Actor Network, Ontic Structural Realism, and the Ontological Status of Actants

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Abstract

In this paper I discuss the ontological status of actants. Researchers have argued that actants are the basic constituting entities of networks in the framework of the actor-network theory (Latour, 2007). I introduce two problems concerning actants that have been highlighted by Collin (2010). The first problem, according to Collin, is that actants cannot simultaneously be constituents and products of a network. The second problem, as Latour suggests, is that if actants are fundamentally propertyless, then it is unclear how they combine into networks.

I suggest that both of the problems Collin ascribes to actants rest on the assumption of a form of object ontology, i.e., the assumption that the ontological basis of reality consists in discrete individual entities. I argue that the solution to this problem consists in the assumption of an ontology of relations and, furthermore, that Ontic Structural Realism (Ladyman & Ross, 2007) is the kind of ontological theory of relations that can solve this problem. While my proposal can be considered as an attempt to solve two problems, it is also an experiment of reconciliation between the analytic and constructivist philosophies of science.

Keywords

Actor network theory, ontic structural realism, relational ontology, actants/actors

Introduction

This paper is an exercise in the ontology of networks. Throughout the text I use the term network consistently within the actor-network theory (ANT) framework presented and discussed by Latour (2007)[1]. The main aim of this paper is to propose a solution to two philosophical problems pointed out by Collin (2010) that concern the ontological status of the basic constituents of networks, i.e., actants (or actors)[2]. The first problem, according to Collin, is that the same actant that participates in the production of a network be produced by the same network. Collin observes that this seems to generate a vicious circle (Collin, 2010, p. 120). Collin formulates the second problem as follows: "How can actants generate the world through their interaction, if they are fundamentally propertyless, beyond their penchant for combining?" (Collin, 2010, p. 137).

The solution I propose for these two problems draws on a theory about the ontology of scientific theories usually labeled as ontic structural realism (OSR) (discussed in detail in Ladyman & Ross, 2007). In short, I argue that the possibility for propertyless actants to constitute a network rests on the abandonment of object ontology in favor of an ontology of only relations. Object ontology refers to the assumption that the world

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[1] Actor-network theory is more a family of approaches than a unified theory or method. It is therefore important to remark that in this paper I only discuss Latour's formulation of the theory as discussed in Latour (2007). My conclusions can be extended and applied to other formulations of ANT as long as they are consistent with Latour's.

[2] The choice of the term "actant" in the text is problematic. It is sometimes avoided in favor of the term "actor." However, the main sources of the discussion in this paper are Collin (2010), Latour (2007), and Harman (2009). While Harman seems to use the terms "actor" and "actant" interchangeably, Latour attempts a distinction. As Latour writes, "*any thing* that does modify a state of affairs by making a difference is an actor—or, if it has no configuration yet, an actant." (Latour, 2007, p. 71). I am going to use this distinction as a default position, unless when directly discussing Collin's claims. In this latter case I use the term actant exclusively since that is the only one used by Collin (I wish to thank the anonymous reviewer for bringing this to my attention).

basically consists of discrete individual objects that have intrinsic properties. Object ontology is a basic intuitive ontological assumption both in scientific and ordinary discourse; however, as others have previously argued, it rests on neither conceptually nor empirically necessary grounds. OSR claims instead that the analysis of actual scientific theories (both in the natural and social sciences) suggests that we should have an ontological commitment to only a universe of relation without *relata*. In other words, external relations are irreducible to intrinsic properties. Relations organize and emerge as patterns; scientific theories track these patterns. The fact that theories imply ontological commitments in discrete entities is just a matter of epistemic clarity. Thus, patterns of relations have the capacity of *constructing* individual entities in the epistemic sense.

Thus, I argue that the problems pointed out by Collin rest on the assumption of object ontology. However, I argue that the employment of OSR can, at the price of little modification for both theories, solve both of Collin's two major troubles concerning ANT.

I start my discussion by introducing some background terminology for ANT and OSR. I continue by proposing that, in light of OSR, the status of actants is not of individual entities but of *structural entities*; that is, actants are themselves patterns of relations without *relata*. In the text I refer to such structural entities as patterns of relations without *relata*.

Finally, I point out some alleged discrepancies between the two theories and argue that these do not constitute a real problem for the project of framing ANT within the context of OSR.

Throughout the text I seek support for my claims by referring to examples of application of ANT to the context of networked learning. Arguably, the complexity of the phenomenon of networked learning gives us a convenient vantage point from which we can clearly understand many important aspects of both ANT and OSR.

Collin's analysis of ANT

The brevity of this paper does not allow me to provide a complete review of ANT or the vast number of ways it has been variously interpreted. Thus, with the help of Collin's analysis (F. Collin, 2010), I briefly analyze a number of claims of Latour's ANT (Latour, 2007) that will be central to my discussion.

In short, ANT is an approach to social theory that was developed from science and technology studies (STS) but which diverges from STS in that it takes social constructivism as an ontological claim, and not only, as is the case in classical STS, an epistemological claim. What exists, i.e. the existence of facts, is ultimately the result of a network of actors. ANT's most characteristic and perhaps most controversial feature is the claim that both human and nonhuman actors play a role in networks and, as such, both participate in the construction of social and scientific facts.

Networks of actors ontologically constitute facts; this seems to be ANT's main claim. As mentioned above, ANT is the result of the ontological turn in STS. This justifies the requirement of some clear-cut ontological grounds from ANT. However, "clear-cut" here does not refer to any kind of foundational ontology, since that would go against the main tenets of constructivism. What is required here is a number of principles that at least partially regulate the existence of networks. Even antirealist ontologies, such as nominalism or instrumentalism, have often been framed by strict logical principles.

The same concern pervades Collin's examination of ANT (Collin, 2010, ch. 6–7). As he states,

> Certain actants only come to exist as result of the activities of a well-established network. The conclusion seems inevitable that those actants could not have contributed to establishing the network in the first place (F. Collin, 2010, p. 117).

Actants seem to constitute the ontological base of networks. Whatever it is that has a role in the production of facts, be it human or nonhuman, is an actant. However, as Collin points out, it is unclear how actants can explain networks and be produced by networks at the same time. Actants cannot be the *explanans* of the establishment of networks *and* at the same time be explained as generated by networks, on pain of circularity. However, Latour seems to be clear that certain actors, such as measurement instruments or chemical formulas, are themselves produced by networks of actors (Latour, 1987, p. 99). Yet, in some cases, they are actors in the same network that generated them. Networked learning provides us with many clear examples of this problem. For instance, as discussed by Fox (2005), the phenomenon of learning communities in networked learning is

produced by a network of human and nonhuman actors. These nonhuman actors include resources such as Massive Open Online Courses (MOOC), virtual educational platforms, or the hardware tools used to implement these platforms. As Fox points out (2005, p. 102), when learning communities are the object of analysis, the actors in the network that produces the learning community are black-boxed. However, we should not consider actors such as virtual platforms as stable discrete entities. The platform is produced itself by a network that involve the learning community. A learning platform is produced in the practice of its application, which is itself a complex network of actors, including users, economical interests, school policies, curricula, and so on. As David Lewis described the empty set in mathematics, the platform without these actors is nothing but "a little speck of sheer nothingness" (Lewis, 1993, p. 9). However, how can the learning platform explain and, at the same time, be explained by the learning community?

This is not only an explanatory problem; it is an ontological problem as well. In Latour's monist ontology, actants are all of the same kind. Yet actants seem to lack any property besides their "penchant for combining" (F. Collin, 2010, p. 137). How can they then generate the world? According to Collin, it is utterly mysterious how actants generate reality "through some kind of bootstrapping process that is essentially beyond explanation" (Collin, 2010, p. 137).

In the next section I introduce a new ontological framework that might provide an answer to these problems.
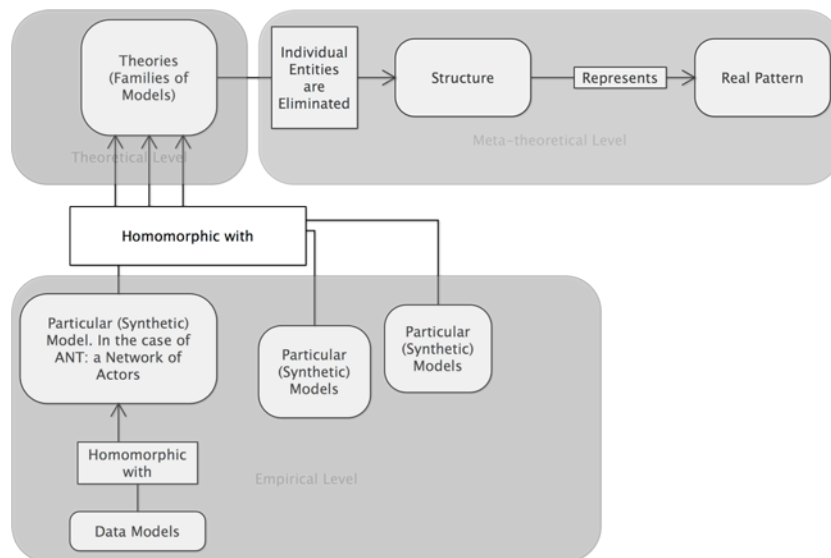
Ontic Structural Realism

In this section I provide a brief review of OSR and explain the aim and the main arguments. I also highlight some of the important points of contact between ANT and OSR.

According to the pessimistic induction argument (Laudan, 1981), which is one of the best-known arguments against scientific realism, the history of science motivates us to not believe in the existence of the entities that appear in scientific theories. Paradigm shifts in disciplines such as physics or psychiatry suggest that the unobservable entities that inhabit our *best* theories, such as electrons or consciousness, are the result of cultural and social negotiation and not of scientific discovery. Thus, the role of theories ought not to be considered as describing reality.

Ontic structural realism holds that, with the exception of the last sentence, all of the above argument is correct. Theoretical entities are constructions, but this does not imply that scientific theories do not describe reality. The structural part of theories is in fact not affected by the pessimistic induction, since structure is retained throughout the paradigm shift (Worrall, 1989). OSR suggests therefore that we should not have an ontological commitment to the individual entities that scientific theories talk about since the content of the terms denoting these entities is destined to change. However, we should hold the structural part of the theories – that is, all the mathematical and logical relations expressed by the theory – as true. One simple way to illustrate this is by imagining a scientific theory in which all theoretical terms referring to individual entities are changed into variables or dummy names such as x. This is not a suggestion that individual terms should be eliminated from our theories, since they play an important epistemic role in theories. However, we should not consider them as referring to any individual entity.

It is not only the criticism against anti-realism that animates OSR. A number of philosophers have suggested that the strongest argument for OSR is that the analysis of micro-physical theories supports the claim that individual entities such as electrons are essentially relational (Esfeld & Lam, 2011; Ladyman & Ross, 2007, ch. 3; Muller, 2011). Thus, according to OSR, successful theories describe reality since they describe the structure of reality. Individual entities populating our descriptions are just constructions that are useful as epistemic bookkeeping devices (Ladyman & Ross, 2007, p. 121).

Fig. 1: Actor-network Theory in an Ontic Structural Realism frame

Therefore, OSR's main ontological claim is that reality is essentially relational[3]. The structural parts of scientific theories track patterns of relations. Hence, OSR argues that structures *represent* real patterns of relations. In this sense, OSR is a form of scientific realism. Patterns of relations exist independently from our knowledge of reality.

OSR proposes an antireductionist ontology. First of all, ontological reductionism implies object ontology. In the case of a learning community, the possibility of reducing the phenomenon of learning to cognitive content implies the existence of human individuals having cognitive content. Patterns are not hierarchically ordered according to complexity or to any other property. Ladyman and Ross (2007, p. 199-204) call this claim the scale relativity of ontology, according to which everything that (really, mind-independently) exists is relative to the scale at which it is measurable. The pattern of relations tracked by the theory of learning communities exists only at the particular scale at which it is measured. Shifting the focus to the cognitive aspects entails a different scale of measurement and thus a different pattern of relations.

Hence, OSR shows a number of interesting similarities with ANT. First of all, it is impossible to draw a sharp ontological distinction between social and natural reality, since the only ontological category is that of relations. Even the elements that are in play in the process of tracking a pattern of relations are themselves the result of a relational pattern, since another scientific theory can describe them. As discussed above in relationship to Fox's analysis of learning communities, the actors in the network that produces networked learning are themselves explainable as networks. We have then another theory, explaining, for instance, the economic aspects of a particular learning community. This theory tracks another pattern of relations.

Both theories stress the relational character of social and natural reality. Latour talks about sociology as "the *tracing of associations*" (Latour, 2007, p. 5, original italicized). Harman (2009) has extensively argued for the relational aspect of Latour's metaphysics. As he states, "things are not real by being less connected with others, but become more real the more they are linked with their allies" (Harman, 2009, p. 80). In the same way, as explained above, OSR claims that theories are *about* real patterns and not about discrete entities. However, the similarity claim between patterns in OSR and networks in ANT is not valid for all aspects of networks and patterns. As we are going to see in the following sections, there are some crucial differences between the two concepts.

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[3] The concept of relations without individual relation bearers, i.e., relation without *relata*, is controversial. A way of making sense of it is rephrasing it as the thesis of the irreducibility of relations to intrinsic properties. Individual entities are necessary if relations supervene on intrinsic properties, since intrinsic properties are necessarily tied to their individual property bearer. However, if relations are irreducible to intrinsic properties, then theories that are ontologically committed to these relations are not ontologically committed to individual entities (Esfeld, 2003; MacBride, 2011).

This brings us to the main point of contact between OSR and ANT: naturalism. Discussing ANT, Latour talks about "empirical metaphysics" (Latour, 2007, p. 51). Both projects are motivated by the aim of naturalizing ontology. That implies that conclusions about ontology are not drawn in light of a priori assumptions but on the basis of empirical evidence. If something exists as *the social* then it will be the result of an empirical investigation.

In Latour's seminal work *Laboratory Life* (Latour & Woolgar, 1979), the track is already set for the project of naturalizing philosophy by substituting "deep-seated ontological commitments" with "empirical evidence" (Latour & Woolgar, 1979, p. 280). Even though Latour seems to be willing to dismiss the largest part of the analytical philosophy of science, we can remark that the advocates of OSR could not agree more with Latour and Woolgar's criticism of a priori philosophy of science. In the frontispiece of Ladyman and Ross' *Every Thing Must Go*, we read the following claim:

> The only kind of metaphysics that can contribute to objective knowledge is one based specifically on contemporary science as it really is, and not on philosophers' a priori intuitions, common sense, or simplifications of science (Ladyman & Ross, 2007, frontispiece).

Just as in ANT and STS, the project of OSR is grounded in empirical evidence. The strongest argument for the ontological claim that everything is relational is that both the natural sciences as well as the social sciences (Dennett, 1991; Kincaid, 2008; Ross & Spurrett, 2004; Ross, 2000, 2008) seem to suggest that the claim is correct.

Actants in the OSR frame – the case of networked learning

Before we consider the ontological status of actors, it is necessary to clarify the relations between patterns within OSR and networks in ANT. Patterns and networks are arguably not the same kind of entity. As represented in Figure 1 above, the framework of OSR consists of data models, synthetic models (the product of the analysis of the data models), and theories (families of synthetic models). Data models are logically embedded in synthetic models, while synthetic models are embedded in theories. A structure is the result of the analysis of a theory. The theory's structure is what is left of the theory when individual entities are eliminated. A structure represents a pattern of relations, which is what there really is.

Networks analyzed in ANT belong to the domain of synthetic models, since not all kinds of products of data analysis are networks. Thus, according to OSR, although networks can locate a pattern, not all patterns are networks in the ANT sense. According to OSR, all synthetic models from all empirical sciences track a pattern.

This does not completely settle the question. In the spirit of the STS roots of ANT, it is possible to interpret Latour so that any kind of data analysis is a network *in disguise*, or that (even stronger claim) at any scale of measurement, the most correct analysis of data is done in agreement with ANT methodology. This could open up a discussion concerning the status of ANT as a meta-theory, that is, a theory that provides an account of how science, at any level, is *produced*. This would imply that networks and patterns are arguably the same kind of entity. However, Latour's critique of philosophy of science as meta-theory makes look this hypothesis implausible. I will therefore assume that networks and patterns are different kinds of entities. This does not imply that ANT and OSR refer to different things when they talk about relational ontology, but only that a) either the models generated within ANT pertain to the area that is described as *theoretical level* in Figure 1, or b) that ANT models are *a priori* committed to a meta-theory very much like OSR (this latter is unpalatable from the point of view of naturalism). We must leave these two possibilities open.

Let us return to Collin's explanatory and ontological problems concerning ANT and consider them in relation to the concrete case of networked learning discussed by Fox (2005). Recall Collin's first problem: actants cannot explain the same network that concurs in producing the actant. The problem with Collin's analysis of the explanatory role of actants in networks is that it implies an ontology of objects. If an object is the explanans of a network, it cannot also have the same network as its own explanans.

If we consider actors as relational entities, however, we can escape this circularity problem. The pattern of relations from which an actor emerges lies at a different scale of measurement than the pattern from which the network emerges. A networked learning community and one of the actors in the network that produces it are

both produced by the same network only if a) we think of networks as consisting of rigid points (nodes) and connections among them, and b) that we can simply isolate one of these objects and analyze it. This is what object ontology implies if applied to networks.

However, if we consider networks as tracking patterns of relations, then the question of the ontological nature of the IT resource used to implement networked learning in a particular learning community is tied to the scale of measurement that is most appropriate for analysis of the ITC resources. From this perspective, if we analyze the network that produces the learning community, then there is no point in discussing how the IT resource is constructed because *there is no (real, mind-independent) IT resource* from the scale of measurement of the whole learning community. Shifting the focus to whichever other actor in the network produces the learning community means assuming yet another scale of measurement, and thus tracking another pattern of relations.

Of course, we might want to consider how that particular learning community concurred together with other actors to establish the reliability of that particular IT resource. Yet again, we are looking at another pattern of relations. At this scale of measurement *there is no (real, mind-independent) learning community*. However, two different patterns cannot result from the same synthetic model (in this case from the same network). This entails that we must be speaking of different networks. As a result, there can be no explanatory circularity.

These two arguments speak for a difference between patterns and networks. It looks therefore like the solution to Collin's first problem require to extend ANT so that it can be embedded in the meta–theoretic framework of OSR.

We can appreciate how the example provided by the ANT frame analysis of networked learning is capable of shedding light on crucial aspects of ANT and OSR. There is no ordering between patterns, and no macro-micro distinction. The shift of scale of measurement from one network to another explaining one of its actants by no means implies a shift downwards in the scale of complexity. Fox's discussion of the concept of community is very helpful in this sense. The actors that concur in producing a network are not more ontologically primitive than the network itself, since a network can be an actor of the network that explains the network's actors. No hierarchy exists among patterns.

The solution to Collin's ontological problem should therefore be stated as follows. From the perspective of a network, actants are propertyless, in that networks consist of only relations. Networks represent patterns. Only for the sake of epistemic simplicity do we attribute dummy identities to actants at this level.

OSR does not imply any commitment to claims of immutability of structure, for example, in the context of social science. Structures are ways of considering theories and theories are *genidentical* entities. This means that they grow, split, merge, and eventually die. Patterns are what really exist, and patterns are just as fluid and complex as we expect reality to be. If a social theory tracks a pattern *via* its structure, then it does not mean that this pattern is immovable since social reality, or social patterns, are not immovable. Nor can a social pattern determine individual choices, due to the scale relativity of ontology. The existence of holistic social structure does not determine the psychological lives of individual members of societies. As we have seen, at the scale of measurement of a community *there are no (real, mind-independent) individual members of the community*.

At this point it is crucial to ask ourselves the following question: would the ANT theorist be willing to trade off a solution for Collin's problem of actants in exchange of a form of realism?

Apparent Discrepancies

ANT inherits the critical stance against philosophical and foundational theories of science from STS (Latour & Woolgar, 1979, p. 280). Latour has criticized analytic philosophy of science on many occasions, especially the idea that scientific rationality, evidence, and prediction lie at the core of science. This criticism should make us skeptical of the possibility of framing ANT within OSR. In the end, if the term *analytic* has any meaning, OSR is a form of analytic theory of science.

However, one main flaw in the STS and ANT criticism of philosophy of science is that the object of criticism looks more like a straw man than a real concurring position. The picture of analytical philosophy of science as resting on a clear-cut scientific rationality; on the symmetry prediction/explanation; on the centrality of inductive evidence; and on the search for laws is, at best, an old relic of logical positivism. OSR is a post-

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200

positivist theory of science with a strong focus on the practices of science, and this implies that many of the STS's criticisms against analytical philosophy of science might not affect OSR.

Thus, in the following section I consider the positions in which ANT and OSR seem to deviate from one another. As I shall argue, much of the apparent disagreement is only apparent.

A first source of discrepancy was actually introduced in the last section and discussed in this section. This discrepancy concerned the status of networks as synthetic or meta-theoretic models. The solution proposed here is to consider ANT models as synthetic models on a par with other scientific models, and to consider OSR as a general ontological framework for scientific theories. This comports some deviation from ANT orthodoxy. This deviation is however arguably a small price to pay in exchange for the solution of Collin's problems. Let us then see which other differences can be observed between OSR and ANT.

Two further discrepancies

The first discrepancy between OSR and ANT regards the concept of practice. According to Collin's analysis of ANT, "[R]eality only exists where practices exist, that is, as far as networks of actants extend" (Collin, 2010, p. 136). It is not so easy to infer from OSR a clear claim concerning practices. As we shall see below, it is arguable that not all existence entails practice within OSR.

Nonetheless, this discrepancy can be solved without any cost for ANT. In fact, it would simply be too strong an anthropocentric claim for ANT to intend the term of practice to only refer to human practice. It would contradict one of the main methodological claims of ANT, i.e., the rejection of the social-natural and human-nonhuman dichotomies. The problem, however, is not completely solved yet.

Since human and nonhuman elements play an evident role in the emergence of theories, and since ontological categories such as human and nonhuman within OSR are only accepted *a posteriori*, it can be argued that even OSR endorses the claim that all scientific theories are constituted by networks of human and nonhuman actors. This is a strong detour from standard OSR that might appear to be too permissive toward social constructivism.

In fact, and without going into too much detail, microphysical phenomena in OSR are understood as only ontologically consisting of their physical relations (Esfeld & Lam, 2011). This implies that the real pattern tracked by some particle physics might be considered in isolation from their technological context. This sounds like an unacceptable concession from ANT. Would the ANT advocate accept a purely information-theoretic explanation of the IT resource involved in the production of a networked learning community? Would that explanation be exhaustive?

There is a possible way out of this problem. We can interpret the scale relativity of ontology in a way that allows us to observe, at some scales of measurement, the kind of pattern that Esfeld and Lam talk about. At this scale of measurement we will not find any *purely physical system* intended as something completely isolated from technological and human influence. Patterns in OSR are intimately connected with data models (the latter of which are embedded in patterns) and experimental set-ups. However, we can claim that the pattern we find at that scale of measurement is simply not a network in the ANT sense. It is important to remark that this is the natural interpretation of the scale relativity and that it by no means prevents the existence of the ANT-type networks. This solution entails an ontological pluralism grounded on the plurality of scientific approaches, all of which are just as correct as long as they are able to track a real pattern. This brings us back to the discussion concerning networks and patterns in the previous section. OSR clearly entails that ANT is not the only possible way of looking at science; rather, it is just one of many. All of these approaches describe a different reality, and all of these realities are equally real.

The second discrepancy concerns the problem of realism. It is intuitively clear that a form of scientific realism such as OSR is not destined to fare particularly well in the company of ANT. As Collin clearly states, it is unclear how we should interpret statements such as "learning communities existed in 1200 BC." We can expect that the realist will try to argue that the statement is in some way true, while the constructivist will try to argue that the same statement is in some way false (since the term "learning community" is produced by theories of learning). How can these two interpretations coexist?

Latour, according to Collin's reconstruction, solves this problem by using a double index to the effect that "learning communities existed in 1200" is false in 1200, while "learning communities existed in 1200" is true in 2013 (F. Collin, 2010, p. 140). Latour seems to claim that for all the time before the development of theories of learning communities, the claim "learning communities existed in 1200" is simply false (F. Collin, 2010, p. 141; Latour, 1987, p. 258).

This discrepancy is simply apparent. The problem completely depends on the assumption of object ontology. If we disregard the entities involved in these statements (such as community), we obtain that the structural part of the theory of learning community applies to patterns of behavior that precede the development of the theory. Thus, even though it is true that the concept of learning community is a product of the late twentieth century, we can still say that the statement "learning communities existed in 1200" is *structurally* true.

Conclusion

In this short paper I have argued that the use of OSR as an ontological framework for ANT implies a number of major rewards at a small price and without distorting ANT's original claims. If ANT is framed within an ontology of only relations, we obtain a clearer and less problematic conception of actant/actor. I have also argued that despite a number of apparently irreconcilable discrepancies, ANT and OSR seem to integrate into one another fairly well.

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202