

## Article

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# Material Parts in Social Structures

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**Abstract:** There has been much debate on whether and how groups of human agents can constitute social structures with causal significance. Both sides in this debate, however, implicitly privilege human individuals over non-human material objects and tend to ignore the possibility that such objects might also play a significant role in social structures. This paper argues that social entities are often composed of *both* human agents and non-human material objects, and that both may make essential contributions to their causal influence. In such cases the causal influence of social structures should be attributed to the emergent causal powers of what I call *socio-technical* entities.

**Keywords:** Causal powers; Critical realism; Distributed cognition; Social structure; Sociomateriality; Socio-technical systems.

## 1 Material Parts in Social Structures

This paper examines the role played by non-human material objects in social structures. Philosophical discussions of structure, agency and the social have overwhelmingly assumed that the crux of social ontology is the relation between the social on the one hand and the contributions of human individuals on the other. These debates seem to suggest that causal significance in the social world can be attributed only to humans or to some structure whose significant properties depend purely on humans and their relations to each other. But this framing, taken for granted by most scholars on both sides, is thoroughly, if unwittingly, anthropocentric: it has ignored the important roles frequently played by non-human material objects in social structures.

While this claim echoes critiques of *the social* by Bruno Latour and his fellow actor-network theorists, that tradition's response is to abandon the idea that

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social structures can be causally significant. This paper will argue, by contrast, that social structure is real and causally important, but that we need to rethink our understanding of it. We need to start thinking of social structure as built from both human and non-human material parts.<sup>1</sup>

This paper will draw on recent work on extended and distributed cognition to identify some of the issues, in particular Edwin Hutchins's account of distributed cognition in the navigation system of a US warship. It then argues that the critical realist theory of social structures as entities with emergent causal powers can be modified productively to encompass such cases, an argument that is illustrated by discussing the causal powers of a string quartet. The closing sections look beyond these specific cases to discuss the distinct but complementary roles of human and non-human objects in materially social structures, and to consider the question of boundaries of social structures: a question that is foregrounded by these ontological extensions.

## 2 Anthropocentrism and Material Intrusions

Debates on social structure are the bread and butter of social ontology. Does it exist? What forms can it take? Is it causally significant and if so, how? But these debates have tended to ignore the non-human material world. Being charitable, we might say that we have abstracted from the influences of ordinary objects, but that would be misleading. Usually the work of social ontologists does not show any evidence that they have even considered whether abstracting from ordinary objects would be justifiable, and this is equally true of the advocates of many different and competing positions. Individualists focus on the causal contributions of human individuals to social events, while advocates of more structural positions have generally linked causation to groups of human individuals constituted into social forms of one kind or another – perhaps societies, families, or organisations, for example. Social ontology is largely enacted as a discourse about human beings and the question of whether higher forms might be produced by their interaction. Even the materiality of human beings themselves is often relegated to the background. The focus is placed instead on communication, language, and intentionality as if the material substrata of such phenomena were of no real significance to social interaction.

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<sup>1</sup> *Structure* has two senses: things may *be* structures or *have* structure (Williams 1976, p. 253–257). The term is used in both ways in discussions of *social* structure, which is one of many reasons the debate on social structure is so confused (Elder-Vass 2010, p. 80–83). This paper aims to minimise such confusion by talking about social *entities* instead, but employs the term social structure to refer back to wider debates.

When ordinary objects do appear, their role is subsidiary. Consider the work of John Searle, a social ontologist who pays far more attention to materiality than most. Searle argues that we live in “a world that consists entirely of physical particles in fields of force” and any explanation of the social must explain how social institutions can exist in such a world (Searle 1995, p. xi). The existence of material objects is an example of what Searle calls a “brute fact”: a fact that exists “independently of any human institutions” (Searle 1995, p. 27). But once we actually enter the realm of the social, brute facts become rather unimportant to Searle; what matters are the institutional facts that are built on top of them (Searle 1995, p. 35). Institutional facts are created, through the use of language, by the collective assignation of status functions to brute facts or already established institutional facts (themselves ultimately founded on brute facts) (Searle 1995, Chapter 2). Institutional facts are profoundly intentional and profoundly linguistic, and everything important in the social world is to be explained in terms of them. Money, for example, is a social construction that depends on assigning status functions to material objects such as cowrie shells or bank notes.<sup>2</sup> Material objects have a role to play here: the bank note in my pocket, for example, is an indicator that the power to purchase has been assigned to me. But even here Searle’s interest in the material object is merely that it provides a means of authenticating a meaning ascribed by humans and their linguistic practices.

Searle is important in this context because he makes explicit what is generally taken for granted by social ontologists: that once we have language, communication and human intentions, these are the things that really matter in the social world. These are the more-or-less uniquely human features, it would seem, that make complex social life possible, and in the context of social ontology the material world is no more than a tool for intentional humans to use – or a constraint, perhaps, on what they can do.

To the extent that this characterisation of social ontology is true, we are guilty of the kind of Enlightenment dualism criticised by Bruno Latour (Latour 1993b) – arguably the most prominent ontologist in the social sciences today, though until recently he resisted this designation (Latour 2005, p. 120, 2013; Latour et al. 2011). Latour argues against the binary division of the social from the natural, and of the human from the material, and against the assumption that only the first term in each of these binary pairs is relevant to understanding social events (e.g. Latour 1993b). Latour, working with Michel Callon, John Law and others, offers us an alternative perspective in the form of actor-network theory. Actor-network theory

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<sup>2</sup> Unless/until, that is, we accept the possibility of what Smith calls “free-floating Y terms” (Smith 2003, p. 19–25).

overcomes these dualisms by treating both sides just the same, for example by ascribing agency equally to humans and to ordinary objects, but it also dispenses with conventional understandings of causality and structure. Events, for Latour and his colleagues, are produced by fleeting influences from temporary nodes (or *assemblages*) of unique, unstable actor-networks operating in a constantly changing maelstrom of forces (Law 2004, p. 42). Both human beings and other kinds of object are merely examples of such nodes, whose influence on any given occasion depends on the wider network momentarily acting through them (Latour 2005, p. 217; Elder-Vass 2015).

Latour's argument has both strengths and weaknesses. He is right, as this paper will argue, to insist that we must restore the attention of social scientists – and by extension, social ontologists – to ordinary objects and the roles that they constantly play in producing social events, and right to see events as profusely multiply determined by situationally contingent mixes of influences (Elder-Vass 2008). But he is wrong, I suggest, in several other respects. He is wrong, first, to deny the uniqueness of human causal powers and thus the *differences* between human beings and ordinary objects, notably when he writes about ordinary objects in terms that suggest they are capable of human-like actions (e.g. Latour 1996, p. 57). We can only make sense of the contributions that ordinary objects make to social events if we recognise that those contributions depend on the particular composition and structure of the objects concerned and that this makes their causal capacities different from those of humans (Mutch 2002, p. 489–490; Elder-Vass 2008, p. 469). He is wrong, second, to efface the causal contributions of social structures or entities, which he systematically seeks to replace with a flat ontology of the social world, replacing all references to structure with individual-level explanations (Latour 2005, p. 107–109; Elder-Vass 2008, p. 463–468).

Most significantly for this paper's argument, he is wrong to deny that there are consistent causal types and repetition. Every individual event, as Latour points out “happens only once, and at one place” (Latour 1993a, p. 162) and is the product of a unique set of diverse causal influences. But this does not mean, as Latour implies, that those causal influences themselves can never be consistent across multiple cases (e.g. Latour 1999, p. 150). Yet entities of the same kind frequently have similar causal effects on different occasions. Rivers often wash mud down to the sea when they flood; ATMs often dispense cash to account holders; people often join the back of a queue when they want to make use of a service. Rivers, then, may be individually unique but nevertheless have causal tendencies that are shared with other rivers, and we could equally well substitute ATMs, queues, or many other types of entity into this statement.

This paper, in other words, and critical realism more generally, is committed to what Sayer calls *moderate essentialism* about both natural and social

entities (Sayer 2000, p. 81–89). This entails grouping entities into kinds which share properties as a result of commonalities in their composition and structure (Elder-Vass 2012, p. 125–126). Objections to essentialism generally take the form of claims that the entities concerned are not identical to each other and that essentialism effaces their differences, but moderate essentialism (indeed most explicit essentialisms) does not make this error. ATMs, for example, need not all be the same in every respect but they all share the capacity (subject to various potentially interfering factors) to dispense cash to account holders, and they do so because of certain structural similarities that they *do* share. It is more controversial to apply this argument to social kinds, but similar issues apply: queues, for example, may vary in many ways, but they all share the capacity to serialise access to resources, and they can do so because the members of the queue understand and enact queuing norms (these issues are discussed in more depth in chapter 7 of Elder-Vass 2012).<sup>3</sup>

Latour proposes a kind of material intrusion into the social, but he is certainly not the only scholar to do so. Indeed he overstates his critique of the Western tradition because many earlier social scientists also ascribe a role to the material. Marx, for example, recognises the role of technology in shaping social possibilities (Marx 1978); Durkheim invokes physical contiguity and population density in cities in his explanation of modern forms of thought and organisation (Durkheim 1984); and Bourdieu sees our *habitus* and thus the influence of the social on the individual as profoundly embodied (Bourdieu 1984). Bourdieu converges here with recent trends in cognitive science, in seeing cognition as embodied: as thoroughly dependent on the materiality of the body (Clark 2010, p. xxvi). More recently several critical realist scholars have also examined the nature of technological objects in a social context (e.g. Faulkner and Runde 2009, Lawson 2010; see Elder-Vass, available from the author for a fuller discussion).

### 3 Extended and Distributed Cognition

Recent debates on cognition have made significant steps towards recognising that human beings interact with ordinary objects in cases where both are parts of a larger system. For the first step, consider Clark and Chalmers's well known paper on extended cognition (Clark and Chalmers 1998). Clark and Chalmers

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<sup>3</sup> Moderate essentialism does not imply that *all* categories of social entity correspond to kinds with common causal powers arising from similar mechanisms. It is always an empirical question whether this is the case (Elder-Vass 2012, p. 127).

compare two imaginary people, Inga and Otto. Inga has a fully functional internal memory, but Otto, suffering from Alzheimers, carries a notebook with him to act as a kind of substitute memory. In cases like Otto's, Clark and Chalmers argue, the notebook is part of the cognitive process and cognition thus takes place, not within Otto as a biological individual, but in a larger system that includes both Otto and his notebook. This is not yet a social entity, as I understand the term, but it is an extended human entity, similar to the concept of a *cyborg* (Haraway 1991, Chapter 8). A cyborg is an artificially enhanced human being, and in mechanical (and optical) terms many of us are already cyborgs, given the role of pacemakers, contact lenses, dental implants, artificial hips and the like in sustaining the functioning of contemporary human beings.

There is considerable debate about whether we should call Otto's notebook, the extended system including both Otto and the notebook, or only Otto alone *cognitive*, but this is not my concern in this paper. Here I am more concerned with the implications for social ontology. What difference would it make to social ontology, if we were to imagine a society populated with cyborgs? Perhaps a social ontology that attends only to the intentional properties of human beings could remain unchanged by cases like artificial hips, but Otto's case is distinctive, given that his enhancement is deeply implicated in intentionality. And Otto's case is not merely an unrealistic thought experiment. While there may not be many Alzheimer's patients using notebooks as a substitute for memory, there are already almost two billion of us using smartphones to enhance our memories, our calculative capacities, and our abilities to communicate with each other (Chalmers 2010, p. ix; eMarketer 2013). Wherever cognition resides in these cases, it is clear that our contemporary intentional and communicative functioning is deeply dependent on our relations with ordinary objects.

There is a second step, however, that brings us closer to the point of this paper, and which emerges from a second, related, tradition of work on cognition: the study of *distributed* cognition. Let me address this through the work of Edwin Hutchins (Hutchins 1995). Hutchins conducted a detailed empirical study of the navigation process on a US warship (prior to the replacement of many traditional navigation systems by GPS sensors). Hutchins argues that the ship's navigation system is a cognitive system, as it performs a cognitive task: it fixes the ship's position on a chart and thus represents its position in space. Although an individual human being actually places the mark on the chart, their ability to do so is utterly dependent on a series of processes. These processes are implemented by: multiple sailors with different roles, a number of instruments for obtaining location data, and indeed the chart itself. Some sailors make observations of the direction of landmarks from the ship, some coordinate those results and communicate them, others plot the outcome on a chart, but none of those roles can

be performed without a range of instruments including alidades, gyrocompasses, telephones, and the chart itself, which acts as a repository of spatial knowledge that is cross-referenced with observational data to obtain the plot (Hutchins 1995, p. 118–128).

In this case, it is the navigation system as a whole that has the capacity to fix the position of the ship on the chart. As Hutchins puts it, “The larger system has cognitive properties very different from those of any individual” (Hutchins 1995, p. 226). Once again the focus of the argument and of subsequent debate has tended to be on the locus of cognition, but once again I propose to look instead at the ontological implications. The navigation system of this ship, I argue, is an entity with a causal power: the power to fix the position of the ship. This power is a collective power, and the navigation staff are parts of the entity that has that power, but they are not the only parts. Both the humans and the artefacts that they employ are essential parts of the entity concerned, in the sense that the system would not have the capacity to fix the ship’s position if they were not present. As Kaidesoja has argued, the navigation system’s capacity to navigate is an *emergent* property that “cannot be explained from a reductionist perspective which ignores the mode of material, social and temporal organization of the components (i.e. interacting people and their cognitive artifacts)” (Kaidesoja 2012, p. 319). It is entirely possible, given the division and deskilling of cognitive labour that has occurred on ships using complex navigation systems like this one, that none of the individuals involved could perform the entire task, even if they had the full set of equipment (Hutchins 1995, p. 133, 154–155). Equally, however, and more germane to my point, even the full set of sailors that makes up the navigation staff could not perform the task without the artefacts. The navigation system, I argue, is a social structure with both human and non-human material parts that has emergent causal powers as a consequence of the way these parts interact within it. While Kaidesoja has made a similar point, he confines his attention to cognitive properties, while this paper proposes that we can generalise the argument to a much wider set of causal powers (Kaidesoja 2012). If this is so then Hutchins has given us a model, and a carefully explained empirical example, of how we could think of social structures, or at least some of them, as depending equally on both human and non-human contributions.

## 4 Social Entities with Causal Powers

Although Hutchins occasionally invokes Latour (e.g Hutchins 1995, p. 62, 132) this paper will argue that his argument is more compatible with a critical realist ontol-

ogy (Elder-Vass 2010; 2012), although existing critical realist accounts require enhancement to accommodate the role of material parts in systems like the one that he describes. Before moving on to that enhancement in the next section, the current section will summarise the key elements of the ontology to be enhanced.

In this perspective, the causal significance of social structure is attributed to the causal powers of social entities. A causal power is an emergent property of a thing or entity: emergent in the non-mysterious sense that it is possessed by entities of a certain type but not by the parts of such wholes when they are not organised into wholes of the type concerned (Elder-Vass 2010, Chapters 2–3). Let me begin with a simple non-social example. A hi-fi speaker is capable of transforming an electrical signal into mechanical vibrations, but the parts of a speaker are not capable of doing so unless they are organised into the form of a speaker. This is therefore a causal power of speakers and not of their parts, even though the power depends on the parts. To be more specific, powers are generated by mechanisms: processes of interaction between the parts of the thing that possesses the power. Such processes can potentially be explained (Bhaskar 1986, p. 61–63). The process in which the parts of speakers interact to enable the speaker as a whole to translate electrical signals into mechanical vibrations, for example, is well known (see, e.g. Institute of Physics n.d.). Any entity which is composed of the sorts of parts required, organised into the appropriate form, will have this causal power, but even parts of the required types will not have the causal power unless they are organised into the appropriate form. Thus we have an emergent but non-mysterious causal power.

Actual causation, however, is more complicated: events are always the product of multiple interacting causal powers (Bhaskar 1986, p. 60; Elder-Vass 2010, p. 47–49). Thus, for example, when a speaker produces sound, at least three factors must come together: a speaker with the causal power to translate electrical signals into mechanical vibration, an electrical current carrying the signal, and an atmosphere capable of transmitting these vibrations to potential listeners. This recognition of the complexity of actual causation, then, makes this a model of cause that accommodates both the uniqueness of individual events, as each event is produced by a unique configuration of causal forces, and an element of consistency and repetition, which arises from the existence of multiple entities of the same type which have one or more causal powers in common and thus a tendency (but only a tendency) to produce similar outcomes.

We may then apply the same model of causality in social ontology, which provides us with a way of making sense of debates about social structure (Elder-Vass 2010, Chapter 4). In this approach, the generalised claims about the causal significance of social structure that we often find in the social sciences and social ontology are replaced by the more carefully specified argument that there are



social entities, of various specific types, that have emergent causal powers over and above those of unorganised human individuals. Although I have speculated that such entities might have non-human material parts<sup>4</sup> (Elder-Vass 2010, p. 157), in practice, like other social ontologists, I have tended to neglect this possibility and analysed social entities as wholes that have people as their parts. We could also think of these as collectives or social groups, though not necessarily groups that are understood as such by their members. For example, organisations are groups of people whose expected contributions to the processes of the organisation are defined by their roles. As a result of interacting in the ways specified in their roles, the group of people that comprise the organisation has causal powers that they would not have if they were not organised in this way (Elder-Vass 2010, Chapter 7). A relay team in athletics, for example, is a simple organisation that has the capacity to carry a baton much faster over a certain distance than the same group of people could do if they were not organised into a relay team.

Organisations are perhaps the easiest case to understand, but there are also other types of social entity with different kinds of causal powers, such as queues, informal interaction groups and the groups I have called norm circles (Elder-Vass 2010, Chapter 6, 2012, Chapter 2). Each norm circle is that group of people that endorses and enforces a particular norm, and collectively they have the power to tend to induce other people (and indeed the members of the group themselves) to comply with the norm concerned. Thus we can replace the rather vague idea that normative institutions are social structures with a causal powers theory that attributes the causal influence behind specific norms to specific social entities. Different kinds of social entity can have different kinds of powers because they are structured by different kinds of relations between the people who are their parts.

Although this argument applies the same model of causality to both social and other kinds of entities and phenomena, there is still at least one distinctive feature of social entities. Ordinary material objects have causal powers that depend on essentially spatial relations between their parts, usually requiring close proximity or contact, but social entities depend at least in part on intentional relations between the people who are parts of the entity (Elder-Vass 2010, p. 200). For a group of singers to form a barbershop quartet, for example, each must understand the expectations that others have about how to behave in such a group and each must intend to conform to those expectations. This is a set of intentional properties of the individuals concerned, but as each of these

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4 My thanks to Tobias Hansson Wahlberg for reminding me of this.

intentions is about how the individual concerned will or should interact with other individuals, they are also *intentional relations* between them. Without these relations there would be no quartet, and so they are essential to the generative mechanism that produces the causal power of the quartet to produce harmonious singing.

This paper does not dispute that there are some social entities that have only people as their parts. If four singers form a barbershop quartet for example, and sing unaccompanied harmonious music together, their collective power to do so is a power of an organisation that has only people as its essential parts (Elder-Vass 2010, p. 153–154). We may also still have different kinds of social entity composed only of people, but with powers that depend on different kinds of relations between the people who are their parts – four people could form a barbershop quartet or a queue, for example, and the resulting powers would differ even if the two entities had exactly the same people as parts. There is nothing anthropocentric about ignoring the contribution of ordinary objects to the causal powers of social structures like these. But what happens once we recognise cases like the navigation system studied by Hutchins? How can we theorise entities that have *both* people and non-human material objects as their parts?

## 5 String Quartets and Socio-Technical Entities

In order to focus more clearly on the ontological issues that this question raises, let us consider a relatively simple case: the causal powers of a string quartet. A competent string quartet has the power to play harmonious multi-part music. In order to do so, it must have certain essential parts: two violinists, two violins, one viola player, one viola, one cellist and one cello. Each part has a role, and when the quartet is playing, each part's role is quite precisely defined by the score for the piece of music being played. The quartet is thus a kind of organisation, but it is one in which the instruments are essential parts as well as the people, and it is an organisation whose power to play harmonious music is emergent: the parts would not have this power, even collectively, if they were not organised in this way. Imagine, for example, four buskers with the appropriate instruments, each playing two or so metres apart from each other along a walkway, but not co-ordinating their playing. Barring an unlikely set of coincidences, as we walked past the buskers we'd experience a horrible cacophony of disharmony, even if each instrument was perfect and each player was a virtuoso.

The string quartet and the navigation system described by Hutchins are examples of what I propose to call *socio-technical entities*.<sup>5</sup> These are entities with powers that depend on both human and non-human material parts and the relations between them. The generative mechanism that produces the power of the navigation system to fix a position on a chart, for example, includes a series of processes in which sailors interact with instruments and processes in which they interact with each other (sometimes using instruments to communicate). The generative mechanism that produces the power of a string quartet to make harmonious music, similarly, depends on a set of processes in which the musicians interact with their instruments and with each other, minutely adjusting their tempo for example to fit with that of the other musicians.

The powers of a navigation system and the powers of a string quartet depend on a mix of both spatial and intentional relations. The execution of an instrument's role in a musical performance depends on how it is manipulated spatially by the musician playing it, but the execution of a musician's role depends both on her spatial relation to the instrument and on her beliefs, knowledge and intentions about what she is doing with her fellow musicians. In a sense the human parts of the quartet act as bridges between intentionality and spatiality, connecting the two through embodied action: muscular contractions and relaxations that translate human intentions into movements and manipulations of other objects. All of these relations and the bridgings between them must be in place (or perhaps we should say *in process*), for harmonious music to be produced.<sup>6</sup>

It was argued above that social entities are marked by the dependence of their powers on intentional relations – they are intentionally articulated – while the powers of ordinary material entities depend purely on spatial relations – they

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5 I prefer *socio-technical* to *sociomaterial* (as used by Orlikowski 2007, for example, and myself in Elder-Vass 2016, p. 145, 164) for two reasons. One is that the latter term now carries somewhat Latourian connotations, whereas the former is linked to a tradition that recognises social structures (Mutch 2013, p. 29; also see Elder-Vass, available from the author). The second is that it can be read as implying that there might be other social entities that are not material, whereas I see all social entities as material. The distinguishing characteristic of socio-technical entities is that they have non-human material parts as well as human parts, whereas other forms of social entity such as queues and barbershop quartets only have human parts, but these are also material. Note that the non-human parts need not be manufactured – even found natural objects are technological objects when they are employed by humans to perform a useful function (Faulkner and Runde 2009).

6 It is also possible that there could be intentional non-human objects such as robots or animals that could translate intentions into the requisite sorts of movement and manipulation. If there were, then we could perhaps have robot string quartets and chimp string quartets, and these would also be socio-technical systems.

are spatially articulated (Elder-Vass 2010, p. 199–200). What is the consequence for this argument when we recognise that socio-technical entities depend on both? One solution would be to see this as a three way distinction: the powers of ordinary objects are spatially articulated, those of social entities are intentionally articulated, and those of socio-technical entities are both. But more careful consideration suggests that at least some social structures that do not have ordinary objects as parts also depend on spatial relations between their human parts.<sup>7</sup> Consider the case of queues: The effectiveness of the queue does not depend only on the intentions of its members but also on them actually positioning themselves appropriately in space. Furthermore, the powers of humans themselves to contribute to structural processes depend on their own internal spatial articulation, and all interaction between humans depends on spatial relations of some sort, including interaction at a distance. Thus it is more plausible to recognise that intentional articulation is not substituted for but *added* to spatial articulation at the level of the social. On this account, intentional articulation remains the mark of the social and socio-technical entities are a sub-type of a broader class of social entities, rather than a third class.

This may be an ambitious argument to build on a brief discussion of a rather trivial form of social structure, but string quartets are far from the only kind of social structure that the argument applies to. Consider, for example, factories, cities, digitally mediated social networks like Facebook and Twitter, and even states.<sup>8</sup> None of these could exercise the causal powers that they do without both people and ordinary objects as interacting parts generating those powers. The argument can even be extended into the most arcane realm of social structure: normative institutions. I have argued that these are produced by the causal powers of groups of people called *norm circles* (Elder-Vass 2010, Chapter 6). But why should we think of norm circles as being composed only of people? Are we not also normatively influenced by books, newspapers, TV and radio programmes, blogs, websites, and the like? Granted, these are always transmission mechanisms for ideas encoded by people, but could those ideas influence us in the absence of these transmission mechanisms? It seems undeniable that these intelligibilia, as Archer calls them, play a crucial role in spreading normative messages (Archer 1988, p. 104).<sup>9</sup> Perhaps, then, norm circles should also be

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<sup>7</sup> A point that I missed in my earlier discussion of these issues (Elder-Vass 2010, p. 199–200).

<sup>8</sup> My thanks to David Copp for suggesting the last example.

<sup>9</sup> Archer is right, I think, to draw attention to the role of intelligibilia in culture, which I neglected in my earlier work on norm circles, but wrong to treat the contents of intelligibilia as a cultural system of ideas that have logical content independently of their realisations in human brains (Archer and Elder-Vass 2012).

theorised as socio-technical entities, with both people and intelligibilia as parts that interact to generate a tendency to conform with the norm concerned.

## 6 Powers and Boundaries

One advantage of this critical realist approach to social causal power is that, unlike the “strikingly nebulous” (López and Scott 2000, p. 1) conceptions of social structure that are commonly employed in the social sciences, it is in principle very precise about the entity that has any given power. That conceptual precision, however, brings with it a practical problem. For any given power, we ought to be able to determine the entity that has it, but how should we decide where the boundaries of that entity lie? Which things are parts of the entity and which are not? While the challenge of identifying entity boundaries arises for other kinds of entities too, it becomes increasingly apparent when we consider the role of material parts in socio-technical structures, because this opens up a new range of questions about which ordinary objects are and are not parts of the structure concerned. It was argued above, for example, that we should regard musical instruments and not just musicians as parts of string quartets, but if that is so, why not also include the score, the music stands, the musicians’ chairs, the concert hall, or even the audience?

To provide the first part of an answer, let me return to the earlier argument. I argued there that the instruments were parts of the string quartet because they were essential elements in the process that generates the power of the quartet to produce harmonious music. Without the instruments, the musicians would be incapable of producing such music and therefore this power is possessed by an entity that includes both the musicians and the instruments. We can apply this argument quite straightforwardly to reject the argument that the score, the music stands, the chairs, the concert hall or the audience are parts of the string quartet, because it is entirely possible for the musicians with their instruments to produce harmonious music without them. The only item on this list that is at all problematic is the musical score, since it is essential that there is some external representation of the roles that each player and instrument will play in a given piece for the musicians to learn their parts and thus for harmony to be achieved. But, although scores may be present and are often actively consulted at the time of a performance, the *necessary* relationship between the score and the performance is diachronic rather than synchronic: the musicians must know how to play their parts, but they could learn this in advance if necessary and then dispense with the scores at the time of the performance. The score contributes causally to the

capacity of the musicians to play their parts, but that is not enough to make it a part of the quartet.

There are other entities, however, that do play a synchronic role in this case. Consider the air in the area around the quartet. Without air to carry the vibrations produced by the strings of the instruments, is there any music? One would have to say not. Does that make the air part of the quartet? I am inclined to say not, and to say instead that the actual event of music being played is one in which multiple causal powers are brought together, including the power of the quartet to play and the power of the air to transmit vibrations. But the distinction between the forces involved in generating a causal power and the forces involved in a case of actual causation does seem to blur at margins like these (Elder-Vass 2007).

A further issue arises when we consider that the organisation we call a string quartet can have multiple different causal powers, and so far we have only focussed on one – the power to produce harmonious music. A string quartet, for example, has the power to accept concert bookings. But although the quartet's power to produce harmonious music is necessarily dependent on the interactions of the musicians with their instruments, its power to accept concert bookings is not. The latter power depends only on the four musicians concerned having some process for jointly committing to bookings. This is a process that need not require any other objects, and certainly does not require the employment of their musical instruments. The instruments, it seems, are parts of the quartet when it is playing a piece of music but not when it is accepting concert bookings.

If this was so, we would have to define the boundaries of the entity differently depending on which of its powers we were concerned with. While this may seem counter-intuitive, it is a potentially valid solution to this problem. A second is to distinguish between the parts of an entity and the *emergence base* of each of its properties, which is “the subset of the entity's parts, the properties of those parts, and the relations between them that the given property depends upon... Different properties of the same entity may... depend upon different mechanisms and different emergence bases” (Elder-Vass 2014, p. 6–7). Applying this solution to the case of the string quartet would make the instruments part of the quartet but not part of the emergence base of its capacity to accept bookings.

## 7 Conclusion

Social ontologists have tended to ignore non-human material objects in their investigations of social structure. Most have seen social structures as composed of, constituted by, or supervenient on groups of human beings, and only human

beings. This paper's first contribution is to show that this view is untenable. Many – perhaps most – social entities are socio-technical entities: they have both human beings and ordinary objects as parts, and their causal influence depends on interactions that involve both kinds of parts.

The urgent need to materialise social ontology, however, could be resolved in many ways, consistent with a variety of alternative ontological approaches. These issues have been raised most prominently by actor-network theorists, who propose to accommodate ordinary objects by denying that social structures have causal powers, and instead advocate a flat ontology with people and objects interacting in ways that differ profusely and unsystematically from case to case. This paper's second contribution is to argue that we do not need to eliminate social structure and systematic causal influence from our social ontology in order to accommodate ordinary objects. Critical realism can already accommodate cases of causal interaction between people, structures and objects as distinct causally powerful entities. But it also enables us to make sense of hitherto untheorized cases where ordinary objects form parts of socio-technical structures.

The most striking difference between these two approaches lies in their treatments of causal types and repetition. For critical realists string quartets, for example, are a causal type with a characteristic set of causal powers. Every performance may be unique, with minor variations in execution and tempo as well as time, place, acoustics, and so on, but we need an approach to causality that can make sense not only of this uniqueness but also of the similarities between different performances. It is not an accident that many string quartets can produce recognisably similar performances of the same piece but rather a product of the shared mechanisms that give them their causal powers, and the same may be true of a vast range of more consequential socio-technical structures, from armies to cities, norm circles and states.

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