versus Latourian Sociology (adapted from Latour 1996, 2000).

Latour admits that there are socially and politically complex groups that manage to cohere without recourse to technology. But their relations are volatile and weak, they need constant maintenance and repair. Other group members need to be constantly placated, or kept in place. But these groups are not human. Does this mean that traditional sociology is useless? No, answers Latour, it is perfectly good for baboons, about whom such observations are made.^{xx}

Seeing Things Differently

I turned to ANT to help answer one of the central questions of my doctoral thesis: how to explain planned weather-modification’s shifting scientific status?^{xxi} Despite the sameness of practice – the same ideas, techniques, tools, substances, sometimes even the same people trying to stimulate rainfall – weather-modification oscillated wildly between pseudo-science, orthodox science and bad science. Clearly, the science itself could not explain these changes. What was needed was something that could illuminate the “constructedness” of science, something that dealt with the *content* as well as the *context* of scientific work. Traditionally, the sociology of science has taken one of these two trajectories. It has either been “internalist” or “externalist.” In the former model science shapes society, science is an autonomous practice capable of imposing its models on the social world. In the

latter society shapes science, scientific practice is reducible to sets of social interests. Yet the problem with this 'age-old polemic' is that 'the same respect for the boundaries of scientific activity is manifested by both schools of thought... The macroanalysts and the microanalysts share one prejudice: *that science stops or begins at the laboratory walls*'.^{xxii} Clearly with something like weather-modification, nothing was stopping at the laboratory walls (or rather the laboratory was the heavens above, meaning that the public found themselves in the experiment).

ANT rejects traditional positions: scientists 'have to find resources, organize teaching programmes, write manuals, create or control scientific journals if they want to succeed in their ... activities'.^{xxiii} Much of this work takes place beyond the laboratory, but it often determines the science that gets done. In the case of weather-modification a combination of ideologies, social relations, politics and economics combined to make it credible (for a time). Scientific weather-modification could not flourish without significant intervention from legislation, government monies and bureaucratic patronage. The science was driven by a volatile mix: the professional interests of commercial weather-modifiers, farmers' concerns, political representatives' concern for their constituents' welfare, and military imperatives. In order to answer the question I had set myself I had to move between a scientific history of weather-modification and a history of scientific weather-modification: ANT helped. It gave me a way to think about scientific success and failure. When science is successful it is because of successful network extension. When it fails it is because the network is punctured.^{xxiv} My thesis traced these networks as a way of examining and explaining weather-modifications varying fortunes.^{xxv}

Criticisms

Something which critiques the entire social sciences was always likely to draw criticisms. Latour and ANT found numerous detractors. The softest criticisms refer to ANT's complexity – even Latour claims not to understand his philosophy!^{xxvi} It is not the easiest of approaches. There is much to confuse the beginning student, as in its name, terminology and definitions. Actor-network theory has also gone by other names (actant-rhizome ontology, co-word analysis, the sociology of associations, the sociology of translation, material-semiotics) and sometimes its proponents insist it is merely another way of thinking about established approaches which it clearly overlaps with (like ethnomethodology or semiotics). Even within the same publication we can get contrasting definitions of key terms. An actor is not a source of action, is made to act and, conversely, makes everything.^{xxvii} Moreover, Latour admits to being a 'moving target'.^{xxviii} In one publication he

recanted his faith in ANT claiming there are four things wrong with it: the words actor, network, theory, and the hyphen.^{xxxix} The Continental tradition has always allowed for rhetorical flourishes. The more staid Anglo-Saxon tradition is not always able to discern when tongue is in cheek. In a later book Latour returns to the fold, writing that a term ‘so awkward, so confusing, so meaningless ... deserves to be kept’.^{xxx} Here he resolves to defend all of ANT’s elements, hyphen included.

Once we have cut through such complexities another question arises: does it even count as theory? One of ANT’s lessons is that actors make their own theories. We are merely encouraged to follow them and describe what happens – how relations and association form or fail to. Law says it is ‘a toolkit for telling interesting stories about, and interfering in, those relations’, not a theory.^{xxxi} Annemarie Mol agrees. It is not a theory, it provides no interpretive schema, no framework for comprehension and it identifies no causality.^{xxxii} (This seems to be unduly harsh, as ANT certainly provides a framework for comprehension albeit not one set in stone.) In Latour’s opinion it can still qualify as a theory, ‘about *how* to study things’.^{xxxiii} Many others would call this a method.

Various objections have been raised about what and how they study. ANT consistently looks at those the networks favour rather than exclude. So, for example, in early works it only studied those actors wanting to do (or be involved in) science and technology. Susan Leigh Star suggests that ‘one of the features of (human and non-human) intermingling may well be that of exclusion (technology as barrier) or violence’.^{xxxiv} The important questions to be asked are: for whom do networks work, what is the fate of those left outside of them? Star argues that we should consider the marginalised and the oppressed, those that do not get to “do science” or design technologies, those that cannot access or shape such knowledge or artefacts but who are nonetheless compelled to feel their effects. Being outside the privileged network does not free you from their impacts. In Star’s opinion the public strength of networks may come at the cost of private pain. Relatedly, Joan H. Fujimura attacks ANT’s agnosticism. She argues that we should analyse the consequences of network construction. Unlike ANT, Fujimura is ‘still sociologically interested in understanding why and how some human perspectives win over others in the construction of technologies and truths, why and how some human actors will go along with the will of other actors, and why and how some human actors resist being enrolled’.^{xxxv}

This squares with Donna Haraway’s objection.^{xxxvi} ANT mostly tells great tales of men and their machines, while other non-scientist humans and non-human non-machines are marginalised. Theirs is a one-dimensional view of science-in-the-making which is particularly masculinist. It relies heavily

on military metaphors, heroic trails of strength and so forth. (In a review of *Science in Action* Olga Amsterdamska also took umbrage at this “might-equals-right” view.)^{xxxvii} Haraway argues that science is not always so agonistic. Interestingly, she states that sociological staples like class, race, and gender can also be read as network effects and as the products of technoscience.^{xxxviii} Yet on these issues Latour and colleagues are silent.

Other objections to ANT have been raised. Humanists are upset that ANT downgrades the importance of human beings and exaggerates the significance of non-humans. Frédéric Vandenberghe defends traditional sociology: shared language and shared understandings of norms and social action bond us. There are essential differences between humans and non-humans. We can walk and talk. We have intentionality and we act. Nonhumans cannot walk and talk. Technologies have no intentionality and do not act.^{xxxix} Steve Fuller also thinks that ANT grants too much power to technology. He also believes that ANT reinforces rather than rejects the heroic inventor/engineer. Their stories smack of “flexible fascism”, the triumph of technicians’ wills, the ongoing attempts to impose visions of order on others via omnipotent technologies. ‘Thus, the necessitarian myths that originally propped up Mussolini, Hitler, and Stalin have now yielded to contingent narratives centred on Pasteur, Edison, and Seymour Cray’.^{xl}

Legacies and Unfinished Business

Reflecting on Latour’s influence, Sal Restivo said he is the most significant scholar of science and society of the last half century.^{xli} Here his only potential rival is Thomas Kuhn. While Latour’s intellectual origins are in Science Studies, his subsequent research and influence have spread much farther. As he explained, ‘ANT started with research into the history and sociology of science, tried first to provide a ‘social’ explanation of scientific facts, failed to do so, and then, from this failure, it drew the conclusion that it was the project of a social explanation of anything that was itself wanting’.^{xlii} The result was not so much another social theory as ‘a kind of alternative ontological order in which few things remain untouched’.^{xliii} And, as Latour is wont to remind us, this alternative ontology is “flat”: ‘society is flat and interactions are all there is’.^{xliv} His network approach eradicates the foundations and dualisms upon which social theory customarily relies. Although, he adds, a better word for his approach would be “worknet” since it is the labours, flows and changes that social scientists should track.^{xlv} Such an approach provides a useful framework for scholars to apply in any number of domains (beyond Science and Technology Studies it is being increasingly used in

the fields of anthropology, art history, education, management and organisation, and media studies, to name but some).

ANT gives us valuable insights into science and technology in the making; it draws our attention to the significance of technology and the importance of non-human agency. This helps illuminate the ways in which power is exercised, how social order is built and what the social is composed of. As one of the subtitles in *The Pasteurization of France* put it: There Are More Of US Than We Thought. Social theorists need to recognise that the 'lists of actors and associations ... are longer and more heterogeneous than the lists offered by the sociologists'.^{xlvi} Time and again ANT turns its attention to the ingredients of the social. Latour (1991) stated it most simply in one of his article titles: 'Technology is Society Made Durable'. From his perspective social theory fails miserably at making sense of what it studies. He tells us that we should forget social ties, norms and moral bonds, and think of translations and associations. (There are two related responses to be made here: first, this is not an either/or proposition, and second, most sociologists would still assert that social interaction, habitual practices and shared notions of morality remain important.) But for Latour society is not a substance, as sociologists tend to describe it, rather it is a connection. Never one to shy away from a fight, Latour responds with a criticism of his own: 'By ignoring the practical means through which inertia, durability, asymmetry, extension, domination is produced, and by conflating all those different means with the powerless power of social ties, [sociologists] are the ones who have disguised the causes of social inequalities'.^{xlvii}

Further reading

Johnson, J. (1988) 'Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer', *Social Problems*, 35(3): 298-310.

This short and accessible piece is actually written by Latour. It contains some of his trademark humour as well as a useful elaboration of nonhuman agency and some of actor-network theory's vocabulary.

Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*, Oxford: Oxford University Press.

While challenging as an introductory text this is still worth consulting as it gives Latour's fullest account of what he takes actor-network to be, and how we should understand both the social world and the social sciences.

Latour, B. (2000) 'When Things Strike Back: A Possible Contribution of "Science Studies" to the Social Sciences', *British Journal of Sociology*, 51 (1), 107-123.

Drawing on insights from Science and Technology Studies, this article considers the proper role of the social sciences and what a social science explanation can and should look like. As such it offers one of Latour's clearest challenges to sociology (and the social sciences) as normally practiced.

Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers through Society*, Milton Keynes: Open University Press.

Described in the dedication to Michel Callon as the 'outcome of a seven-year discussion', this was Latour's breakthrough book in English, and probably the biggest seller in Science and Technology Studies after Thomas Kuhn's *The Structure of Scientific Revolutions*. It concerns science and technology in the making, and Latour's thoughts on how best to study this.

Additional Sources

Blok, A. and Jensen, T. E. (2011) *Bruno Latour: Hybrid Thoughts in a Hybrid World*, New York: Routledge.

This book begins by situating Latour in his intellectual context. It offers a chronological overview of his oeuvre – looking at his critical engagements with science, modernity, political ecology and his own sociology of associations – before closing with a glossary of terms and an interview with the man himself.

Law, J. (ed.) (1986) *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge and Kegan Paul.

This edited collection contains contributions from the three leading protagonists of actor-network theory: Michel Callon, Bruno Latour and John Law. Law provides the introduction and a historical paper on control at a distance, Latour writes on 'The Powers of Association', while Callon's chapter is arguably the single best case study to introduce the beginning scholar to actor-network theory (his notorious piece on the scallops of St Brieuc Bay).

McGee, K. (2014) *Bruno Latour: The Normativity of Networks*, London: Routledge.

McGee's work provides a comprehensive overview of Latour's work, beginning with his co-authored book *Laboratory Life* and ending with *Modes of Existence*. Particular stress is placed on Latour's work on the law. His earlier work is read through this lens.

Sayes, E. (2014) 'Actor-Network Theory and Methodology: Just What Does it Mean to Say that Nonhumans have Agency?' *Social Studies of Science*, 44(1): 134-149.

This up-to-date article surveys twenty five works by Bruno Latour as well as those of colleagues (Michel Callon, John Law and Annemarie Mol) in order to clarify the roles that nonhumans play in actor-network theory. It is a very useful guide to one of their most contentious notions, that of nonhuman agency.

Bibliography

Amsterdamska, O. (1990) 'Surely you are Joking, Monsieur Latour!' *Science, Technology and Human Values* 15(4): 495-504.

Berliner, D., Legrain, L. and van der Port, M. (2013) 'Bruno Latour and the Anthropology of the Moderns', *Social Anthropology*, 21(4): 435-447.

- Callon, M. and B. Latour (1992) 'Don't Throw the Baby Out with the Bath School! A Reply to Collins and Yearley' in A. Pickering (ed.) *Science as Practice and Culture*, Chicago: University of Chicago Press, pp. 343-368.
- Callon, M. (1986) 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay', in John Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge and Kegan Paul, pp. 196-233.
- Fuller, S. (2000) *Thomas Kuhn: A Philosophical History for Our Times*, Chicago: University of Chicago Press.
- Haraway, D. J. (1997) *Modest_Witness@Second_Millennium.FemaleMan@_Meets_OncoMouse™*, London: Routledge.
- Haraway, D. J. (1992) 'The Promise of Monsters: A Regenerative Politics for Inappropriate/d Others' in L. Grossberg, C. Nelson and P. A. Treichler (eds) *Cultural Studies*, New York: Routledge, pp. 295-337.
- Harman, G. (2007) 'The Importance of Bruno Latour for Philosophy', *Cultural Studies Review*, (13)1: 31-49.
- Latour, B. (2013) 'Another Turn after ANT: An Interview with Bruno Latour', *Social Studies of Science*, 43(2): 302-313.
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*, Oxford: Oxford University Press.
- Latour, B. (2004) 'Nonhumans' in S. Harris, S. Pile and N. Thrift (eds) *Patterned Ground: Entanglements of Nature and Culture*, London: Reaktion, pp. 224-227.
- Latour, B. (2003) 'Is Re-modernization Occurring – And If So, How to Prove It?' *Theory, Culture & Society*, 20(2): 35-48.
- Latour, B. (2000) 'When Things Strike Back: A Possible Contribution of "Science Studies" to the Social Sciences', *British Journal of Sociology*, 51 (1), 107-123.
- Latour, B. (1999) *Pandora's Hope: Essays on the Reality of Science Studies*, Cambridge, MA: Harvard University Press.
- Latour, B. (1998) 'For Bloor and Beyond - a Reply to David Bloor's "Anti-Latour"', Bruno Latour's Homepage, available: <http://www.bruno-latour.fr/poparticles/poparticle/p075.html>, accessed 25 June 2010.
- Latour, B. (1996) 'The Flat-Earthers of Social Theory', in M. Power (ed.), *Accounting and Science: Natural Inquiry and Commercial Reason*, Cambridge: Cambridge University Press, xi-xvii.
- Latour, B. (1994) 'Pragmatogonies: A Mythical Account of How Humans and Nonhumans Swap Properties', *American Behavioral Scientist*, 37(6), 791-808.
- Latour, B. (1983) 'Give Me a Laboratory and I Will Raise the World', in Karin D. Knorr-Cetina and Michael Mulkay (eds) *Science Observed: Perspectives on the Social Study of Science*. London: Sage, pp. 141-70.
- Latour, B. (1992) 'One More Turn after the Social Turn', in E. McMullin (ed.) *The Social Dimension of Science*, Notre Dame: The University of Notre Dame Press, pp. 272-294.
- Latour, B. (1991) 'Technology is Society Made Durable' in J. Law (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, pp. 103-131.
- Latour, B. (1988) *The Pasteurization of France*, Cambridge, MA.: Harvard University Press.
- Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers through Society*, Milton Keynes: Open University Press.
- Latour, B. and Woolgar, S. (1986) *Laboratory Life: The Construction of Scientific Facts*, 2nd edn, Princeton: Princeton University Press.
- Law, J. (2009) 'Actor Network Theory and Material Semiotics', in B. Turner (ed.) *The New Blackwell Companion to Social Theory*, Malden, MA.: John Wiley and Sons, pp. 141-158.
- Mol, A. (2010) 'Actor-Network Theory: Sensitive Terms and Enduring Tensions', *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 50(1): 253-269.

- Restivo, S. (2011) 'Bruno Latour', in G. Ritzer and J. Stepnisky (eds) *The Wiley-Blackwell Companion to Major Social Theorists*, Boston: Wiley-Blackwell, pp. 520-540.
- Star, S. L. (1991) 'Power, Technology and the Phenomenology of Conventions: On Being Allergic to Onions' in J. Law (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, pp. 26-56.
- Vandenbergh, F. (2002) 'Reconstructing Humans: A Humanist critique of Actant-Network Theory' *Theory, Culture & Society*, 19(5/6), 51-67.

-
- ⁱ B. Latour, 'Is Re-modernization Occurring – And If So, How to Prove It?' *Theory, Culture & Society*, 20(2): 16, 2003.
- ⁱⁱ G. Harman, 'The Importance of Bruno Latour for Philosophy', *Cultural Studies Review*, 13(1): 33, 2007.
- ⁱⁱⁱ B. Latour and S. Woolgar, *Laboratory Life: The Construction of Scientific Facts*, 2nd edn, Princeton: Princeton University Press, 1986, pp. 273-4.
- ^{iv} Ibid. p. 17.
- ^v B. Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, Oxford: Oxford University Press, 2005, pp. 95-6.
- ^{vi} M. Callon and B. Latour, 'Don't Throw the Baby Out with the Bath School! A Reply to Collins and Yearley' in A. Pickering (ed.) *Science as Practice and Culture*, Chicago: University of Chicago Press, 1992, p. 350.
- ^{vii} B. Latour, *Science in Action: How to Follow Scientists and Engineers through Society*, Milton Keynes: Open University Press, 1987, p. 258.
- ^{viii} Ibid. p. 259.
- ^{ix} B. Latour, *Pandora's Hope: Essays on the Reality of Science Studies*, Cambridge, MA: Harvard University Press, 1999, p. 195.
- ^x Op. cit. B. Latour, 2005, p. 185.
- ^{xi} Op. cit. B. Latour, 1999.
- ^{xii} Op. cit. M. Callon and B. Latour, 1992, p. 359.
- ^{xiii} B. Latour, 'One More Turn after the Social Turn', in E. McMullin (ed.) *The Social Dimension of Science*, Notre Dame: The University of Notre Dame Press, 1992, p. 272.
- ^{xiv} Op. cit. M. Callon and B. Latour, 1992, p. 347.
- ^{xv} B. Latour, 'When Things Strike Back: A Possible Contribution of "Science Studies" to the Social Sciences', *British Journal of Sociology*, 51 (1): 112, 2000.
- ^{xvi} Ibid. p. 109.
- ^{xvii} Ibid. p. 108.
- ^{xviii} Ibid. p. 112.
- ^{xix} Ibid. p. 113.
- ^{xx} B. Latour, 'Pragmatogonies: A Mythical Account of How Humans and Nonhumans Swap Properties', *American Behavioral Scientist*, 37(6): 791-808, 1994.
- ^{xxi} S. Matthewman, *Science in the Social Sphere: Weather-Modification and Public Response*, Unpublished PhD Thesis: The University of Auckland, 2000.
- ^{xxii} B. Latour, 'Give Me a Laboratory and I Will Raise the World', in Karin D. Knorr Cetina and Michael Mulkay (eds) *Science Observed: Perspectives on the Social Study of Science*, London: Sage, 1983, pp. 142, 168.
- ^{xxiii} M. Callon, 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay', in John Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge and Kegan Paul, 1986, p. 226.
- ^{xxiv} Op. cit. B. Latour, 1987, p. 249.
- ^{xxv} For a condensed account see: S. Matthewman, 'Of Clouds and Crustaceans: Using Actor Network Theory', *New Zealand Sociology*, 17(1): 19-42, 2002.
- ^{xxvi} B. Latour, 'Another Turn after ANT: An Interview with Bruno Latour', *Social Studies of Science*, 43(2): 305, 2013.
- ^{xxvii} Op. cit. B. Latour, 2005, pp. 46, 147.

-
- ^{xxviii} B. Latour, 'For Bloor and Beyond - a Reply to David Bloor's "Anti-Latour"', Bruno Latour's Homepage, 1998, available: <http://www.bruno-latour.fr/poparticles/poparticle/p075.html>, accessed 25 June 2010.
- ^{xxix} Op. cit. B. Latour, 1999, p. 15.
- ^{xxx} Op. cit. B. Latour, 2005, p. 9.
- ^{xxxi} J. Law, 'Actor Network Theory and Material Semiotics', in B. Turner (ed.) *The New Blackwell Companion to Social Theory*, Malden, MA.: John Wiley and Sons, 2009, p. 141.
- ^{xxxii} A. Mol, 'Actor-Network Theory: Sensitive Terms and Enduring Tensions', *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 50(1): 257, 2010.
- ^{xxxiii} Op. cit. B. Latour, 2005, p. 142.
- ^{xxxiv} S.L. Star, 'Power, Technology and the Phenomenology of Conventions: On Being Allergic to Onions' in J. Law (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, 1991, p. 40.
- ^{xxxv} Ibid. p. 29.
- ^{xxxvi} D.J. Haraway, 'The Promise of Monsters: A Regenerative Politics for Inappropriate/d Others' in L. Grossberg, C. Nelson and P. A. Treichler (eds) *Cultural Studies*, New York: Routledge, 1992, pp. 331-2.
- ^{xxxvii} O. Amsterdamska, 'Surely you are Joking, Monsieur Latour!' *Science, Technology and Human Values* 15(4): 501, 1990.
- ^{xxxviii} D.J. Haraway, *Modest_Witness@Second_Millennium.FemaleMan@_Meets_OncoMouse™*, London: Routledge, 1997, pp. 34-5.
- ^{xxxix} F. Vandenberghe, 'Reconstructing Humants: A Humanist critique of Actant-Network Theory' *Theory, Culture & Society*, 19(5/6): 52, 2002.
- ^{xl} S. Fuller, *Thomas Kuhn: A Philosophical History for Our Times*, Chicago: University of Chicago Press, 2000, pp. 376-7.
- ^{xli} S. Restivo, 'Bruno Latour', in G. Ritzer and J. Stepnisky (eds) *The Wiley-Blackwell Companion to Major Social Theorists*, Boston: Wiley-Blackwell, 2011, p. 520.
- ^{xlii} Op. cit. B. Latour, 2003, p. 35.
- ^{xliiii} D. Berliner, L. Legrain, and M. van der Port, 'Bruno Latour and the Anthropology of the Moderns', *Social Anthropology*, 21(4): 437, 2013.
- ^{xliv} B. Latour, 'The Flat-Earthers of Social Theory', in M. Power (ed.), *Accounting and Science: Natural Inquiry and Commercial Reason*, Cambridge: Cambridge University Press, 1996, p. xiv.
- ^{xliv} Op. cit. B. Latour, 2005, p. 143.
- ^{xlvi} B. Latour, *The Pasteurization of France*, Cambridge, MA.: Harvard University Press, 1988, p. 257.
- ^{xlvii} B. Latour, 'Nonhumans' in S. Harris, S. Pile and N. Thrift (eds) *Patterned Ground: Entanglements of Nature and Culture*, London: Reaktion, 2004, p. 225.