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Virtual attractors, actual assemblages: How Luhmann's theory of communication complements actor-network theory

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Abstract

This article proposes complementing actor-network theory (ANT) with Niklas Luhmann's communication theory, in order to overcome one of ANT's major shortcomings, namely, the lack of a conceptual repertoire to describe virtual processes such as sense-making. A highly problematic consequence of ANT's actualism is that it cannot explain the differentiation of economic, legal, scientific, touristic, religious, medical, artistic, political and other qualities of actual entities, assemblages and relationships. By recasting Luhmann's theory of functionally differentiated communication forms and sense-making as dealing with different types of virtual attractors calling for actualizations in concrete assemblages, I propose a symmetrical understanding of societal differentiation processes as based on the co-production of virtual attractors and actual assemblages.

Keywords

actor-network theory, differentiation, sense-making, social systems theory, symmetry

During the past few decades, scholars working in the research tradition of actor-network theory (ANT) have produced sharp descriptions of highly differentiated objects and practices. Beyond the classic studies of science and technology (STS) carried out in the

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1980s and 1990s (Callon, 1986; Latour, 1987, 1988; Law, 1986), path-breaking research has been carried out on markets and the economy (cf. Caliskan and Callon, 2010; Callon, 1998; Callon and Muniesa, 2005), medicine and care (Mol, 2002, 2008), musical mediation and taste (Hennion, 2002, 2007), law (Latour, 2009), government and the State (Barry, 2001), etc. In all these cases, one of the greatest contributions of ANT has been to demonstrate the heterogeneity of the entities and processes that constitute each of these objects and practices. In addition, it has successfully challenged distinctions between nature, technology and society and between different social planes (interactional, institutional, cultural) that usually underlie sociological and anthropological analysis. However, as noted by Latour himself (2007, 2013), ANT has hitherto primarily presented a negative argument aimed at showing why such divides should be abandoned, but devoted little attention to developing a substantive description of how these types of practice and assemblage differ.

Differentiation is at the core of Latour's inquiry into distinct modes of existence (2013), which he has elaborated on during the past 20 years in parallel, and possibly even in contradiction, with some of the theoretical principles of ANT, especially that of the irreduction of the actual. According to this post-ANT Latour,

This is slightly embarrassing but in fact three years after writing and publishing *Irreductions* [which resumes ANT's ontological starting point], I embarked on another project which is completely parallel and absolutely antithetical to it . . . which is the study of modes of existence or regimes of enunciation. (Latour et al., 2011: 47)

This project connects the classic sociological question of societal differentiation with a much more ambitious question regarding the modalization of being and existence (Latour, 1998; 2011; 2013). From this perspective, politics, science, technology, religion or the economy not only refer to different forms of the social, but also involve different modes of existence. Thus, for example, Latour holds that while the objects of science exist as circulating references in chains of proof, legal facts are made up of legal means (Latour, 2009: 222–43). Moreover, these modes of existence are put on a par by Latour (1998) with the mode of existence of inert things, living things and even unconscious things.

This article proposes a different analytical perspective, though perhaps complementary, based on the work of Luhmann on communication and its differentiation (Luhmann, 1999, 2012). The references that Latour makes to the German sociologist when he discusses the analytical limitations of ANT with regard to the problem of differentiation (2005: 241; 2007: 7; 2009: 263) suggest that Luhmann's proposal is currently, practically speaking, the only competing comprehensive framework for studying the differentiation of the social. The reading of Luhmann that I propose suggests that differentiation originates from attractors of sense-making processes constituted in a virtual plane. Therefore, rather than seeking actual differences in the modes of association (or even of existence) of entities and assemblages, the challenge involves understanding how political, economic, religious, touristic or legal qualities emerge from the virtual loop, incomplete and incompletionable, of sense and sense-making.

Consequently, the underlying theoretical problem I address in this article is not only ANT's lack of a theory of differentiation, but the fact that this is due to its lack of

conceptual repertoires capable of accounting for virtual processes such as sense-making. In the first part of this article I will therefore discuss the place of the virtual (or better, its lack of place) in ANT and point to the resulting limitations by introducing the notions of affect, duration and sense. The second section introduces the theory of communication developed by Luhmann and describes how communication occurs, or rather subsists, in the frontier between the virtual and the actual. The central claim here is that communicative linkages based on sense-making constitute types of associations that are distinct and irreducible to those described by ANT. The third section then explains the theory of differentiation Luhmann elaborates on the basis of the study of communication linkages. Such a theory, it is suggested, is based on the identification of different types of virtual attractors that orientate the reproduction of communication. The final section sums up the argument presented above by formulating a third principle of symmetry, according to which social phenomena should be studied in their double constitution through virtual attractors and actual assemblages; a fully symmetrical approach that is exemplified for the case of touring practices.

ANT and the problem of the virtual

There are probably few things farther from, and perhaps even contrary to, the empiricist spirit of ANT than the question of the virtual. After more than 30 years of effort to uncover the active and decisive role played by concrete, material and tangible objects in the production of the social, the question of virtual forces, processes and potentialities cannot seem more out of place. In fact, much of the strong criticism that ANT directs at the social sciences has been precisely that the latter do not merely forget or overlook objects (both natural and cultural), but explicitly deny any relevance to anything outside the immaterial sphere of meanings, symbols, beliefs and norms. This is Latour's (1999b) critique of the symmetry principle proposed by David Bloor (1991), according to which it is beliefs that ultimately confer the attribute of truth or falsity to scientific statements. Such a perspective, Latour points out, forms the basis of an idealistic programme. Even though Bloor's symmetry principle does not completely deny the role that natural objects (microbes, forests, gravity) play in the production of scientific facts and truths, it conceives material entities as neutral and innocuous for the social construction of knowledge. Beyond this, neither have cultural objects (religious totems, literary works, culinary traditions) been duly considered by cultural sociology. As noted by Antoine Hennion (2002), the problem here has been the reverse: such objects are conceived by sociology as purely social intermediaries (i.e. pure symbols, meanings or value-signs) so that the transformations, resistances and mediations arising from their material or technical existence are fully bracketed. Given this strong effort to develop a sociology that takes into account objects, it is perhaps understandable that any reference to the virtual or to forces, processes and potentialities at first sight intangible, immaterial and in a certain sense ideal, only provokes scepticism and bewilderment among advocates of ANT.

But the distancing of ANT from the virtual is not a simple matter of emphasis, for example, equivalent to the emphasis with which Goffman (1983) studies the interactional order without, however, denying the reality of a structural order of society. ANT's rejection of the virtual is, in fact, quite radical, as the virtual would directly oppose one of

its fundamental theoretical and ontological principles: irreduction. As was earlier formulated by Latour, the principle of irreduction states that '[n]othing can be reduced to anything else, nothing can be deduced from anything else, everything may be allied to everything else' (Latour, 1988: 163). ANT is based on a conception of the world and the real that only recognizes the existence of concrete entities, actual actors, or, more precisely, actants constituted in networks of mutual relations. Indeed, understood as concrete and irreducible individuals, actants cannot be explained by reference to external powerful actors, underlying structures or virtual forces, but only through the situated work of establishing the alliances, partnerships and networks that make them what they are. In this sense, what exists are specific, concrete and local events taking place on the occasion of such relationships; and through which things, objects, actants exist (cf. Harman, 2009). Such an actualistic and occasionalist ontology, on the basis of which ANT is founded, does not leave much room for the virtual, for that which Gilles Deleuze (2004), following Marcel Proust, defined as real without being actual, ideal without being abstract, symbolic without being fiction.

Latour, meanwhile, has openly acknowledged this limitation: 'I take *Irreductions* to be a flawed, completely flawed philosophy. And this is actually because of a point [Graham Harman] mentioned very well, which is the virtuality question . . . the question of potentiality' (Latour et al., 2011: 46–7). In fact, when ANT and, in particular, Latour try to account for potentiality, references to the virtual break into their conceptual repertoires in a somewhat uncontrolled manner. The clearest example is the concept of 'plasma' that Latour introduces to account for what he calls the 'virtual Paris' (cf. Latour and Hermant, 1998); which would consist of those materials and entities not connected to any urban actor-network (Fariás and Bender, 2009). This plasma would open up unforeseen possibilities and potentialities, explaining thus the feeling of air and freedom that prevails in the city. In *Reassembling the Social*, Latour goes even further, describing this plasma as 'a vast hinterland providing the resources for every single course of action to be fulfilled' (Latour, 2005: 244). The problem with such irruptions of the virtual in Latour's work is the asymmetric allocation of priority to the virtual over the actual.

Accordingly, the main theoretical challenge for ANT is to incorporate and develop conceptual vocabularies to grasp the virtual processes, capacities and tendencies that subsist in concrete actual assemblages. Speaking of assemblages, and not just of actor-networks, is already a first step in this direction, as this Deleuzian notion aims precisely to account for the concurrence of virtual processes and actual entities. But the larger challenge is enriching ANT with a differentiated vocabulary to account for different virtual forms and processes co-constituting actual assemblages.¹ I shall argue that the concepts of affect (Deleuze and Guattari, 1987), duration (Deleuze, 1988) and sense (Deleuze, 1990) are of key importance to account for, respectively, the potentiality, becoming and differentiation of actual assemblages, while never equating the virtual to an exterior force that determines and shape the actual. I can provide here only a brief sketch of how these notions can complement key theoretical problems in ANT, but this should suffice to make the latter point clear, before moving on to how Luhmann's theory of communication describes virtual processes of sense-making.

First, the notion of affect understood as a pre-individual intensity orthogonal to entities and actants offers a necessary complement to ANT's notion of attachment (Gomart

and Hennion, 1999; Latour, 1999a). Attachments, suggests Hennion (2007), are what hold us together, connected to the world, to the things we like and care for, to relevant others, etc. The key analytical gain this notion brings is overcoming distinctions between active subjects and passive objects. Attachments operate in the form of *faire faire*, of making do, of making happen that one loves a compositor or a drug. Yet attachments appear in ANT as always already existent, 'what gets experienced' (Hennion, 2010: 3). Callon, Méadel and Rabeharisoa (2002), for example, point to the complicated socio-technical arrangements needed to cut attachments to things and to transform them into sellable market goods. Latour (1999a), for his part, criticizes the assumption underlying the cult of individual autonomy that it would be possible to free oneself from all attachments, while suggesting a different principle of morality based on a distinction between good and generative attachments from malicious ones. ANT, however, does not discuss the ontological capacities that enable entities to create new attachments. It is here where the notion of affect becomes inescapable. This notion refers to the non-actualized capacities of bodies, things and entities to affect or be affected. Similar to affordances (Gibson, 1977), affects do not designate possibilities already inscribed in the real or in the actual state of an object, but they result from the imprevisible encounter between two or more entities. The affect concept describes a capacity, a *potentia* and thus a virtual element in the constitution of bodies or assemblages that remains a blind spot for ANT. It is indirectly recognized by Hennion (2010) when he argues that attachments require one to put oneself in the condition of being actively affected by something.² But affect and attachment are not identical and their difference is precisely the boundary between the actual and the virtual.

Considering such non-actualized capacities implies also attending to the becomings of entities and assemblages; processes that involve temporal duration (Deleuze, 1988). ANT's ontology, however, conceives only instants, events, or punctual encounters between heterogeneous entities and forces. ANT rightly does not conceive time as an independent and objective physical coordinate or as a transcendental schema shaping subjective perceptions of the world, but rather as an effect from the way entities materially relate to each other: '[t]ime does not pass. Times are what is at stake between forces' (Latour 1988: 165). Consequently, entities do not endure or last in time, for every transformation in relationships, associations and alliances implies a transformation of their own reality. Hence, to the extent that ANT concedes that entities perish at every instant, it cannot but ignore notions of flux, process, becoming or duration (cf. Harman 2009: 105). Latour is the first to recognize this problem: 'what is obvious in *Irreductions*, which is a big weakness of actualism and what the concept of network never managed to capture, is the notion of trajectory' (Latour et al., 2011: 48). Indeed, when ANT's empirical commitment prevails over ontological considerations, it is busy describing the trajectories of scientific facts (Latour, 1987), of Portuguese ships (Law, 1986), of drinking water pumps (de Laet and Mol, 2000), of buildings (Latour and Yaneva, 2008), and so on. But, strictly speaking, such spatio-temporal trajectories do not imply an ontological duration or becoming of the entity at stake. In order to produce a more realistic and thus accurate description of assemblages as in a constant process of becoming, it is critical to recognize the virtual coexistence of the past with the always changing present. Thus, if the notion of affect is particularly helpful to explain entities and assemblages'

capacities and potentialities regarding future presents, the notion of duration (Deleuze, 1988) is particularly helpful to understand how the past coexists with the present, so that transformations can be grasped as continuous, and not as discontinuous cuts involving different entities as it follows from ANT. Virtual duration makes it possible for entities and assemblages to not just either endure or perish, to remain immutable or be something else, but to exist as temporal entities and assemblages.

Lastly, and more briefly, since I will dwell on this in the next section, ANT does not adequately account for the virtual process of sense and sense-making. Certainly, language plays a central role in ANT's material semiotics. But, as the notions of translation (Callon, 1986) and performativity (Callon, 2006) suggest, ANT's interest in language is mostly limited to the role played by statements and spokespersons in the assemblage of actor-networks. Latour (1999b), for example, concludes his discussion about how science and its language transform the world, by recalling Whitehead's notion of proposition. These are not just linguistic statements, but articulations of words and things; events in which language and the world are connected and transformed in a certain manner. However, such a notion does not account for a key emergent phenomenon that characterizes articulations of words and things, namely, sense. According to Deleuze (1990), sense unfolds in the interstices between materiality and language. Sense is not contained in the proposition, in what is said, but always presumed, displaced, elsewhere, opening up a virtual plane that exceeds the actual, while *subsisting* in it. The thesis that I explore in the next two sections is that it is through sense-making processes that entities and assemblages differ qualitatively. The possibility of becoming economic, politic, artistic, touristic, legal, and so on is not inscribed in any actual socio-technical arrangements, but depends on the actualization of sense-making problems.

Certainly, each of the forms of the virtual mentioned above merits a much more detailed discussion. My only aim here is to make evident that ANT battles one asymmetric understanding of the social, which assumes the ontological priority of the virtual, with yet another asymmetry, which does not just give priority to the actual, but also denies the virtual. The general challenge is thus to develop conceptual repertoires to symmetrically account for the empirical entanglement of actual assemblages and virtual capacities, tendencies, processes. In this context, Luhmann's theory of communication (1997; 2012) comes in very handy, as it precisely seeks to account for the entanglement of actual utterances with a specific virtual process: sense-making.

Communication: sense-making and communicative linkages

In a lecture given by Latour in 2009 at the Department of Communication of the University of Montreal, one of the academics present asked him if he considered it a just criticism that there was a certain reluctance in his work to address issues related to language and communication. Latour replied somewhat hesitantly: 'I don't take ... communication ... at all ... seriously.' Immediately, however, he corrected himself: 'No, that's probably a bad answer because I remember now we are in a Communication Department' – the audience laughs. 'I mean, I rephrase it in many other terms: inscriptions, networks, et cetera. But I don't use communication as a word. That's true.'³ This response reflects very well the status of communication in ANT. It is as if, suddenly, ANT stopped applying the principle of

irreduction equally to all objects. Communication, it seems, is indeed reducible, comparable to other things.⁴

Luhmann's sociology (1995; 1997; 2012) can be described as an exceptional case of the application of the principle of irreduction to communication. All of his work is aimed at understanding communication as an emergent process that unfolds self-referentially and autonomous from the intentions of human entities, as well as the forces, properties and affordances of non-human entities. His proposal is thus very close to that of Serres (1996), who describes communication processes as the passage of information between various points that certainly end up transforming, translating and transfiguring the processes, but which neither send nor receive communications (cf. Wolfe, 2007). Luhmann, as we shall see, is more radical. Serres describes communication from the perspective of the interlocutors. For them, communication constitutes a third party, which, just like a parasite (Serres, 2007), is dependent on the interlocutors, but develops a life of its own. Luhmann (1995; 1997; 2012), meanwhile, describes communication as autonomous sequences of sense-making. Instead of showing how communication emerges and coexists in a heterogeneous ecology, he focuses exclusively on the abstract forms that structure the life of this parasite called communication, to the point of asserting that the social consists solely of communications. A common criticism levelled at Luhmann is that his theory imagines a 'society without men' [*sic*] (see Izuzquiza, 1990), without humans and nonhumans, one should rather say. But such an assessment is too simplistic. Just as ANT does, so does Luhmann reject descriptions that equate the social with human entities and their actions, intentions, beliefs or representations. Instead, he emphasizes precisely those intermediate processes linking humans, words, communication technologies and objects but without therefore assuming that any of them are social entities. The specific associations that Luhmann is interested in describing in an irreductive way are those based on sense-making. Sense here is not understood as a quality of the world or of the spirit, neither actual nor ideal, but something that emerges, or, as Deleuze says, subsists in communication.

In order to understand how sense appears in communication, one should first consider Luhmann's description of a communication as involving three selections: the selection of an information, the selection of an utterance and the selection of an understanding. This definition makes it clear that communication is not based on any form of transmission of a message or content from a sender to a receiver. Communication does not travel through space and time, as the transmission metaphor suggests, but is 'an event tied to a moment in time, which as soon as it appears, it vanishes' (Luhmann, 1997: 71, my translation). The key event, explains Luhmann, is the selection of an understanding. This occurs whenever a difference between information and an utterance is stated. Thus, a grimace, the eruption of a volcano or a car alarm are in this sense understood whenever they are observed as an utterance expressing information. Communication thus happens retroactively, in the moment of understanding.

According to this first definition, communication involves actual operations of selection that can be well studied with ANT. Indeed, such selections do not occur in an immaterial mathematical space, as often imagined mobilizing Spencer Brown (1994). A scientific experiment can be, for example, understood as a quite sophisticated procedure of manufacturing information, just as the textual work of writing and citing scientific

papers can be understood as a procedure for crafting utterances (cf. Knorr-Cetina, 1981; Latour, 1987). ANT thus makes evident that communicative selections are not abstract operations, but concrete socio-material practices that take time and effort to complete. This is also evident in the selection of understandings, as is evidenced by studies of distributed cognition (Gieri and Moffat, 2003; Hutchins, 1995) and in *oligoptics* (Latour and Hermant, 1998), such as healthcare call centres, where the production of correct understandings through socio-technical systems, codification books, careful listening, etc. can result in life or death (cf. López and Domènech, 2008).

But Luhmann's key insight is that communication, while requiring these selections to be performed, cannot be reduced to them. Even in its most compact form, a communication always involves the unity or synthesis of these selections. And it is through such synthesis that a communication makes sense. The synthesis Luhmann imagines resembles less a trialectical one, a sort of transcendental unity of the three selections at stake, than what Deleuze (1990) calls a disjunctive synthesis. This involves bringing together fully divergent elements (information, utterances, understandings) by virtue of the difference passing between them: 'A disjunctive synthesis is not a reduction through abstraction but a transforming addition that connects by creating differences' (Williams, 2008: 27). Such differences are not synthesized by a subject, such as the sender or receiver of a message. It is rather in the communication process itself that a difference between what is actually signaled by a communication and a virtual horizon of non-actualized possibilities is marked. Indeed, as Williams further explains, disjunctive syntheses 'take place on two irreducible sides of reality: on sense and expression, virtual and actual, surface and depth' (2008: 27). Similarly, Luhmann understands sense as a virtual plane or medium, which appears in communication 'as a surplus of references to other possibilities of experience and action' (Luhmann, 1995: 60). Sense thus opens up a virtual world for communication, a world that does not encompass a collection of pre-existing things, but is rather an unlimited and unpredictable reservoir of lines of communication.

Each communication is thus an actual operation that occurs in the virtual medium of sense. Now, in order to produce a communicative linkage (or with Deleuze, in order for communication to become a line of flight), a fourth selection must take place: that of an acceptance or rejection of the actual-virtual fabric of sense being made or, rather, synthesized in communication. Sharply, Luhmann observes that communicative linkages not only occur in the case of acceptance of a previous communication and that also rejections build a communicative linkages, for what matters is the recursive process by which a new communication refers to a previous one.⁵ Conflicts and disputes are, in fact, instances in which communication shows its potential to link completely disparate entities.

Accordingly, the social is not understood here as 'following someone, then enrolling and allying, and, lastly, having something in common' (Latour, 2005: 6). The etymological meaning of communication as making common is, for Luhmann, an old-European burden that should be overcome. Communication linkages do not require so much of a retinue or allies, but simply interlocutors, be they best partners or bitter enemies. Accordingly, the only case in which a communication linkage does not occur is when the actual-virtual fabric of sense woven by a communication is simply ignored, forgotten or excluded in such a way that no communication reacts to it. While in face-to-face interactions, this is more

unlikely to occur, except perhaps in large groups, this is indeed very common in more mediatized communicative spaces – consider just how unlikely it is that scholars who have read this article at least this far, will refer to it in future articles, accepting or rejecting some of its claims.

Differentiations: attractors and problems

In a sense, Luhmann's sociological theory revolves around a simple problem that stems from the improbability of communicative linkages, namely, how does communication ensure that another communication reacts to it, so that it becomes a highly probable and recursive process? The concepts deployed by Luhmann in his writing (self-reference, self-observation, self-description, autopoiesis, symbolically generalized means of communication, *distinctions directrices*, codes of preference, structures of expectations, operational closure, structural coupling, etc.) aim to describe in detail the various operators and structures that enable and make probable the recursivity of communication. All of these concepts can be summarized in turn in one fundamental answer: differentiation. Unlike most sociological theories, the crux of the matter for Luhmann is not what holds things, in this case, communications together, but what keeps them apart.

Luhmann's (1995; 2012) more general and well-known answer to this question is that communication processes form self-referential systems: interactional, organizational and functional ones. More implicitly, his own theory offers a different, much more interesting answer: the stabilization of communication via its differentiation is made possible by what I shall call *attractors*, i.e. singularities that orientate the operation of a system (DeLanda 2002). There are of course very general types of attractors stabilizing communication processes. First, there are *languages* (Luhmann, 1997: 201–315), not just different tongues, but also what Luhmann calls 'diffusion media'. Thus, body and spoken languages, which require co-presentness, are complemented by written, visual, digital and computer languages, which, given their inscription in materials and technologies, allow a decoupling from co-presentness. Second, communication processes are sorted based on *topics* (Luhmann, 1995: 154ff; 1997: 77ff), which allow discrimination among communications in relation to the information they mobilize and how relevant it is for the current topic. This does not mean that communication processes cannot change the topic or even discuss several topics simultaneously, but simply that the reference to certain topics is necessary to differentiate and probabilize communication. A third type of attractor sustaining differentiations are *persons*, that is, humans from which understandings can be expected although Luhmann accepts the possibility that non-humans appear in communication as persons (1997: 302ff). The differentiation of persons into segments or lineages (1997: 634–62), castes or strata (1997: 707–43) or groups, according to their membership of organizations (1997: 826–47), networks or movements (1997: 847–65), or professional qualifications, is one of the most effective ways to limit and, at the same time, secure communication linkages. Such reference to types or groups of persons allows a clear distinction to be made between those included and those excluded by communication (1997: 618–34) and, thus, between contributions that must be considered and those that do not need to be considered, even if they are relevant for the topic of communication.

Two general observations can already be made. First, languages, topics and persons do not designate actual entities, but rather virtual attractors. They are virtual to the extent that they are implicitly referred to, but not fully manifestable in communication, so that they subsist in actual communication, while maintaining their virtual identity among different sites and situations. Languages, topics and persons do not just offer stable reference points, but they are also attractors, in the sense that they make probable some communicative selections upon others. Topics for example, attract the selection of certain information. The same can be observed regarding a specific language, which attracts certain types of utterance, or regarding persons, which attract also unique understandings.

Second, none of these virtual attractors acts upon or influences communication linkages, which are based on a fourth selection between acceptance and rejection of a communication. Here we find the key element from which Luhmann develops his theory of the functional differentiation of communication. Rather than societal domains, such as economy, politics, art or science, each with its own culture, institutions and spaces,⁶ Luhmann focuses on the economized, politicized, aestheticized or scientified modes in which communication linkages are performed. What is scientific or economic or political is thus the way a communication is linked to another, the value codes and valuation criteria upon which a communication is accepted or rejected; and certainly not the individuals, socio-material networks, institutions directly or indirectly involved in such communication processes.

The differentiation of communication linkages occurs as a result of a different type of virtual attractor: the so-called *problems of reference* (Luhmann, 1997: 332–58). In Luhmann's theory, economic, political or artistic communication linkages are constituted as such depending on whether they realize highly specific and mutually irreducible problems of reference. Thus, when a communication linkage entails the problem of scarcity, communication processes become economized. When what is at stake is rather the problem of producing collectively binding decisions, communication linkages become politicized. And when the problem is rather the suitability of a material form in relation to a concept, we are then dealing with artistic communications. It is important to note that the problems of reference cannot be deduced theoretically and neither should they be conceived as ahistorical. Unlike the secondary or cultural imperatives for the satisfaction of needs (Malinowski, 1944) or the functional prerequisites of the social system (Parsons, 1951), problems of reference are neither pre-existing nor necessary, but rather contingent historical products that arise from the concrete situations of everyday life (Luhmann, 1997).

The historicity of problems of reference can be exemplified by looking at the case of tourism. The rise of a touristic form of communication about the world during the nineteenth century was an answer to the practical problems posed by a new type of situation: that of leisure travel (Fariás, 2008). This new form of mobility required overcoming the historical and practical incompatibility between travel and leisure; two phenomena that, for centuries, had fully separated histories. The travels of pilgrims, traders, medieval chevaliers or upper-class young men on Grand Tours had different intentions than leisure: commerce, politics, education, religion, etc. Thus, while travel represented a form of labour (*travail*), and if we follow the etymology a form of torture, leisure was its

opposite: a licence from the obligations of everyday life. By referring to such problematic incompatibility, tourist communication involved not just making travel and leisure compatible, but even making such a combination attractive. A short look at tourist guidebooks reveals how tourist communication is oriented at presenting the encounter with other places, cultures and languages as something entertaining or at providing recommendations to ease the inconveniences of travelling. Thus, in this incompatibility of travel and leisure, tourist communication finds a reference problem that permits its rise and expansion.

It is also important to notice that reference problems are not 'solved' in communicative processes, but rather constituted, mediated and eventually postponed. The case of economic communication is a good example. This does not simply react to or thematize an objectively existing problem of scarcity (Luhmann, 1982). Communication processes are economized to the extent that communication linkages realize or rather enact scarcity. This is what happens in a transaction; an operation that has a dual relationship with scarcity. While it solves the scarcity of the buyer, it makes the goods or service traded more scarce. Scarcity is thus not an actual problem that can be solved by the transaction, but a virtual problem of reference, which is made present and reproduced in the transaction. Economized communication therefore is not a result of scarcity, but rather both are mutually constitutive. What is economic is thus not a property to be found in any actual entity, rather it emerges as a virtual problem of reference of communication linkages, which, by the way, are made possible by complex socio-material agencements (cf. Caliskan and Callon, 2009). The relationship between virtual problems of reference and actual communications is thus circular. To the extent that such problems provide common reference points, they allow for the redundancy and recursivity of communication. At the same time, they do not exist prior to communications, but are rather constituted by them.

Such reference problems become virtual attractors for differentiated communicative linkages to the extent that they transform the alternative between acceptance or rejection of a communication into highly specific communicative codes with a positive and a negative side. In the case of economy, for example, where the problem of reference involves self-produced scarcity, the general alternative acceptance/rejection is transformed into a much more specific one involving paying/not paying. Luhmann considers that payments are indeed the most basic economic operation, as it even includes payments in savings and investment funds. But even deciding not to pay for something and accepting, at least temporarily, a relative scarcity is considered here as an economic operation. In the case of tourism, it is also possible to observe the historical emergence of a communicative code that distinguishes between figures and landscapes of touring and vacationing (Löfgren, 1999; Urbain, 2003). Both represent touristic operations, although it is only the 'touring' that is explicitly oriented to overcome the incompatibility of leisure and travel (Farías, 2008).

These problem-oriented codes are thus value-laden, as the side representing operative or situational solutions to these reference problems is preferred over the other side. This is particularly evident in the case of communicative linkages that perform or realize the problem of cognitive uncertainty regarding the external world, where 'true' propositions, however they are constructed, tend to appear preferable over 'false' ones. Scientific communication is accordingly not defined by persons or institutions, but by an explicit orientation in

communication processes towards the communicative code true/false (Luhmann, 1990). Thus, even though all communications presuppose the mobilization of some type of knowledge, they are not necessarily scientific. An economic transaction, for example, requires knowledge regarding the qualities of the goods, their past, present and future availability, their price, etc. But economic linkages do not primarily involve making a decision about the truth or falsity of such knowledge, but rather about the realization or not of a transaction via payment. Neither, one could argue, is journalistic communication oriented towards distinguishing between true and false statements. One could of course assume that there is a professional ethics reinforcing the production of true news and that this is often the case, but even more important seems to be the novelty of the information communicated (Luhmann, 2000).

Luhmann's sociology describes the differentiation of communication linkages and forms of sense-making starting from specific virtual problems of reference and value-laden communicative codes. Accordingly, the historical studies he undertakes try to account for the genealogies of highly specific problems of reference and communication forms and how they have historically modelled the economic, political, legal, scientific, religious, etc. These differentiations are not understood as actual properties of concrete entities, but as emergent ways of processing specific and mutually irreducible sense-making problems. In this sense, Luhmann's sociology is in accordance with Deleuze's argument (2004) that the virtual is not an indeterminate and amorphous reserve of forces and tendencies, but instead should be looked at in terms of problems or tensions that generate actual assemblages.

Towards a third principle of symmetry: virtual attractors, actual assemblages

The virtue of Luhmann's perspective is, however, also the source of its biggest flaw: its extreme disregard for the socio-material practices and arrangements that enable communication. While Luhmann's sociology does offer sophisticated and precise conceptual tools to account for the reality and generative capacity of virtual *attractors*, such as problems of reference, it also conforms to an abstract analysis that does not take into account the empirical formation of the actual assemblages through and in which communication occurs. However, rather than choosing between Luhmann's communication theory and ANT, it is crucial to understand that both approaches enact objects that are also distinct (Law and Urry, 2004). On the one hand, ANT makes present socio-material networks and practices that Luhmann's sociology is not really able to distinguish or describe. On the other hand, ANT has difficulty when it comes to doing what communication theory does so well, that is, producing descriptions of the ways the social differentiates. Thus, while ANT stands out in the study of actual assemblages, the sociology of communication shines in the analysis of virtual attractors.

The challenge then is to articulate both empirico-conceptual registers and thus extend the study of associations starting from the new questions arising from Luhmann's sociology of communication. This articulation, however, requires the establishment and monitoring of a principle of symmetry that would question any attribution of priority to either virtual attractors or actual assemblages. It is important to point out that a symmetrical

perspective on the virtual and the actual does not represent an alternative to the principles of symmetry and generalized symmetry, proposed by Bloor (1991) and Callon (1986) respectively, but instead would extend and complement them. Indeed, as ANT outlined quite some time ago, it is not enough to maintain the first principle of symmetry and go on to explain with recourse to the same conceptual repertoires, true and false knowledge, successful and failed innovations, the logic of exchange and of gifts, etc. But, and this is what we can take from Luhmann's sociology, neither is it enough to realize that knowledge, newness, worth, etc. are produced in socio-material, hybrid and heterogeneous assemblages. Complementing this principle of generalized symmetry with a principle of full symmetry, as one can derive from this article, suggests that it is also necessary to show how such actual assemblages intersect with virtual processes, such as the differentiation of communication through problems of reference, and how this criss-cross manoeuvre has performative implications for the formation and maintenance of actual sociomaterial assemblages.

Consider the case of sightseeing-buses (Fariás, 2009; 2010). The key question we need to pose is how these buses perform tourism as a highly differentiated form of enacting reality, and thus how they produce a tourist quality that is attached not just to those individual humans and non-human entities brought together by the bus, but also to the whole situation and mobility experience at stake. Such a question cannot be answered by mobilizing either ANT or Luhmann's communication theory. With Luhmann, as suggested above, we can engage in an exploration of the historical emergence of forms of communication oriented to cope with new reference problems, such as the incompatibility of leisure and travel, and the corresponding value-laden codes that facilitate its reproduction (e.g. orientation towards touring attractions over vacationing). But none of this is sufficient to explain the specific way in which sightseeing buses perform tourism and how that might differ not just from other touring practices, but also from other types of bus-tours. With ANT we rapidly discover that the sightseeing encounter between a site, a tourist and a semiotic marker (MacCannell, 1999) is indeed only the tip of a much larger network connecting travel and hospitality industries, urban renewal programmes, traffic regulations, buses, drivers, microphones, speakers, headphones, and so on. Sightseeing buses are highly heterogeneous assemblages composed of an indefinite number of entities acting together and in a multiplicity of different ways: the sightseeing bus is also a private business, a style of driving, an object of traffic regulations, an employment option for art history students, an educational activity, an actor of memory production, a source of museum visitors, and so on. But while by following sociomaterial networks ANT shows that the bus is much more than touristic, that it is also involved in politics, economics, the arts, education, and so on, we learn nothing about how this heterogeneous imbroglia produces a touristic sense of the sightseeing situation.

A full symmetric approach to sightseeing buses, which simultaneously looks at the actual assemblages and virtual attractors of sightseeing, requires bringing together these two types of approaches. In his post-ANT exploration of differentiation of modernity, Latour makes a similar observation:

The sense of a situation can thus be defined thanks to two types of data: first, the very general data of the [NET] type . . . and, second, something that we have to add to these data

in every case, something that will allow us to define the quality of the activity in question ... The first list is indefinite, as are the entities that can be associated in a network; the second is finite, as are the values that the Moderns have learned to defend. (2013: 42)

Certainly, the challenge is to not just juxtapose these two types of data, but to connect them in such a way that we could understand the co-constitution of actual assemblages and virtual attractors. As we saw in the case of the sightseeing buses, the challenge was to show both, how 'touring', as one of those values Moderns seem to be attached to, is differently enacted in different sightseeing buses, and how the work invested in assembling a sightseeing bus is critically oriented to highly specific reference problems and communicative codes.

Thus, while the classic 'principle of symmetry' requires us to explain with the same analytical means both successful and failed sightseeing experiences, and while the 'principle of generalized symmetry' requires us to describe with the same conceptual repertoires how human and non-human entities partake in the production of such a sightseeing bus, the 'principle of full symmetry', as this article postulates, involves producing unique sets of data which take into account how tourist problems of reference and the socio-material assemblages of sightseeing buses enable and co-determine each other.

Conclusion

Four major arguments have been put forward in this article. The first is that while ANT has challenged and decentred traditional ways of doing sociology, it remains an irredeemably incomplete theory of actual assemblages that needs to be complemented with conceptual vocabularies to grasp virtual processes, forces, capacities. The second is that Luhmann's theory of communication offers precisely one such vocabulary to grasp one particular type of virtual process, namely, that of sense-making. The third is that by taking into account one specific type of virtual attractors of sense-making, what Luhmann calls problems of reference, it is possible to provide a precise description of the emergence of highly differentiated economic, political, artistic, legal, and other qualities of assemblages. Finally, it is suggested that it is necessary to introduce a third principle of symmetry, which could be called full symmetry, and which calls for a symmetrical account of actual assemblages and virtual processes.

I shall conclude by emphasizing that this call for a principle of full symmetry should not be misread as suggesting the need for a theoretical synthesis of actor-network theory and Luhmann's communication theory. Invoking symmetry is precisely necessary to both recognize the insurmountable gap between actual assembling and virtual sense-making, their creative encounter and their constitutive friction, while at the same time assuming that their difference is an empirical problem that cannot be traced *a priori*. More generally, the empirical entanglement of actual assemblages and sense-making covers only one way in which the actual and the virtual are entangled. Beyond this, ANT scholars need to continue developing new conceptual vocabularies to grasp the empirical entanglement of actual assemblages with other virtual processes, potentialities, and becomings.

Notes

1. At least since *Reassembling the Social* (Latour, 2005), the concept of assemblage (in French *agencement*) has become more widespread in ANT literature basically as a synonym for actor-network and collective. Caliskan and Callon (2010), for example, have proposed defining markets as *agencements*, keeping thus the Deleuzian concept untranslated. However, ANT's deployment of this notion tends to differ from the original Deleuzian coining. ANT seems to be interested only in the heterogeneous associations constituting assemblages, in their socio-material, hybrid, actual reality. In Deleuze, however, assemblages are thoroughly constituted by virtual capacities, tendencies and processes. Thus, while ANT increasingly speaks of assemblages, it does not speak of their becomings, lines of flight, territorialization/deterritorialization processes, and so on.
2. Recently, Latour has suggested that entities would exist in a state of expectation towards future encounters and alliances with other entities (Latour et al., 2011: 108ff).
3. See <http://www.youtube.com/watch?v=JXCj5Qij-bM&feature=related>.
4. Here it should be noted that the most recent work of Latour seems to take more seriously what Luhmann calls communication forms, as he has argued that providing a positive description of the modern European ontology requires us to pay attention to different modes of enunciation, of sending out a messenger (ex-nuncio), of producing a mediation and of articulating existence (Latour, 1998). Modes of enunciation

set up what comes next without impinging in the least on what is actually said. Like a musical score, the regime merely indicates the tonality, the key in which one must prepare to play the next part. So this is not about looking for what is underneath the statements, their condition of possibility, or their foundations, but a thing that is light but also decisive: their mode of existence. (Latour, 2011: 309)

5. This capacity of communication to produce linkages regardless of its acceptance or rejection is a result of it taking place on the plane of sense, which remains 'strictly the same for propositions which are opposed from the point of view of quality, quantity, relation, or modality' (Deleuze 1990: 32).
6. Latour (2005: 241; 2009: 263) criticizes Luhmann for proposing a compartmentalized reading of the social and imagining only one type of autonomy, that of the systems. But these criticisms miss the points raised by Luhmann. First, functional systems are not compartmentalized domains (1997: 595–608). Such an interpretation follows from a simplistic interpretation of the concept of a system, but functional systems are ways of observing and communicating about the social and lead to what Luhmann calls the policontextuality of the social, that is, the multiplicity of the real. Second, it is perfectly possible to distinguish between various types of autonomy for the forms of communication. Following Luhmann, Teubner (1988) has proposed a distinction between four different levels of autonomy: self-observation, self-organization, self-production and autopoiesis. Teubner associates this last level with the emergence of theories of reflection, such as legal theories or economic theories. Here, we find an interesting parallel with the importance that Callon attributed to economics: 'the economy does not exist as an economy before the elaboration and implementation of the knowledge, statements and representations which cause it to exist as an object of both knowledge and intervention, in short, as an economy' (2009: 20).

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