



# A half-hearted romance? A diagnosis and agenda for the relationship between economic geography and actor-network theory (ANT)

Progress in Human Geography

2015, Vol. 39(1) 65–86

© The Author(s) 2014

Reprints and permission:

sagepub.co.uk/journalsPermissions.nav

DOI: 10.1177/0309132513518833

phg.sagepub.com



**Martin Müller**

Universität Zürich, Switzerland

## Abstract

This paper examines the relationship of actor-network theory (ANT) and economic geography, arguing that there has been a rather restrictive, sometimes ambiguous reading of ANT literature. It reviews three major lines of reception in economic geography around the themes of topological space, translation and performativity. Subsequently, the paper problematizes conflicting interpretations of ‘network’ and ‘power’ as central ANT terms. In an attempt to open up new avenues of engagement with ANT, it finally sketches an agenda around three themes that are of relevance both for economic geography and for human geography more broadly: hybridity, desire and fluidity.

## Keywords

actor-network theory, ANT, economic geography, materiality, power, sociomaterial practices

*Man lernt sich irgendwo ganz flüchtig kennen  
Und gibt sich irgendwann ein Rendezvous.  
Ein Irgendwas, – ‘s ist nicht genau zu nennen –  
Verführt dazu, sich gar nicht mehr zu trennen.  
Beim zweiten Himbeereis sagt man sich ‘du’.*  
(One’s met somewhere in passing  
Then sometime went for a rendezvous.  
Something – it’s quite hard to name –  
Makes one stay together all the same  
And switch to first names after raspberry ice  
cream two.)  
(Mascha Kaléko, *Großstadtliebe*, 1933)

affair. The subject of infatuation, actor-network theory (ANT), has become the muse of much research in economic geography and the inspiration for recent theorizing and numerous empirical studies in the field. Pioneered by sociologists Bruno Latour, Michel Callon and John Law, its key proposition is that action arises from the association of humans and materials in a network – the actor-network (Latour, 1996b: 380). ANT has left its mark across a range of diverse subjects in economic

## I Introduction

Since the mid-1990s, parts of economic geography have become tied up in a burning love

### Corresponding author:

Martin Müller, Universität Zürich, Winterthurerstr. 190,  
8057 Zürich, Switzerland.

Email: martin@martin-muller.net

geography, from the study of markets (Berndt and Boeckler, 2009, 2011), firms (Jones, 2007a; Ouma, 2012) and global production networks (Dicken et al., 2001) to that of food and commodities (Murdoch et al., 2000; Whatmore and Thorne, 1997) and the discipline itself (Barnes, 2001) – so much so that some interventions have started to sound the alarm bell: ‘the still voguish adherence to actor-network theory’, Gertler (2010: 4) writes, ‘diverted collective attention to the minutiae of everyday practice, as reflected in texts, artefacts, and people’.

In contrast to calls warning that the liaison between economic geography and ANT has gone too far, I shall claim the opposite in this paper: the relationship between the two has, in fact, been rather selective and one-sided and, if anything, has not gone far enough. The article grows out of a concern that the reception of ANT has been confined to a limited number of core ideas and has sometimes remained rather superficial or exhibits tensions with ANT thought. In other words, the relationship between economic geography and ANT is a half-hearted romance, to stick to the allegory in Mascha Kaléko’s poem from the epigraph: it is passionate, no doubt, but it also has, as romances tend to, rose-coloured glasses.

Offering a reflection on more than 15 years of ANT-inspired thought in economic geography, this paper has a threefold aim (see Figure 1). The first is to provide a diagnosis of the relationship between ANT and economic geography, reviewing three major lines of engagement that have emerged so far around the notions of topological space, translation and performativity. The second is to provide an account and critique of the variegated, often diverging readings of two central concepts of ANT in economic geography: network and power. The final one is to develop further the potential of the romance, outlining three worthwhile translations that would allow strengthening the relationship between the two and address some critical

concerns. This paper, then, straddles the divide between ANT sceptics and ANT supporters: it is with the sceptics in arguing that the adoption of ANT has perhaps been too rash and unreflexive, while it is with the supporters in upholding the value of ANT for various relevant fields of inquiry in economic geography and human geography more broadly.

## II What is ANT?

Defining ANT is far from straightforward. That the three constituents of its acronym – actor, network and theory – are, to some degree, misnomers and can be misleading does not make the task easier. This is why Law (2009) has suggested the term ‘material semiotics’ and Latour (1999) ‘actant-rhizome ontology’ as more adequate descriptions. Latour justifies ‘actant-rhizome ontology’ because instead of social actors ANT is interested in the social *and* material world, in what it calls *actants*; instead of a stable network with nodes and ties, the notion of the *rhizome*, borrowed from Deleuze, denotes the emergent and fluid character of associations between actants; instead of a theory offering explanations of social phenomena it considers itself an *ontology* – a particular approach for describing the world that is grounded in empirical case studies. Rather than a coherent theory, ANT might thus be better thought of as a perspective or a set of sensitivities and its proponents have resisted its being confined to a narrow set of fixed principles and applications (Latour, 1999; Mol, 2010).

While ANT is thus malleable and can be adopted for different purposes, however, it does have characteristics that make it distinguishable from other approaches to understanding the social and economic (or the sociomaterial, as ANT would have it) world. Three central ones should be highlighted here, as they run from the early expositions of ANT (e.g. Latour, 1996b; Law, 1992) through to more recent ones (Latour, 2005: 10–11; Law, 2009; Mol, 2010).

III Reception	<b>Topological Space</b>	<b>Translation</b>	<b>Performativity</b>	
	Key Claim	Distance and scale are functions of the relations in a network.	Aligning humans and non-humans in an actor-network creates agency.	The model of the world becomes the world of the model.
	Empirical Contexts	communities of practice   knowledge networks	governance at a distance   food chains   knowledge creation	Marketisation   performativity of economic models
	Key Literature	Amin 2002, Amin and Cohendet 2004, Law 2002, Mol and Law 1994, Serres and Latour 1995	Barnes 2002, 2004, Callon 1986, Latour 1987	Berndt and Boeckler 2009, 2011, Çalışkan and Callon 2009, 2010, Callon 1998
IV Tensions	<b>Network</b>		<b>Power</b>	
	<ul style="list-style-type: none"> <li>- Do actors pre-exist networks?</li> <li>- Are humans more important than non-humans?</li> <li>- Are networks hierarchical?</li> </ul>		<ul style="list-style-type: none"> <li>- Does power predate networks?</li> <li>- Is power structural, agential, both or neither?</li> <li>- Is ANT blind to power?</li> </ul>	
V Translations	<b>Hybridity</b>	<b>Desire</b>	<b>Fluidity</b>	
	Key Question	How do boundaries between humans and non-humans blur?	What is the role of corporeal desire in re-ordering actor-networks?	How are actor-networks in continuous transformation and flux?
	Empirical Contexts	Lively things   commodification of bodies and body parts   prostheses   augmented realities   cyborgs	consumption   advertising   attachment to places, territories, landscapes   human bonding	Operating adhocracies   projects   events   temporary organisations   disasters
	Key Literature	Bennett 2004 Ingold 2010	Deleuze and Guattari 1972 Latour and Lépinay 2009	Law 2004 Law and Mol 2001

**Figure 1.** The relationship of ANT and economic geography: outline of the argument.

First, ANT's key contention is that the social sciences draw an artificial dividing line between the social and the material world, privileging the former over the latter. In contrast, it argues that action is always an outcome of *sociomaterial actor-networks* – associations between human

and non-human actants. In principle, humans and non-humans are equally able to contribute to action. This is what ANT calls the principle of generalized symmetry. In its attention to the enmeshment of the social and the material, ANT's lineage as an offshoot from Science and

Technology Studies (STS) becomes obvious (Akrich, 1992; Law, 1991). What figures as ‘material’ can vary: it may be single objects, such as door closers (Latour, 1992), fluorescent lamps (Bijker, 1992) or water pumps (de Laet and Mol, 2000), or complex technological systems, such as mass transit (Latour, 1996a), as well as animals, such as elephants (Thompson, 2002), or human bodies (Mol and Law, 2004). A crucial argument of ANT is that the mixing together of social and material elements makes arrangements durable: a verbal exhortation to hotel guests to leave the key at the front desk upon leaving the hotel has a much lower chance of durably achieving the intended effect than making the key too bulky to be carried around and thus enrolling a material object in social action (Latour, 1991).

Second, ANT engages in description to arrive at explanation. It contends that understanding *why* a particular arrangement has come to be as it is can only be understood through illustrating *how* it has come to be. ANT thus asks how the world is made and remade of associations between actants and stipulates that *tracing associations* should be the prime task of researchers. Latour (2005: 9) also speaks, tongue-in-cheek, of an associology. When ANT is called ‘constructivist’ (Latour, 2005: 91–92), it thus means that it is interested in how action is assembled from human and non-human elements. This should not be confused with social constructivism, which implies a privileging of human actors and their activities of meaning-making.

Third, ANT works from a process perspective, dedicating attention to transformation rather than stasis. In reconstructing associations forged or severed between actants, ANT recognizes that *action is a precarious accomplishment* rather than a *fait accompli*. This feature became particularly prominent starting with the 1999 collected volume *Actor-Network Theory and After* (Law and Hassard, 1999), which initiated a push towards devoting greater attention to the fleeting and fluid character of actor-

networks (Latour, 1999; Law, 2004b; Law and Mol, 2001). ANT thus does not start from finished actor-networks but is more interested in their gradual genesis. This has implications for research methods: ANT proposes to follow things around as they circulate to establish associations, thus adopting an agnostic view on what matters in bringing about action.

De Laet and Mol’s (2000: 226) analysis of the so-called bush pump is an apt illustration of these three key features. The authors focus on the spread and functioning of this hand water pump in rural Zimbabwe and how it ‘*does* all kinds of things . . . it *acts* as an actor’. Rather than being a passive object, the pump is bound up in a sociomaterial network: it reshapes village life and, through its presence throughout the country and its key role in tying the government together with communities, also helps build a nation. De Laet and Mol trace how the pump is assembled and reassembled, bringing together villagers and spare parts, in different places, and from this tracing arrive at explanations for its immense success. Attributing its success to inherent properties – the pump’s ingenious design, for example, or its price – would only tell half of the story. De Laet and Mol show that the pump’s spread is due to its being a fluid object: flexible and responsive to changing circumstances and thus able to circulate and adapt easily. The pump thus has a life of its own: it is not the docile subject of its creator or some larger social structures, but it evolves and mutates as it circulates.

### III ANT and economic geography: the story so far

When human geography started to take notice of actor-network theory (ANT) in the middle of the 1990s, it was hailed as an approach that made ‘a bold transgression’ (Murdoch, 1997a: 750) and whose principle of generalized symmetry would help overcome various dualisms, such as those of nature/society, global/local, action/structure

or economy/culture (Murdoch, 1995, 1997b, 1998; Whatmore and Thorne, 1997). It subsequently was increasingly taken up across all subfields of the discipline, from cultural geography (Whatmore, 2002) to urban geography (Graham and Marvin, 2001; Smith, 2003) and nature-society geography (Hinchliffe, 2007). An indication of the growing popularity of ANT in economic geography can be gleaned from the canonical collections of the subfield. In the 2000 editions of the *Oxford Handbook of Economic Geography* (Clark et al., 2000) and the *Companion to Economic Geography* (Barnes and Sheppard, 2000). ANT was only represented in notes from the margin, if not in name then at least in spirit: Thrift's (2000b) 'coda', tellingly entitled 'Pandora's box', foreshadowed ANT with his outlook on the cultural geographies of economies, and Gibson-Graham's (2000) intervention drew attention to the performativity of discourse and the politics of research in a subfield that poststructuralism had hardly yet touched.

How different is the situation today, a little more than 10 years on! In the enthusiasm for a relational turn in economic geography, the associational agenda of ANT made it a welcome tool to think about all things relational. Ideas and concerns from actor-network theory have made their way into the new edition of the *Companion to Economic Geography* (Barnes et al., 2012) across a wide range of contributions on performative practices for diverse economies, qualitative methods, the 'matter of nature', the performativity of financial theory, markets and marketization, the economies of bodily commodification and the lives of things. Engagement with ANT has also become something of an export success, belying the sometimes lamented 'proclivity [of economic geography] continually to import theories and models from other disciplines' (Sunley, 2008: 16). In April 2013, Murdoch et al.'s (2000) paper from the journal *Economic Geography*, for example, was the item with the highest number of citations across

all disciplines in a search for 'actor-network theory' as a keyword in the Web of Knowledge database. It was also the paper with the most citations in *Economic Geography* over the past 17 years. Of the 219 total citations, 135 were from outside geography, mostly from fields like rural studies, sociology, planning, agriculture and food studies.

Given these quick inroads of ANT into economic geography and adjacent fields, it appears warranted to review the main directions into which the approach has taken research. To be sure, not all authors explicitly attach the label ANT to their work, and in repeated circles of reception concepts develop lives of their own. As a definition for the following review, then, this paper shall consider a particular piece of work as pertinent if it either labels itself as ANT or if the writings and ideas of the central proponents of ANT play a pivotal role in it.

### *I Topological space*

Perhaps the most riveting implication of ANT thought for economic geography, if not human geography as a whole, has been the turn towards a topological understanding of space. Instead of assuming a Euclidean notion of metric distance, as in topographical space, in topological space distance and scale are functions of the relations in a network (Law, 2002; Mol and Law, 1994). In an illustrative example, Latour (1996b: 371) writes that 'I can be one metre away from someone in the next telephone booth and nevertheless be more closely connected to my mother 6000 miles away'. This crumpling or folding of space (Serres and Latour, 1995: 60), drawing places that look distant close and making close places more distant, also implies a move towards a flat ontology (Amin, 2002; Marston et al., 2005). Instead of assuming discrete vertical scale levels – global, national, local – 'the words "local" and "global" offer points of view on networks that are by nature neither local nor global, but are more or less long and more or

less connected' (Latour, 1993: 122). According to ANT, there is no a priori distinction between local and global, close and distant forces: the construction of relations is what brings space and scale into being in the first place.

The notion of topological space struck home with human geography as a whole (e.g. Latham, 2002; Smith, 2003), but economic geography incorporated it in particular in research on the geographies of learning. Against the claim that learning requires close physical proximity and face-to-face interaction, this perspective argues that knowledge does not fit 'into neat scalar or territorial bundles', but needs to be imagined 'topologically, where the folds and undulations of lines drawn as contours bring into close proximity sites that might appear distant and unconnected on a linear plane' (Amin and Cohendet, 2004: 12, 93). Communities of practice are one phenomenon where a topological understanding of space is most evident (in economic geography, see, for example Amin and Cohendet, 2004; Faulconbridge, 2010; Jones, 2008). The concept describes a group of people, often dispersed around the globe, with a shared practice, tied together through common relations and thus enrolled in the same actor-network (Faulconbridge, 2010). Virtual communication, travel as well as shared routines, codes and standards all contribute to forging close associations (Amin and Cohendet, 2004; Jones, 2009). This bridging ties together the London investment banking industry with its US counterparts (Hall, 2007), law firms in London and New York (Faulconbridge, 2007) or overseas volunteers (Jones, 2007b). Yet Ettliger (2008) cautions that the enthusiasm about long-distance ties, enabled by new technologies and associated with the emergence of the new economy, should not ignore that networks require a concatenation of material *and* social elements and that phenomena such as trust or cooperation do not easily emerge from long-distance connections.

## 2 Translation

The term translation was coined by Callon (1986) and describes the processes of enrolling heterogeneous actants into an actor-network, in the course of which their interests become aligned, 'creating convergences and homologies by relating things that were previously different' (Callon, 1980: 211). According to Callon, it proceeds in four moments: *problematization* defines the problem and the set of relevant actants that relate to it; *interessement* is the group of actions through which a primary actant recruits other actants to assume roles in the actor-network and defines their identities; *enrolment* is the outcome of problematization and *interessement* and describes the successful alignment of actants' interests in the actor-network; during *mobilization*, finally, the primary actant becomes able to speak for the other actants in the network, making them act towards a common goal. As this description suggests, the process of translation is akin to creating agency: it makes action possible through aligning interests and leads to the emergence of an actor.

Several economic geographers have made explicit use of the concept of translation. Leyshon and Pollard (2000), for example, see the convergence of retail banking structures as an outcome of the successful alignment of interests through a process of translation involving texts, people and technological artifacts. Conventions circulate as texts in journals or white papers, or in embodied form with experts, and become inscribed into financial technologies. Knowledge, too, is a product of translation, for it requires the alignment of bodies, machines, communication technologies, texts and so on to be stabilized and become a valid claim (Barnes, 2002, 2004, 2006; Hughes, 2000; Ibert, 2006; Reiffenstein, 2006). Depending on the degree of alignment of actants, knowledge can be harder, i.e. less disputable, or softer, i.e. more open to interpretation and negotiation (see also Callon, 1991: 146;

French, 2000). In all these accounts, translation is a process of alignment to achieve something and enable action: convergence, valid knowledge claims and so on.

Successful translation allows governing at a distance, drawing distant others within close reach, thus linking to the notion of topological space. This mediated power, as Allen (2011) calls it, often relies on the mobilization of intermediaries, or immutable mobiles (Latour, 1987: 223–228), to enrol others. Intermediaries can be ‘anything passing between actors which defines the relationship between them’ (Callon, 1991: 134): books may act as intermediaries of scientific paradigms and principles (Barnes, 2002) or standards may regulate the quality features of food products (Ouma, 2010; Whatmore and Thorne, 1997).

More often than not, however, immutable mobiles are not faithful delegates, but rather ‘transform, translate, distort, and modify the meaning or the elements they are supposed to carry’ (Latour, 2005: 39). This turns them into what Latour calls mediators. Mediators might still align actants, but not necessarily in the way originally intended. Standards fail to do in one place what they achieved in another (Higgins and Larner, 2010); books and documents have unintended consequences when circulating between different organizations (author reference withheld). More importantly, mediators can be turned against those whom they are meant to serve as delegates. Thus, Featherstone (2004) details how in the Newcastle Port Strikes labourers effectively contested a particular practice of enrolling materials – the measurement of coal – in the actor-network and derailed the hitherto successful translation of actants that held together the mercantile networks of the coal trade.

### 3 Performativity

Translation not only enables action, but it also has a second important effect: it brings

something into being, i.e. it is performative. Following Callon’s (1998) interpretation of ANT and coalescing with research at the seams of economic sociology, political science and anthropology, economic geography has developed a strand of research that examines the performative production of markets (Barnes, 2008; Berndt and Boeckler, 2009, 2011; Hall, 2011). The core idea of performativity is encapsulated in Thrift’s (2000b: 694) chiasmus that ‘the model of the world becomes the world of the model’: instead of describing reality, models and theories produce it. This strand conceptualizes markets as ‘calculative collective devices’, formed through the double play of the ordering of sociomaterial networks, called framing, and the constant disruption of these ordering processes, called overflows (Callon, 1998). Markets are thus precarious achievements that need stabilizing through continuous re-performance. Research in this vein uses the term ‘assemblage’, similar to that of the actor-network, to characterize markets as hybrid collectives that attain a distributed agency through the association of material, technical, logistical, legal and other elements as well as human beings.

Such performativity is present, for example, in the work practices of business school graduates who are taught particular tools and techniques, such as discounted cash flow modelling, to assess the net present value of investments or firms (Hall, 2008). Circulating through immutable mobiles, such as textbooks, computer spreadsheets or online calculators, this valuation technique has become so widespread that it produces economic value, turning the people who apply it into ‘economists in the wild’ (Callon, 2007: 336), i.e. agents partaking in shaping the economy according to the models devised to describe it. Drawing ever wider circles, the performance of economic theories extends the margins of marketization, taking the market principle to new places. In Ghana, the global value chains approach became

performative as the government adopted it as an agricultural development strategy and out-growers for organic mangos became enrolled in an extensive actor-network of quality standards, loan schemes and logistical infrastructure (Ouma et al., 2013). Markets, the key argument goes, do not just emerge out of thin air, but require an elaborate sociomaterial apparatus to be brought into being.

## IV Tensions

The wealth of scholarship from the past 10–15 years indicates that ANT has fallen on rather fertile ground in economic geography – so fertile indeed that the rush to get on with the business of sociomateriality has sometimes resulted in a rather indiscriminate appropriation of ANT concepts as all-purpose terms, leading to considerable ambiguities and tensions in the interpretation of several central concepts (cf. Martin and Sunley, 2001, and Sunley, 2008, who voice cognate concerns for relational economic geography in general).<sup>1</sup> To be sure, this predicament is not unique to economic geography, as the reflections by a number of leading ANT proponents on the success of ANT show (Law and Hassard, 1999). In a bid to work towards a more systematic use of central concepts, this section addresses the most salient tensions that have emerged in the course of the incorporation of ANT into economic geography around the two central notions of networks and power.

### I Networks

The move towards a network paradigm in economic geography in the early 1990s (Cooke and Morgan, 1993; Murdoch, 1995) made ANT an obvious candidate to turn to for theoretical inspiration. Knowledge networks, production networks, firm networks, regional networks and so on have taken centre stage in research for quite some time now. In harnessing ANT for thinking about networks, three critical points

have emerged where there is significant tension with ANT thought: an understanding of actors as pre-existing networks; a privileging of human actants over non-human ones; and a hierarchical conception of networks.

The use of the term network often confounds two different understandings of the relationship between actors and networks: actors *in* networks and actors *through* networks. The first is the prevailing view in a host of different conceptions of networks, such as that of the widespread definition of the network as ‘a specific set of linkages among a defined set of persons’ (Mitchell, 1969: 2). For ANT, on the other hand, a central tenet is that the actor does not pre-exist the network but arises as a product of it: an actor is what is ‘made to act by many others’ (Latour, 2005: 46). This view of the actor as a relational effect is crucial, because it does not take actors’ capacities as pre-given black boxes but problematizes the very process and precariousness of assembling them. Remember the example of the Zimbabwe bush pump from the beginning: the point is not how different pre-formed actors interacted with the pump, but how relating to the pump defined and circumscribed actors in the first place. The village community, for example, was reshaped through the pump, just as it shaped the pump itself.

That actors should be considered a product of networks is far from commonplace in scholarship that invokes ANT in economic geography. A much-cited appropriation of ANT to conceptualize global production networks, for example, claims that we need to ‘take into account the role of social actors in their actor-networks’ and recognize the ‘centrality of intentional human agency’ (Dicken et al., 2001: 93, 107). In this perspective, social actors may be ‘individuals, households, firms, industries, states, unions, or other organizations and institutions’ (p. 97) – concepts that ANT would mostly describe and analyse as actor-networks in their own right. In these interpretations, actors are embedded in networks, but not constituted



through them. Yes, there are global links and flows connecting different scale levels, and actors are dependent on different institutional, political or cultural contexts that do not make them entirely autonomous. As a result, these approaches hark back to earlier conceptions of networks as linkages between pre-existing social actors and fail to exploit the more radical potential that ANT is offering.

Related to this is the implicit or explicit privileging of human over non-human actants in actor-networks, which is also evident in the use of the term ‘social actor’ in the quotes above. The material world is relegated to providing the context for human action, the ‘props’ (Jones, 2007b: 15, 2009: 206) that humans recruit to the network. Whether we use the narrow understanding of props as objects used to aid in creating a realistic effect in performances or the wider one of ‘a pole or beam used as a support or to keep something in position, typically one that is not an integral part of the thing supported’ (Oxford English Dictionary), it accords non-human actants a passive role: they are instrumental as codes or procedural frameworks in the activation of power (Yeung, 2000: 412) or as intermediaries such as letters of credit to build trust (Murphy, 2006). Callon and Law (1997: 178), however, maintain that ‘non-humans are not simply resources and constraints... [but] intervene actively to push action in unexpected directions’ and encourage us to think in more active terms about non-human actants in networks. Thus, the bush pump was everything but a prop: it slipped out of control of its inventor and the government, it adapted to unforeseen situations, worked under unexpected conditions and provided healthy water where bacteriological studies maintained that the water was not healthy at all.

The rhizomatic connotation of the actor-network as a flat, unhierarchical and multiple entity (Latour, 1999) seems to get lost in recent interventions that seek to combine ANT with critical realism in order to theorize practice in

economic geography. Such an approach, it is claimed:

must clearly *demarcate* the boundaries of particular practices such that they are discernible as quasi-independent factors constituting or driving larger-order socioeconomic phenomena. Second, it must be able to identify those practices that have a significant *impact* on socioeconomic outcomes at the, among others, firm, household, community, regional, or global scales... Third, ... it enables economic geographers to make *generalizations* about meanings in, and the sociospatial dynamics of, the space economy. (Jones and Murphy, 2011: 381, emphases in the original)

Here, the ideas of demarcated boundaries, scales, causalities and generalizations that ANT helped to oust sneak in through the back door, paradoxically reinstating themselves under the guise of ANT. Such an account risks lapsing into viewing networks as discrete hierarchical structures, where, as the term ‘generalization’ suggests, the shape of one can explain the shape of many others. The demarcation of boundaries between practices imposes a purification that runs counter to the impetus of ANT to recognize hybrids and reproduces the separation of purification and hybridization that Latour (1993) takes issue with. In taking them for granted, such a perspective risks reproducing the very categories and categorizations that a critical analysis should grapple with. Yet the boundaries of the bush pump as a fluid object are hard to demarcate, nor can it be confined to a particular scale. In fact, its very ability to transcend boundaries and reach across scales makes it what it is.

## 2 Power

A second set of tensions revolves around the concept of power in ANT. Two conflicting views have emerged: one is that ANT is highly attentive to power and the other is that it ignores power. One of the earliest adaptations of ANT in geography, Thrift’s *Spatial Formations*,

justified the engagement with ANT precisely on the grounds of its concern with power, as opposed to many theories of practice (Thrift, 1996: 23). In a self-critical reflection, Latour even remarked on the almost obsessive preoccupation of ANT with power: '[t]he managerial, engineering, Machiavellian, demiurgic character of ANT has been criticized many times' (Latour, 1999: 16). For ANT, power is the effect of translation: 'understanding what sociologists generally call power means describing the ways in which actors are defined, associated and simultaneously obliged to remain faithful to their alliances' (Callon, 1986: 224; for seminal work on the 'classic' ANT take on power, see Law, 1991). It is a mediated power, which does not simply radiate out from a central location but brings the far-off into close reach through the successive enrolment of actants and the extension of the actor-network (Allen, 2003: 129–158).

In the eagerness to bring ANT's concern with power to bear on economic geographical analysis, however, often enough power has been attributed an a priori existence, predating or even influencing the process of translation. This view is evident in statements that 'actor networks are...shaped by power asymmetries' and that '[a]n agent successfully translates his or her power into desired actions and outcomes through the building up of alliances and by enrolling or ordering heterogeneous materials in his or her network' (Murphy, 2006: 436). In a similar vein, a fundamental dimension of ANT is considered to be the 'autonomous power of actors' (Yeung, 2003: 450). ANT is sometimes pitted against the perceived excessive structuralism of other approaches, as in the claim that '[p]olitical economy has much to offer in terms of explaining the structural and institutional preconditions of human actions, whereas ANT as a poststructuralist concept helps us focus on the agency dimension' (Hess and Yeung, 2006: 1199; see also Yeung, 2006: 149). This move seeks to position ANT on the agency side of the

structure/agency division, implying an agential and anthropocentric notion of power.

On the other hand, ANT has paradoxically drawn much fire for its alleged blindness to power, in particular to a mode of structural power – whether it is institutions or the oppressive effects of social differentiations along dividing lines such as class or race – that precedes the formation of actor-networks. In describing each actor-network from scratch, ANT does not assume regularities behind processes of network construction and thus negates that structural constraints can lead to the potentially differential ability of certain actants to shape networks (e.g. Castree, 2002: 135; Ettliger, 2003: 157; Kirsch and Mitchell, 2004). 'In the rush to document the seemingly never-ending ways in which actors and networks produce specific outcomes', Gertler (2010: 4) claims, 'sight was lost of the larger institutional architectures that shape and constrain individual choices'. Dicken et al. (2001: 94) thus caution against (ANT as) a 'network methodology that loses a sense of structural power operating beyond the spaces of traceable connections in networks'. In this interpretation, actor-networks are separated from a kind of structural power that shapes and at least partly explains them.

Seeking to propose agential or structural notions of power, these appropriations of ANT ignore, however, that it is this very duality that Latour and others seek to avoid. ANT insists on focusing on the processes of association through circulation, without assuming a priori that there is something like human agency or sedimented structures driving or constraining them (cf. Latour, 1999: 17). This does not mean that ANT is blind to power, but rather that it chooses to see power as an effect rather than as a precondition of actor-networks. This view enables it to remain agnostic with regard to what might become big and powerful in one situation by enrolling lots of others in its support, but small and powerless in others. From an ANT

perspective, the success of the bush pump, to continue with this example, cannot be attributed to the power of either actors (such as its inventor) or structures (such as class), but rather to its situational mutability, which helps it assemble an actor-network in most places it touches down.

## V Translations: new prospects

The incorporation of ANT into economic geography is an ongoing, often unruly endeavour, with shifts and jolts, tensions and ambiguities. There is thus not one form of ANT, but it gets translated to fit into disciplinary traditions and discussions. Outlining in broad strokes the potentials of an agenda for future research, this section suggests three worthwhile but as yet unrealized translations of ANT. These respond to critical points raised in the previous sections and seek to provide new vistas for economic geography's engagement with ANT, while at the same time also opening up points of connection to debates in human geography at large.

### I Hybridity

Hybridity – the enmeshing of humans and non-humans – is constitutive of the economic. This does not mean equating humans and non-humans, but conceding that materiality is constitutive for the production of action. The first translation proposed here thus seeks to move away from the privileging of social actors to recognize the hybridity of actor-networks and the manifold ways in which things and technologies become entangled with humans. Such a move seeks to redress the predominant understanding of the material world as props and subservient objects that has characterized economic geography's reception of ANT. Ingold's (2010) distinction between thing (*Ding*) and object (*Gegenstand*) is instructive here. He contrasts the object as a bounded, finished and inert entity with the thing as a vital knot of activity that is always in the making, always reaching out and

drawing others in. A thing is not contained and circumscribed by humans. ANT's non-humans then are to be considered as vital things, not as closed-off objects, exercising what political theorist Jane Bennett (2004) calls 'thing-power'. Jorge Luis Borges' short story 'The dagger', fictional but masterful in its evocative description, throws this thing-power into sharp relief:

Whoever lays eyes on it has to pick up the dagger and toy with it, as if he had always been on the lookout for it. The hand is quick to grip the waiting hilt, and the powerful obeying blade slides in and out of the sheath with a click. This is not what the dagger wants. It is more than a structure of metal; men conceived it and shaped it with a single end in mind . . . On wielding it the hand comes alive because the metal comes alive, sensing itself, each time handled, in touch with the killer for whom it was forged. (Jorge Luis Borges, 'The dagger', 1954)

What Borges intends to capture is not a dagger with an agency of its own, but still with a forceful vitality in its interaction with humans. The dagger here is not a mere instrument wielded at the will of a human, although it was forged by humans. Instead, it is one of those non-humans that seduce and enrapture us, make us want to do something we would not otherwise do, slip out of our control and resist. This vitality of things in hybrid relationships is an important insight for at least two reasons: first, because it questions the autonomy of the human agent and asks us to consider how s/he is co-articulated, often in aleatory ways, in the encounter with the material world; and, second, because it queries action as the outcome of a calculative, semiotic process. Instead, hybridity allows for the human body to be drawn into immediate relations with things – relations that may be mediated but are not to be reduced to semiosis.

The parallels between the concept of hybridity and Haraway's (1991) cyborg metaphor are patent here: human-machine hybrids have

become incorporated, in the literal sense, as naturalized parts into everyday life, as the line between body and technology is becoming ever thinner. But what for Haraway is essentially a figure of liberation – the cyborg as a concept to wage war on entrenched dualisms – is viewed in a more agnostic fashion from an ANT perspective: hybrids can perpetuate as well as alleviate existing inequalities. While sharing much common ground, the crucial difference between the cyborg metaphor and ANT can be found in the political status they accord to hybridity: for Haraway it is a liberating utopia, whereas for ANT it is merely a precarious arrangement to be described. Haraway has thus argued for taking on the inequalities perpetuated through dominating relationships such as gender, race or class and the reproduction of exclusion in the tradition of a racist, male-dominated capitalism. As a non-dualist figure, the cyborg subverts the unequal binaries of male/female, humans/nature or white/non-white and replaces them with the indeterminate and fraying boundaries of the human-machine hybrid. ANT, by contrast, insists that starting from social differentiations a priori obstructs our view of how these are made and actualized in the first place (cf. Murdoch, 1997a: 748).

Hybridity is most striking in those areas where technologies have started to penetrate and intervene in the human body. One of those areas is medicine, where advances in genomics, reproductive medicine, pharmacology and other fields have boosted our abilities, as Rose (2007: 3) writes, to ‘control, manage, engineer, reshape and modulate the very vital capacities of human beings as living creatures’. No longer does medicine focus on the treatment of disease but increasingly on the medical optimization of life itself, which is being turned into an economic value. These developments towards a bioeconomics have also enabled and accelerated a general speed-up of bodily commodification and marketization. Bodies and body parts are rendered manipulable and globally mobile, not

least for reproduction and trading, while also creating increasing streams of medical tourism (Parry, 2012). This bioeconomics produces its own specific geographies. Elements from around the world – donors, recipients, drugs, instruments, doctors, surgical techniques – must be brought together for the creation of economic value, creating a complex web of associations; certain forms of technologies are allowed in some places and prohibited in others; some spread from one place to another, while others are inert; some might create additional social inequities, while others might flatten them. In each case, however, the classic boundaries between non-human – traditionally tradeable and commodifiable – elements and human – traditionally non-commodifiable – elements become more and more blurred, redefining what it means to be human (Rose, 2007).

Digital mediation of sociospatial practices through a range of technologies from augmented realities to user-generated content, often termed ‘neogeography’ (Wilson and Graham, 2013), exemplifies another variant of hybridity. Consider Google’s Project Glass,<sup>2</sup> an augmented reality device which projects information right onto a lens in front of the user’s eyes. It makes the integration between body and technology even more seamless, indeed almost fusing the two – ‘putting you back in the moment’, as Google advertises. However, like other augmented reality devices, it also blurs the line between the real and the virtual world through facilitating the immediate transposition of one into the other: whatever a person looks at or hears can be recorded and matched with digital information that then is fed back onto the lens to inform the user’s choices and subsequent actions. The realities thus created are remade through algorithms, new code and content, and the user’s changing situation in time, space and social relations. Or consider social networking sites such as facebook and Google+, where a user’s physical body and existence are both fused with and disentangled from the digital

body she creates on those sites in a multitude of ways. Offline and online worlds are intertwined to a degree that makes it impossible to separate them, but they at the same time function according to different logics (Boyd, 2008). Largely out of control of the individual user, algorithms infer identities upon individuals based on online behaviour. These identities tailor what we are shown and able to do online – what book we are recommended, what price we are quoted for a flight – and thus structure and regulate our lives, online and offline (Cheney-Lippold, 2011).

Material stuff here is everything but a mere prop: in crucial ways it redefines us as humans. It shapes what we can know, see and do and how we can know, see and do it. For economic geography, there are several pressing questions in these rapidly increasing entanglements of humans and non-humans. How is the proliferation of human-technology hybrids a geographically uneven process? What paths does it follow and how is it transformed in the course? How does it become performative of economic practices? What new markets does it create, what existing ones does it transform and how does economic valuation vary geographically? How does it reshape economic power and control? How does it change how space is perceived and interacted with and how is what we see and experience based on where we are located in space?

Tackling these issues will see us move away from treating technologies as tools to accepting them as a constituent, vital force of the sociomaterial world – as a thing, not an object – but it also raises questions about the methods with which to research the participation of things in shaping our lives. Marres (2012) suggests a device-centred approach, which attends to material devices in their performance rather than a description of abstract principles – it attends to *materialization* instead of materiality. This asks how material devices change existing modes of action and what kinds of actions they make possible that were not possible before

(e.g. Pfaff, 2010). With Law (2004a: 2–3), such an approach calls for ways of knowing that are more embodied and more situated, but also more reflexive. Crucially, a focus on the thing – instead of on the action or the actor – asks economic geographers to become more agnostic about what and who matters in research and more attuned to the often unpredictable, wilful behaviour of what would otherwise be dismissed as inanimate objects.

## 2 Desire

As we have seen in the previous section, the question of power – who or what keeps network relations stable – in relation to ANT has vexed both economic geographers and human geographers more broadly. Latour (1991) proposed that ‘technology is society made durable’: the inscription of social relations in matter lends them a degree of fixity. Another route towards understanding what keeps associations stable and what transforms them at the same time is to acknowledge the power of desire – the affective impulse of wanting to have something – as a corporeal force tied to actor-networks. Such a move has two crucial advantages. For one thing, it presents an alternative to situating power in the structure/agency duality, thinking of it as a distributed arrangement. For another, it acknowledges that power is an abstract force that works not only *on* bodies but also, tangibly and perceptibly, *through* bodies.

While initially rather reluctant to take this affective component on board (cf. Laurier and Philo, 1999: 1063; see also Thrift, 2000a: 215), ANT has recently made steps to open up to it. Revalorizing the work of Gabriel Tarde, Latour and Lépinay (2009: 24) have argued that economics should be seen as the ‘science of passionate interests’. What keeps us attached to goods in the economy is not so much abstract, rational calculation as corporeal desires, or what Thrift (2010: 290) calls a ‘certain kind of secular magic that can act as a means of willing

captivation'. It was Deleuze and Guattari who plumbed the libidinal qualities of sociomaterial association in greater depth (cf. Goodchild, 1996). They claim that desire is tied to sociomaterial assemblages (*agencements* in the French original), a concept that has received increasing attention in human geography (e.g. Anderson and McFarlane, 2011). The assemblage is a close equivalent to ANT's actor-network (for more detail on the parallels of Deleuze and Guattari with ANT, see Murdoch, 2006: 89–97). Desire should not be mistaken as a property inherent to humans, but is always distributed in assemblages – what Deleuze and Guattari call a desiring-machine: '[d]esire constantly couples continuous flows and partial objects that are by nature fragmentary and fragmented' (Deleuze and Guattari, 2004 [1972]: 6). Particular assemblages hold their shape for a while, as subjects desire them with and through their bodies. Much like Foucault's concept of power, desire is thus a productive force. It is, however, also precarious at the same time: Deleuze and Guattari speak of 'becomings' to emphasize that there is a never a stable end state to sociomaterial associations.

Let us consider the theoretical argument of the productive effect of desire through an empirical example that also speaks to the notion of thing-power from the previous section. Barry and Thrift (2007: 519) note that modern consumer economies depend on 'tracking as well as generating the propagation of desires'. This is true for a range of activities, from processes of marketization that promise to bring the long-awaited access to consumer goods to the pleasurable consumption of comfort food, the shudder down the spine that keeps people attached to fast cars and reckless driving or the rush of adrenaline in playing video games. Such desires drive the, often uneven, extension of economic activities across space. The global juggernaut of Apple products is arguably one of the most impressive manifestations of consumerist desire. This desire is captured in terms

like 'mania', 'craze', 'pandemonium', 'frenzy', 'crave', 'salivating' or 'fever' that news coverage employs to describe people's relations to the iPhone and that convey a sense of the immediate corporeal dimension attached to wanting and owning such a device, no matter the price. It is also reflected in Apple's credo that 'the most important thing to us is that our customers love our products, not just buy them but love them' (Garside, 2013). The desire for the product can become so intense that people sell organs to be able to afford an Apple gadget or kill when discovering that they have been sold a replica (BBC News, 2012; Granger, 2012). Yet these desires are fickle at the same time and can often shift in an instance: while the success of the iPhone was hailed as unprecedented in 2012, 2013 already saw customer interest in the device eroding and migration to other platforms such as Android (Garside, 2013).

Desire, however, extends not only to objects of consumption, but also to relations between humans, and as such is an intersubjective force. Erotic desire – and the economic value attached to it – is perhaps the most obvious example of this. Another relates to the affective economies of reproduction and the desire for a child. Children are perhaps the most affectively charged bodies in modern societies, typically considered to be beyond economic valuation (Zelizer, 1985). However, as technological advances, from in-vitro fertilization to surrogate motherhood, have opened up new opportunities of reproduction, attendant markets and advertising have sprung up that cater to the desire for having children for economic gain. This throws up a range of questions relating to the modalities, regulation and the geographical spread of a market for something considered 'priceless' and beyond consumption, yet still the target of strong desire (Schurr, 2014).

Places and landscapes, too, are bound up with desire. The Portuguese *saudade* or the German *Heimweh* all express feelings of passionate longing, often tied to places that one desires to

go back to but is barred from. Los Angeles (McClung, 2000) and Kashmir (Kabir, 2009), to name two very different places, have figured as desirable and desired fantasies at different times for different people in different places, with promises of freedom, opportunity, self-fulfilment and wholeness. Ideals of wilderness, on the other hand, have often become bound up with the desire for returning to an original, primeval state of human life: 'as we gaze into the mirror it [wilderness] holds up for us, . . . we see the reflection of our own unexamined longings and desires' (Cronon, 1996: 7). This desire that arises from the interaction of material places and human bodies is not innocent. It is frequently exploited for economic purposes, for example in tourism marketing or for attracting and directing people and investment, but also for nationalist sentiments, fostering bonds with the homeland.

There is, thus, also a politics of desire behind stabilizing and extending actor-networks. It can be targeted to increase people's attachment, whether as customers or citizens, open up new markets, launch a product or enhance staff performance (Thrift, 2004, 2010). But desire, it should be stressed, is also unpredictable: what is desired in one particular historical conjuncture might fail to stoke the affective fire in another. Translating ANT with desire thus suggests an avenue to recover the sense of power that many studies in economic geography have sought in drawing on ANT. It does so without attributing power to the agency of humans or the constraints of structures, but as emerging out of the ephemeral arrangements of an actor-network, distributed among material and immaterial components whose boundaries, often enough, become blurred in the process of association. Power draws in and works through bodies and their affective associations with material things – holding actor-networks in place at one moment but letting them fall apart the next. Unlike structural power, this sense of power is not as all-encompassing and omnipresent, but

unlike agential power it is also not at the disposal of individual human agents.

### 3 Fluidity

While explaining the obduracy of actor-networks is an important task, economic geography has tended to focus almost exclusively on questions of stability and stabilizing processes, in particular its concern with successful translations. No doubt, this has partly been due to the high level of aggregation at which actor-networks were examined in the early accounts (e.g. Thrift and Leyshon, 1994). Law and Mol (2001: 612) have bemoaned this 'functional managerialism' of ANT, and Star (1991) pointed out relatively early that ANT's notion of power is too unified and one-dimensional, overlooking the instances where translation is imperfect and partial. Thrift (2000a: 214), too, later critically remarked that 'even though fleet Hermes is one of its avatars, [ANT] dies a little when confronted with the flash of the unexpected and the unrequited'.

A final translation would thus bring into focus the fluidity of actor-networks as fleeting performances. In so doing, it seeks to provide a corrective to the overwhelming focus of existing work on stability. Incorporating the multiple, imperfect configurations of actor-networks back into the analysis allows us to rediscover those things that tend to become invisible and overlooked in a primary concern with stability. Such a translation recognizes that there is often not one but multiple realities enacted through actor-networks: multiple potential network configurations might overlap, overturn, contradict or flow into each other to constitute different realities (Law and Mol, 2001). Mol (2002) demonstrates this for the case of medical practice, where diseases take different shapes depending on the practices and objects enrolled to diagnose them. As a result, actions vary, depending on what particular configuration of an actor-network prevails in a specific situation. Actor-networks thus

are often fluid and emergent: connections break and are transformed, elements slip out of networks and are enrolled in others and different configurations are counterposed. In fact, this fluidity can be crucial for successful translation: had it not been for its mutability and adaptability for different purposes and situations, the Zimbabwe bush pump would never have had the success it had (de Laet and Mol, 2000).

In economic geography, ANT's potential for dealing with the fluid and the fleeting remains to be explored in greater depth. Such a shift in attention should be welcome, considering that economic activity in the past two decades has also become considerably more transient and fluid with the increased mobility of people, things, knowledge and capital. What Mintzberg (1980: 336–338) has termed 'operating adhocracies' – fast-moving and task-oriented organizations with fluid structures and manifold interfaces with their outsides – are becoming more and more common, in particular in professional services. These organizational forms are often linked to the ongoing projectification, i.e. a shift from permanent forms of organization to more transient, task-oriented ones, in the organization of work (Grabher, 2002). Projects are highly dependent on the creation, mobilization and temporary fixation of actor-networks: ties are intense but ephemeral, and once the project is over the elements of an actor-network are recombined for new projects (Grabher, 2004).

The spread of the event as a cultural and economic form is a prominent exemplar of adhocracies and project-based organizing. Large-scale events such as the Olympic Games require building an organization with tens of thousands of permanent staff and volunteers and a budget of sometimes several billion dollars over the course of a few years and dissolving it again in just a few months. Smaller events do not grow to such size but have a similar pulsating and transient character that often calls for adapting

to the unexpected and where stability is at best temporary and continuously contested. Fluidity is also epitomized in emergency situations, for this is where we find emergent actor-networks par excellence. Wherever and whenever disaster strikes, the uncertainty and disorientation it creates brings new forms of organizing and coordinating across space into being. Although plans for emergency situations might exist, more often than not improvisation and experimentation carry the day (Kreps and Lovegren Bosworth, 1994). Order needs to be recreated and maintained on a regular basis and fenced off against forms of disorder that threaten to overturn temporarily stabilized actor-networks. Responses to disaster thus represent a precarious form of actor-networks that allow to act in some ways, but that are also constantly challenged and undermined.

Devoting greater attention to fluidity and transience does not mean, as some might be tempted to assume, that everything should be considered in flux (cf. Marston et al., 2005: 424). It also does not mean that fluidity can only be found in situations of profound upheaval: often what looks stable and ordered from the outside harbours multiple fluidities on the inside that might, however, converge into a single reality for a while. But taking fluidity seriously brings us closer to recognizing that key proposition of poststructuralist thought that any fixation or order is always partial. Stability and instability, framing and overflowing are two sides of the same coin. Every attempt at ordering relations in an actor-network is set against an irreducible fluidity and thus remains forever incomplete. Çalışkan and Callon (2010: 8) sum up this dialectical relationship: '[i]n the sense that it structures an exterior to itself, a framing is its own inescapable source of the threat of overflows'. In the past, economic geographical analysis has too often come down on the side of the ordered and stable. A translation of ANT with a focus on the fluid and transient ordering of actor-networks would serve to recognize that



order needs to be appropriated out of disorder and is a precarious accomplishment. It would direct our gaze beyond the calm, ordered surface to the manifold situations in which changes are immanent and existing orders are contested, multiplied and diffracted.

## VI Conclusion

ANT has had a significant impact on much research in economic geography. Although not all will feel entirely at ease about this, it is likely to be here to stay. Yet we all too often find a selective and one-sided reading of the ANT literature – what I have characterized as a half-hearted romance. I have shown how this has been the case for the concept of network, which has sometimes been interpreted as an anthropocentric notion of pre-existing social actors *in* networks instead of sociomaterial actors emerging *through* networks, and for the concept of power, which has variously been read as an agential or as a structural force, whereas ANT seeks to operate outside this duality.

To become more than a half-hearted romance, the relationship between ANT and economic geography needs both deepening and broadening: deepening in the sense of a more reflexive and in-depth engagement with key concepts in the ANT vocabulary, and broadening in the sense of an exploration of a broader field of encounters. The aim of this paper thus is not to instate an authoritative catechism of ANT, for this would constitute a futile attempt at purification in what Latour has described as a world of hybrids. But it wants to clarify misunderstandings and encourage future research to be transparent about its assumptions with regard to ANT as well as potential translations that it is undertaking. Such transparency also helps in maintaining an awareness that, as with any conceptual approach, ANT allows us to see some things in sharper relief than others and is more appropriate for some research questions than for others. Now that the initial phase of excitement

when discovering something new is coming to an end, it seems an opportune time to take this next step.

In terms of broadening, translations of ANT are vital for realizing its potential in economic geography and beyond. I have outlined three translations that seem to hold particular promise, whether it is because they relate to important critiques of the reception of ANT in economic geography or to emerging empirical phenomena. A translation with *hybridity* and the role of technologies as vital things rather than subservient, human-wielded crutches helps to do better justice to the ways in which the non-human world shapes economic activities, often pushing them in unexpected directions. Exploring the role of *desire* in holding actor-networks together opens up ANT to corporeality and provides a different perspective on the question of who or what has the power to order and transform the sociomaterial world beyond the duality of structure and agency. Finally, developing a stronger focus on the *fluidity* of actor-networks would recognize that stability and instability are but two sides of the same coin, something that is visible, among others, in the increasing presence of transient forms in the organization of work.

In proposing these three translations, the paper also opens up connections and parallels with recent developments in other fields of human geography. The translation with hybridity links with literature on material geographies and socionatures (e.g. Castree and Nash, 2006; Whatmore, 2006); the interest in desire tallies with turns towards exploring the role of emotions and affects as well as the body and the corporeal (e.g. Anderson and McFarlane, 2011; Anderson and Wylie, 2008; Thrift, 2008); and the attention to fluidities and transience finds resonance with the concern with mobilities and emergence (e.g. McCann, 2011; Thrift, 2000a). All the while retaining a distinctive focus on the economic aspects of the phenomena under consideration, there is thus much potential for

developing broader agendas across human geographic subfields and establishing ‘inclusive trading zones’ for an engaged pluralism (Barnes and Sheppard, 2010: 208) – so that the relationship between ANT and economic geography might not end as abruptly and superficially as the romantic affair in Mascha Kaléko’s poem:

*Hat man genug von Weekendfahrt und Küssen  
Läßt man’s einander durch die Reichspost wissen  
Per Stenographenschrift ein Wörtchen: ‘aus’!  
(One’s had enough of weekend trips and kisses  
Sends through the postal service missives  
In stenographic letters just one word: ‘out’!)  
(Mascha Kaléko, *Großstadtliebe*, 1933)*

### Acknowledgements

Much of this paper was written during a research visit at the University of North Carolina at Chapel Hill. Special thanks go to John Pickles for being such a great host and thoughtful reviewer. Sue Roberts’ guidance, as well as those of three reviewers and a second editor, helped shape this article into what it is now.

### Funding

The Swiss National Science Foundation co-funded this research under grant number PP00P1\_144699.

### Notes

1. One particular imprecision is at once central and trivial: the spelling of actor-network theory. A multiplicity of spellings abound in economic geography: sometimes without a hyphen, sometimes with two hyphens, sometimes capitalized, sometimes not. This is not only bickering over orthography, and Latour (1999) is unambiguous about the correct version: ANT is not a theory of actors and networks, but of the actor-network, hence actor-network theory.
2. See <http://www.google.com/glass/start/what-it-does>.

### References

Akrich M (1992) The de-scription of technical objects. In: Bijker WE and Law J (eds) *Shaping Technology, Building Society: Studies in Sociotechnical Change*. Cambridge, MA: The MIT Press, 205–224.

- Allen J (2003) *Lost geographies of power*. Oxford: Blackwell.
- Allen J (2011) Topological twists: Power’s shifting geographies. *Dialogues in Human Geography* 1: 283–298.
- Amin A (2002) Spatialities of globalisation. *Environment and Planning A* 34: 385–399.
- Amin A and Cohendet P (2004) *Architectures of Knowledge: Firms, Capabilities, and Communities*. Oxford: Oxford University Press.
- Anderson B and McFarlane C (eds) (2011) Assemblage and geography. *Area* 43: 124–164.
- Anderson B and Wylie J (2008) On geography and materiality. *Environment and Planning A* 41: 318–335.
- Barnes TJ (2001) In the beginning was economic geography: A science studies approach to disciplinary history. *Progress in Human Geography* 25: 521–544.
- Barnes TJ (2002) Performing economic geography: Two men, two books, and a cast of thousands. *Environment and Planning A* 34: 487–512.
- Barnes TJ (2004) Placing ideas: Genius loci, heterotopia and geography’s quantitative revolution. *Progress in Human Geography* 28: 565–595.
- Barnes TJ (2006) Geographical intelligence: American geographers and research and analysis in the Office of Strategic Services 1941–1945. *Journal of Historical Geography* 32: 149–168.
- Barnes TJ (2008) Making space for the economy: Live performances, dead objects, and economic geography. *Geography Compass* 2: 1432–1448.
- Barnes TJ and Sheppard ES (eds) (2000) *A Companion to Economic Geography*. Oxford: Blackwell.
- Barnes TJ and Sheppard ES (2010) ‘Nothing includes everything’: Towards engaged pluralism in Anglophone economic geography. *Progress in Human Geography* 34: 193–214.
- Barnes TJ, Peck J and Sheppard ES (eds) (2012) *The Wiley-Blackwell Companion to Economic Geography*. Chichester: Wiley-Blackwell.
- Barry A and Thrift N (2007) Gabriel Tarde: Imitation, invention and economy. *Economy and Society* 36: 509–525.
- BBC News (2012) China arrests after kidney sold for iPad. 6 April 2012. Available at: <http://www.bbc.co.uk/news/world-asia-china-17640209>.
- Bennett J (2004) The force of things: Steps toward an ecology of matter. *Political Theory* 32: 347–372.
- Berndt C and Boeckler M (2009) Geographies of circulation and exchange: Constructions of markets. *Progress in Human Geography* 33: 535–551.

- Berndt C and Boeckler M (2011) Geographies of markets: Materials, morals and monsters in motion. *Progress in Human Geography* 35: 559–567.
- Bijker WE (1992) The social construction of fluorescent lighting, or how an artifact was invented in its diffusion stage. In: Bijker WE and Law J (eds) *Shaping Technology, Building Society: Studies in Sociotechnical Change*. Cambridge, MA: The MIT Press, 75–102.
- Boyd D (2008) *Taken Out of Context: American Teen Sociability in Networked Publics*. Berkeley, CA: University of California Press.
- Çalışkan K and Callon M (2009) Economization, part 1: Shifting attention from the economy towards processes of economization. *Economy and Society* 38: 369–398.
- Çalışkan K and Callon M (2010) Economization, part 2: A research programme for the study of markets. *Economy and Society* 39: 1–32.
- Callon M (1980) Struggles and negotiations to define what is problematic and what is not: The socio-logic of translation. In: Knorr K, Krohn RG and Whitley R (eds) *The Social Process of Scientific Investigation: Sociology of the Sciences*. Dordrecht: D. Reidel, 197–219.
- Callon M (1986) Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. In: Law J (ed.) *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge, 196–233.
- Callon M (1991) Techno-economic networks and irreversibility. In: Law J (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge, 132–165.
- Callon M (1998) *The Laws of the Markets*. Oxford: Blackwell.
- Callon M (2007) What does it mean to say that economics is performative? In: MacKenzie D, Muniesa F and Callon M (eds) *Do Economists Make Markets? On the Performativity of Economics*. Princeton, NJ: Princeton University Press, 311–357.
- Callon M and Law J (1997) After the individual in society: Lessons on collectivity from science, technology and society. *Canadian Journal of Sociology* 22: 165–182.
- Castree N (2002) False antitheses? Marxism, nature and actor-networks. *Antipode* 34: 111–146.
- Castree N and Nash CJ (2006) Special issue: Posthuman geographies. *Social and Cultural Geography* 7: 501–647.
- Cheney-Lippold J (2011) A new algorithmic identity: Soft biopolitics and the modulation of control. *Theory, Culture and Society* 28: 164–181.
- Clark GL, Feldman MP and Gertler MS (eds) (2000) *The Oxford Handbook of Economic Geography*. Oxford: Oxford University Press.
- Cooke P and Morgan K (1993) The network paradigm: New departures in corporate and regional development. *Environment and Planning D: Society and Space* 11: 543–564.
- Cronon W (1996) The trouble with wilderness: or, Getting back to the wrong nature. *Environmental History* 1: 7–28.
- de Laet M and Mol A (2000) The Zimbabwe bush pump: Mechanics of a fluid technology. *Social Studies of Science* 30: 225–263.
- Deleuze G and Guattari F (2004 [1972]) *Anti-Oedipus*. London: Continuum.
- Dicken P, Kelly PF, Olds K, et al. (2001) Chains and networks, territories and scales: Towards a relational framework for analysing the global economy. *Global Networks* 1: 89–112.
- Ettlinger N (2003) Cultural economic geography and a relational and microspace approach to trusts, rationalities, networks, and change in collaborative workplaces. *Journal of Economic Geography* 3: 145–171.
- Ettlinger N (2008) The predicament of firms in the new and old economies: A critical inquiry into traditional binaries in the study of the space-economy. *Progress in Human Geography* 32: 45–69.
- Faulconbridge J (2007) London's and New York's advertising and law clusters and their networks of learning: Relational analyses with a politics of scale? *Urban Studies* 44: 1635–1656.
- Faulconbridge J (2010) Global architects: Learning and innovation through communities and constellations of practice. *Environment and Planning A* 42: 2842–2858.
- Featherstone D (2004) Spatial relations and the materialities of political conflict: The construction of entangled political identities in the London and Newcastle Port Strikes of 1768. *Geoforum* 35: 701–711.
- French S (2000) Re-scaling the economic geography of knowledge and information: Constructing life assurance markets. *Journal of Economic Geography* 31: 101–119.
- Garside J (2013) Apple shares slide as iPhone misses Christmas sales forecast. *The Guardian* 24 January 2013. Available at: <http://www.theguardian.com/technology/2013/jan/24/apple-results-iphone-sales>.

- Gertler MS (2010) Rules of the game: The place of institutions in regional economic change. *Regional Studies* 44: 1–15.
- Gibson-Graham JK (2000) Poststructural interventions. In: Barnes T and Sheppard ES (eds) *A Companion to Economic Geography*. Oxford: Blackwell, 95–110.
- Goodchild P (1996) *Deleuze and Guattari: An Introduction to the Politics of Desire*. London: SAGE.
- Grabher G (2002) Cool projects, boring institutions: Temporary collaboration in social context. *Regional Studies* 36: 205–214.
- Grabher G (2004) Learning in projects, remembering in networks. *European Urban and Regional Studies* 11: 103–123.
- Graham S and Marvin S (2001) *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. London: Routledge.
- Granger L (2012) Man kills vendor over fake iPhone. Memeburn 3 May 2012. Available at: <http://memeburn.com/2012/03/man-kills-vendor-over-fake-iphone>.
- Hall S (2007) Knowledge makes the money go round: Conflicts of interest and corporate finance in London's financial district. *Geoforum* 38: 710–719.
- Hall S (2008) Geographies of business education: MBA programmes, reflexive business schools and the cultural circuit of capital. *Transactions of the Institute of British Geographers* 33: 27–41.
- Hall S (2011) Geographies of money and finance I: Cultural economy, politics and place. *Progress in Human Geography* 35: 234–245.
- Haraway D (1991) *Simians, Cyborgs and Women: The Reinvention of Nature*. London: Routledge.
- Hess M and Yeung HW (2006) Guest editorial: Whither global production networks in economic geography? *Environment and Planning A* 38: 1193–1204.
- Higgins V and Larner W (eds) (2010) *Calculating the Social: Standards and the Reconfiguration of Governing*. New York: Palgrave Macmillan.
- Hinchliffe S (2007) *Geographies of Nature*. London: SAGE.
- Hughes A (2000) Retailers, knowledges and changing commodity networks: The case of the cut flower trade. *Geoforum* 31: 175–190.
- Ibert O (2006) On the localization of knowledge through practice: The constitution of sites of learning via routines, objects and circulation. *Geographische Zeitschrift* 94: 98–115.
- Ingold T (2010) Bringing things to life: Creative entanglements in a world of materials. *Realities Working Paper* 15: 1–14.
- Jones A (2007a) More than 'managing across borders'? The complex role of face-to-face interaction in globalizing law firms. *Journal of Economic Geography* 7: 223–246.
- Jones A (2007b) The rise of global work. *Transactions of the Institute of British Geographers* 33: 12–26.
- Jones A (2008) Beyond embeddedness: Economic practices and the invisible dimensions of transnational business activity. *Progress in Human Geography* 32: 71–88.
- Jones A (2009) Theorizing global business spaces. *Geografiska Annaler B* 91: 203–218.
- Jones A and Murphy JT (2011) Theorizing practice in economic geography: Foundations, challenges, and possibilities. *Progress in Human Geography* 35: 366–392.
- Kabir AJ (2009) *Territory of Desire: Representing the Valley of Kashmir*. Minneapolis, MN: University of Minnesota Press.
- Kirsch S and Mitchell D (2004) The nature of things: Dead labor, nonhuman actors, and the persistence of Marxism. *Antipode* 36: 687–705.
- Kreps GA and Lovegren Bosworth S (1994) *Organizing, Role Enactment and Disaster*. Newark, DE: University of Delaware Press.
- Latham A (2002) Rethorizing the scale of globalization: Topologies, actor-networks, and cosmopolitanism. In: Herod A and Wright M (eds) *Geographies of Power: Placing Scale*. Oxford: Blackwell, 115–144.
- Latour B (1987) *Science in Action*. Milton Keynes: Open University Press.
- Latour B (1991) Technology is society made durable. In: Law J (ed.) *A Sociology of Monsters? Essays on Power, Technology and Domination*. London: Routledge, 103–131.
- Latour B (1992) Where are the missing masses? The sociology of a few mundane artifacts. In: Bijker WE and Law J (eds) *Shaping Technology*. Cambridge, MA: The MIT Press, 225–258.
- Latour B (1993) *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
- Latour B (1996a) *Aramis or the Love of Technology*. Cambridge, MA: Harvard University Press.
- Latour B (1996b) On actor-network theory: A few clarifications. *Soziale Welt* 47: 369–381.

- Latour B (1999) On recalling ANT. In: Law J and Hassard J (eds) *Actor-Network Theory and After*. Oxford: Blackwell, 15–25.
- Latour B (2005) *Reassembling the Social*. Oxford: Oxford University Press.
- Latour B and Lépinay VA (2009) *The Science of Passionate Interests: An Introduction to Gabriel Tarde's Economic Anthropology*. Chicago, IL: Prickly Paradigm Press.
- Laurier E and Philo C (1999) X-morphising: Review essay of Bruno Latour's *Aramis, or the Love of Technology*. *Environment and Planning A* 31: 1047–1071.
- Law J (ed.) (1991) *A Sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge.
- Law J (1992) Notes on the theory of the actor-network: Ordering, strategy and heterogeneity. *Systems Practice* 5: 379–393.
- Law J (2002) Objects and spaces. *Theory, Culture and Society* 19: 91–105.
- Law J (2004a) *After Method: Mess in Social Science Research*. London: Routledge.
- Law J (2004b) And if the global were small and noncoherent? Method, complexity, and the baroque. *Environment and Planning D: Society and Space* 22: 13–26.
- Law J (2009) Actor-network theory and material semiotics. In: Turner B (ed.) *The New Blackwell Companion to Social Theory*. Oxford: Blackwell, 141–158.
- Law J and Hassard J (eds) (1999) *Actor-Network Theory and After*. Oxford: Blackwell.
- Law J and Mol A (2001) Situating technoscience: An inquiry into spatialities. *Environment and Planning D: Society and Space* 19: 609–621.
- Leyshon A and Pollard J (2000) Geographies of industrial convergence: The case of retail banking. *Transactions of the Institute of British Geographers* 25: 203–220.
- McCann EJ (2011) Veritable inventions: Cities, policies and assemblage. *Area* 43: 143–147.
- McClung WA (2000) *Landscapes of Desire: Anglo Mythologies of Los Angeles*. Berkeley, CA: University of California Press.
- Marres N (2012) *Material Participation: Technology, the Environment and Everyday Politics*. New York: Palgrave Macmillan.
- Marston S, Jones JP III and Woodward K (2005) Human geography without scale. *Transactions of the Institute of British Geographers* 30: 416–432.
- Martin R and Sunley P (2001) Rethinking the 'economic' in economic geography: Broadening our vision or losing our focus? *Antipode* 33: 148–161.
- Mintzberg H (1980) Structure in 5's: A synthesis of the research on organization design. *Management Science* 26(3): 322–341.
- Mitchell JC (1969) The concept and use of social networks. In: Mitchell JC (ed.) *Social Networks in Urban Situations: Analyses of Personal Relationships in Central African Towns*. Manchester: Manchester University Press, 1–50.
- Mol A (2002) *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press.
- Mol A (2010) Actor-network theory: Sensitive terms and enduring tensions. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 50: 253–269.
- Mol A and Law J (1994) Regions, networks and fluids: Anaemia and social topology. *Social Studies of Science* 24: 641–671.
- Mol A and Law J (2004) Embodied action, enacted bodies: The example of hypoglycaemia. *Body and Society* 10: 43–62.
- Murdoch J (1995) Actor-networks and the evolution of economic forms: Combining description and explanation in theories of regulation, flexible specialization, and networks. *Environment and Planning A* 27: 731–757.
- Murdoch J (1997a) Inhuman/nonhuman/human: Actor-network theory and the prospects for a nondualistic and symmetrical perspective on nature and society. *Environment and Planning D: Society and Space* 15: 731–756.
- Murdoch J (1997b) Towards a geography of heterogeneous association. *Progress in Human Geography* 21: 321–337.
- Murdoch J (1998) The spaces of actor-network theory. *Geoforum* 29: 357–374.
- Murdoch J (2006) *Poststructuralist Geography*. London: SAGE.
- Murdoch J, Marsden T and Banks J (2000) Quality, nature, and embeddedness: Some theoretical considerations in the context of the food sector. *Economic Geography* 76: 107–125.
- Murphy JT (2006) Building trust in economic space. *Progress in Human Geography* 30: 427–450.
- Ouma S (2010) Global standards, local realities: Private agri-food governance and the restructuring of the Kenyan horticulture industry. *Economic Geography* 86: 197–222.
- Ouma S (2012) Creating and maintaining global connections: Agro-business and the precarious making of

- fresh-cut markets. *Journal of Development Studies* 48: 322–334.
- Ouma S, Boeckler M and Lindner P (2013) Extending the margins of marketization: Frontier regions and the making of agro-export markets in northern Ghana. *Geoforum* 48: 225–235.
- Parry B (2012) Economies of bodily commodification. In: Barnes T, Peck J and Sheppard ES (eds) *The Wiley-Blackwell Companion to Economic Geography*. Chichester: Wiley-Blackwell, 213–225.
- Pfaff J (2010) A mobile phone: Mobility, materiality and everyday Swahili trading practices. *Cultural Geographies* 17: 341–357.
- Reiffenstein T (2006) Codification, patents and the geography of knowledge transfer in the electronic musical instrument industry. *The Canadian Geographer* 50: 298–318.
- Rose N (2007) *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century*. Princeton, NJ: Princeton University Press.
- Schurr C (2014) Serving the transnational surrogacy market as a development strategy? In: Coles A, Gray L and Momsen J (eds) *Routledge Handbook of Gender and Development*. London: Routledge, forthcoming.
- Serres M and Latour B (1995) *Conversations on Science, Culture, and Time*. Ann Arbor, MI: University of Michigan Press.
- Smith RG (2003) World city topologies. *Progress in Human Geography* 27: 561–582.
- Star SL (1991) Power, technologies and the phenomenology of conventions: On being allergic to onions. In: Law J (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge, 26–56.
- Sunley P (2008) Relational economic geography: A partial understanding or a new paradigm? *Economic Geography* 84: 1–26.
- Thompson C (2002) When elephants stand for competing models of nature. In: Law J and Mol A (eds) *Complexity in Science, Technology, and Medicine*. Durham, NC: Duke University Press, 166–190.
- Thrift N (1996) *Spatial Formations*. London: SAGE.
- Thrift N (2000a) Afterwords. *Environment and Planning D: Society and Space* 18: 213–255.
- Thrift N (2000b) Pandora's box? Cultural geographies of economies. In: Clark GL, Feldman MP and Gertler MS (eds) *The Oxford Handbook of Economic Geography*. Oxford: Oxford University Press, 689–704.
- Thrift N (2004) Intensities of feeling: Towards a spatial politics of affect. *Geografiska Annaler B* 86: 56–78.
- Thrift N (2008) *Non-Representational Theory: Space, Politics, Affect*. Abingdon: Routledge.
- Thrift N (2010) Understanding the material practices of glamour. In: Gregg M and Seigworth GJ (eds) *The Affect Theory Reader*. Durham, NC: Duke University Press, 289–308.
- Thrift N and Leyshon A (1994) A phantom state? The de-traditionalization of money, the international financial system and international financial centres. *Political Geography* 13: 299–327.
- Whatmore S (2002) *Hybrid Geographies: Natures, Cultures, Spaces*. London: SAGE.
- Whatmore S (2006) Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies* 13: 600–609.
- Whatmore S and Thorne L (1997) Nourishing networks: Alternative geographies of food. In: Goodman D and Watts M (eds) *Globalising Food: Agrarian Questions and Global Restructuring*. London: Routledge, 287–304.
- Wilson MW and Graham M (2013) Theme issue: Situating neogeography. *Environment and Planning A* 45: 3–102.
- Yeung HW (2000) The dynamics of Asian business systems in a globalizing era. *Review of International Political Economy* 7: 399–433.
- Yeung HW (2003) Practicing new economic geography: A methodological examination. *Annals of the Association of American Geographers* 93: 442–462.
- Yeung HW (2006) Globalizing Asian capitalisms: An economic-geographical perspective. In: Bagchi-Sen S and Lawton Smith H (eds) *Economic Geography: Past, Present and Future*. Abingdon: Routledge, 145–156.
- Zelizer V (1985) *Pricing the Priceless Child: The Changing Social Value of Children*. Princeton, NJ: Princeton University Press.