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MAKING SENSE OF A MESSY OBJECT: HOW TO USE SOCIAL TOPOLOGY AS AN ANALYTIC TOOL FOR ETHNOGRAPHY OF OBJECTS

ABSTRACT

This theoretical-methodological essay seeks to answer the question, "*How can one make sense of a messy object?*" The denomination "messy" refers to a situation in which the object of ethnographic research is interpretatively complex to such a degree that the ethnographer may become trapped in the attempt to capture all of the various facets of the object at once (Law & Singleton, 2005). We focus on blood as a messy object and study it in the context of a Belgian Blood Establishment, the organization charged with the provision of safe and sufficient amounts of blood for a region. Existing research has dealt with the messiness of blood through epistemological response, casting it in four "blood stories" – the gift relationship, the blood economy, biological citizenship, and blood safety. While these stories have enhanced our understanding of blood, we argue that they are examples of *perspectivalism* (Mol, 2002). Although they do frame blood from various angles, they fail to grasp the entanglement of technological, biomedical, political, and socio-technical aspects of this "bio-object" (Vermeulen et al., 2012). This essay takes a different turn and attempts to mediate the difficulties by formulating an ontological response through careful consideration of the social topology framework (Law & Mol, 2001; Mol & Law, 1994). For every space (Euclidian, network, fluid, and fire), we provide a comprehensive summary of the theory, after which we delineate specific elements from this theory to induce conceptual sensitivity and propose research questions that follow from these elements. In this endeavor, we attempt to highlight the unique value of this framework for the ethnography of objects, as compared to the frameworks that initially gave rise to the theory.

INTRODUCTION

Blood is a "messy object" (Law & Singleton, 2005, p. 333). The denomination "messy" refers to a situation in which the object of ethnographic research is interpretatively complex to such a degree that the ethnographer may become trapped in the attempt to capture all of the various facets of the object at once (Law & Singleton, 2005). We focus on blood as a messy object and study it in the context of a Belgian Blood Establishment, the organization charged with the provision of safe and sufficient amounts of blood for a region. As a "bio-object," blood is characterized by the entanglement of technological, biomedical, political, and socio-technical aspects (Vermeulen, Tamminen, & Webster, 2012). In order to summarize and structure the messiness, social scientists have formulated an *epistemological response* (Law & Singleton, 2005). By casting blood as the subject of *four blood stories*, they highlight the "trans" character of blood – how it simultaneously fits multiple "interpretive repertoires" (Holmberg & Ideland, 2012).

In the most frequently cited story, blood was the object of a gift relationship (Titmuss, 1998, p. 155), in which one person donates blood to the benefit of an undefined other, without demanding direct return. Most Western blood establishments have adopted this idea as one of their core professional beliefs (Folléa, G. et al., 2013; Farrell, 2012), and the blood donor has gradually become the archetypical "altruistic personality" (Goodwin, 2013). The gift relationship still sparks researchers to search for what typically motivates blood donors (Bednall & Bove, 2011; Shehu, Langmaack, Felchle & Clement, 2015) and how blood collection should be organized (Healy, 2000, 2006). In the second story, blood is part of a market (Hagen, 1982; Sheikh, Deleuran & Hoeyer, 2016; Slonim, Wang & Garbarino, 2014). It is the object of a *blood economy*, with a supply side (i.e., donor group) and a receiving end (i.e., patients-recipients), along with intermediary means of production in blood banks, processing facilities, and similar entities known as *blood establishments* (Epstein R.A. in Goodwin, 2013, pp. 49-50). In a third story, blood establishments mediate the relationship between donors and recipients, with blood being a matter of safety and risk governance (Anderson et al., 2009; Davison, Brant, Presanis & Soldan, 2011; Germain, Remis & Delage, 2003; Hoeyer, 2015). Through the mechanism of donor-selection practices pertaining to such safety and risk governance, a *fourth story* comes to light, in which blood is intermeshed with biology and citizenship or, more generally, group membership (Rose, 2001; Rose & Novas, 2004; Valentine, 2005). Given that donors are the archetypical altruistic personality and given that blood makes up part of a person's *bio-identity* (Waldby, Rosengarten, Treloar & Fraser, 2004, p.

1462),[1] the link between group membership and blood incites discussion on the existence of *the right to donate blood* (Franklin, 2007; Martucci, 2010; Valentine, 2005).

This epistemological response to the encounter with messy objects (Law & Singleton, 2005, p. 332) has nevertheless been criticized as leading to perspectivalist accounts (Mol, 2002). Although this response implies recognition and exploration of the numerous possible "perspectives" on the object studied, it never "touches the object." In other words, it does not take the object as the starting point for studying the entanglement of different "interpretive repertoires" (Holmberg & Ideland, 2012, p. 21; Mol, 2002, p. 12). The alternative is thus to formulate a response in *ontological* fashion (Law & Singleton, 2005, p. 334). This implies a necessity "to rethink method in quite radical ways." To this end, Law and Singleton (2005) propose developing models for imagining objects by using the *social topology framework*. Such an approach has also been adopted in other articles written by Law (Law, 2002, 2009), along with Mol (Law & Mol, 1995, 2001; Mol & Law, 1994), who has also written on the topic alone and with others (De Laet & Mol, 2000; Mol, 1999, 2002).

Our essay follows Law and Singleton (2005) in formulating an ontological response to the methodological challenge of using the framework of social topology (Law & Mol, 2001) to grasp the nature of a messy object. The text is built upon a careful consideration of the framework, demonstrating how the various space imaginations may serve to guide an ethnographic study of *messy* objects. For every space (Euclidian, network, fluid, and fire), we provide a comprehensive summary of the theory, after which we delineate specific elements from the theory to induce conceptual sensitivity and propose potential research questions that follow from these elements. We aim to make explicit the analytic implications for other research objects, thereby demonstrating how social topology can be used as an analytic tool that can help researchers know what to observe and which questions to pose.

SOCIAL TOPOLOGY

Following the ontological response to the methodological difficulties encountered when studying messy objects can mean two things (Law & Singleton, 2005, pp. 334-345; Mol, 2002). First, it can mean studying the object through a focus on enactment, as in Annemarie Mol's work *The Body Multiple* (2002). This method presupposes the thorough observation of the actions in which the object is involved, thus making it possible to observe coincidences and/or contradictions between narrative and action, protocol and reality, principle and practice (Mol & Berg, 1994), which help explain the object's

[1] According to Waldby and colleagues (2004), however, the link between blood and bio-identity is less performative than is the case with organs.

ontologies as enacted in practice (Mol, 2002). In our context, following the methodological focus on enactment means following blood from its donation onwards, as well as studying its enactment throughout the processes in which it is involved in a blood establishment. We pursue this line of work elsewhere. In this essay, however, we do not proceed from observation, but from a theoretical exercise, "to work on different models for imagining objects" (Law & Singleton, 2005, p. 334). Using the framework of social topology to this end, we proceed from rethinking *space as given* to consider *space as performance*.

The framework can be related to the spatial turn in social theory or,

> (...) the insight that all spaces (architectural spaces, urban spaces, regions, nation-states, bedrooms, recreation parks, river landscapes, etc.) are always also results of social production: not only in the sense that there are professions that plan and design these spaces, but also in terms of the challenging insight that spaces only become spaces for people inasmuch as they are – again and again and again – produced socially. In other words: the constitution of space is a performative act (Löw, 2016, p. vii).[2]

If space is a performance, a researcher can adopt a space performance to examine a given object in multiple ways and to study its ontologies through an approach highlighting the elements that shape it and that are in turn shaped by the properties of the object. This relates to a subject discussed during the *Ethnography of Objects* sessions.[3] While ethnographers commonly discuss scenes in terms of zooming in or out, there are other ways to think of space. It has more to do with going along than with seeing from above. For example, in contrast to urban planners, who conceive of a city as a plan, people walk around and see houses and public buildings from the street or from the inside of the building; they interact with their environment, lean against the facades, use the back door if the level of acquaintance with the person living in the house allows, or look with curiosity through curtains where their interest is sparked. This multiplicity of potential focuses has informed our endeavor to delineate thinking of spatiality as a special way of ordering our observation of the social. Given that space and the social world are co-constitutive, we can use a specific space-imagination to produce a conceptualization of observations.

In order to break loose from a black-boxed materiality, Mol and Law (2001, 1994) suggest that we extend our views to include a topological sense of space. If we think of space in topology, a wide array of possible spaces emerges from which we may choose. Spaces are made by and shape the conditions

[2] In response to an important comment by Alev Coban, we should explicitly state that the social constructionist background developed by Martina Löw is highly divergent from the epistemological assumptions of Law and Mol.

[3] Credit is due to professors Estrid Sørensen and Jeanette Pols for bringing these ideas to our attention. Nevertheless, the understanding of and attention to the notions of space, place, and time have also benefitted from discussions with Dara Ivanova.

for the objects we study (Law, 2002). Social topology is built on mathematical topology: "a branch of mathematics which explores the character of objects in space." It is based on thinking about spatiality "by asking questions about the continuity of shapes."

> In topology (…) a shape is said to hold its form while it is being squeezed, bent, or stretched out – but only so long as it is not also broken or torn. If it is broken or torn then it changes, it is no longer homeomorphic (Law, 2002, p. 94).

Homeomorphism is thus a form of simultaneous continuity and deformation (either potential or actual). An object moving in a space is homeomorphic as long as it does not break; as long as there is no rupture. In different topologies, however, rupture can have different meanings. Mol and Law (1994) discern regions (i.e., Euclidian space), networks, fluids, and fire space. Importantly, the different spaces should not be seen as either in conflict or separate from one another. Neither should they be conceptualized in any hierarchical interrelationship, even if their presentation in a text does suggest such a hierarchy. These spaces are available simultaneously and, in some cases, it is their interplay that forms our understanding of the social. For this reason, the framework can be used as an analytic frame, with multiple space imaginations informing multiple types of observations and analyses. In the following section, we discuss the theoretical assumptions for each of the spaces and exemplify how each space could guide observations through the formulation of research questions related to our own messy object: blood in a Belgian blood establishment.

EUCLIDIAN SPACE

In modernist Euro-American[4] thinking, we typically refer to only one type of space: regional or Euclidian space. This practice emerges from the idea that "space comes before us (…) it is a neutral container within which our bodies (…) happen to exist" (Law, 2002, p. 96). In this space imagination, objects are homeomorphic only if the boundaries of the object occupy a fixed relative position in three-dimensional space (Law, 2002). Euclidian space guides our thought toward sets of regional differences to discuss (Mol & Law, 1994). The central axis of our analysis shifted to socio-geographical regions (e.g., states, continents, nations, boroughs) – sometimes scaled down to "settings," "social groups," "classes," or other entities. One consequence of this shift, however, is that it forces us to level out intra-regional differences (Mol & Law, 1994).

[4] The phrasing "modernist Euro-American" is used in line with the expositional ends explained by Strathern (1996), who draws a distinction between "twentieth-century Euro-Americans," "late twentieth-century Euro-Americans," and "modern, Euro-Americans" and sometimes does not use an adjective at all. In the interest of consistency, however, we continually use the term *modernist*.

There are three important ways in which the analytical frame of a Euclidian space can be applied to blood. First, scholars have discussed differences between the various national organizations that perform the blood supply, usually through large-scale comparative research (Boenigk, Mews & de Kort, 2015; Healy, 2000, 2006). A second option is to focus on collection sites and study the spatial organization of elements contained within them. For example, Simon Cohn (2016) has recently described the organization and atmosphere in blood collection centers in the United Kingdom's NHSBT,[5] and Zainab Sheikh et al. (2016) have described Danish blood-collection centers. A third focus takes the middle ground. Taking inspiration from urban sociology, a researcher departing from Euclidian space imaginations can ask such questions as:

- *How does the establishment organize itself geographically?*
- *Where does it locate its collection sites to maximize their effectiveness?*
- *How does it ensure the apt distribution of blood products through the location of its storage facilities?*

In our attempt to answer such research questions, we take positivist, measurable, and delineated socio-geographical divisions into account and ask how these divisions influence the provision of blood in a region. This space imagination nevertheless says nothing about the ontology of blood. In this context, blood is (or becomes) something that moves from one region to another, from a body to something or someone else. In some cases, however, it is precisely the connection between the origin of blood and its destination that can help elucidate *what* blood *is*. For example, blood bags can move in a given department of the service and suddenly change from "pure" to "impure." This can happen *if* anything goes wrong with the processing method, although this need not be the case. A bag can become "impure" as it moves along the production chain – thus even if everything goes according to plan – given that it is then embedded within a different network, in which the "safe status" of the bag has yet to be confirmed by another department that tests for pathogens in the donor's test sample. In such cases, we can think about another space imagination, which allows for the incorporation of multiple Euclidian spaces into a single observation or analysis: the space imagination of networks.

NETWORK SPACE

Thinking about the social world in terms of material-semiotic networks was introduced by actor network theory (see Law, 2009, for a discussion on the origins and evolution of ANT). First-generation ANT considers the world in (1) *semiotic relationality*, meaning that objects and actors co-exist and co-create each other within a network formation. These networks are (2) *heterogeneous*, given that actors can be

[5] This refers to the NHS Blood and Transplant Special Health Authority, which is responsible for blood collection on behalf of the UK National Health Service.

of a material, human, natural, ideological, or other nature. Focusing on heterogeneity, ANT draws attention to the world's (3) *materiality*, which is embedded in the social, and to (4) *process and precariousness*, given that all elements must *continuously* fulfill their function in order to keep the network in place. Furthermore, (5) *power* is regarded as an effect of the network configuration. Finally, attention has been paid to (6) *space and scale* or, in other words, "how it is that networks extend themselves and translate distant actors" (Law, 2009, p. 146). Actor network theory studies *how* something happens, "how differences [are] generated in a semiotic relational logic" (Law, 2009, p. 146). A *network object* can thus be understood as a set of objects and actors that are linked through defined relationships. For this reason,

> Proximity has (…) to do with the identity of the semiotic pattern. It is a question of the network elements and the way they hang together. Places with a similar set of elements and similar relations between them are close to one another, and those with different elements or relations are far apart (Mol & Law, 1994, p. 649).

Network objects should be understood as "an effect of stable arrays or networks of relations [that] hold together so long as those relations also hold together and do not change their shape" (Law, 2002, p. 91). There is thus continuity in the specific assemblage of actants in the network. These networks are not fixed in a Euclidian sense, however, as they can move. The combination of shape continuity and regional-space mobility inspired the classic concept of the "immutable mobile" (Latour, 1990).

Before we can formulate research questions, we must consider yet another question, that of where to "cut the network" (Strathern, 1996). In essence, networks are self-expanding. The analysis could thus conceivably go on to incorporate everything. Strathern (1996) suggests two ways of conceptualizing a network: discussing (1) *the perceivable network* and delineating (2) *the analytic hybrid*. Whereas the former is built up from the accounts of respondents in the field – an *emic* conceptualization – the latter is built up from the researcher's perspective – the *etic* conceptualization. It is important to note that referring to a network as analytic does not imply that it is inconceivable to the respondents in the field. It simply refers to a situation in which the researcher sees connections that have not been brought to the researcher's attention by the respondents. Both types of network imaginations may shape the research questions posed.

The perceivable network of a blood establishment is made up of the various different departments that divide the tasks of collection, processing, testing, distribution, and research that are involved in providing sufficient and safe amounts of blood to a region. In encountering such networks, researchers can formulate such questions as:

- *How is the blood establishment organized to succeed in what it delineates as its mission?*
- *How should blood be considered as a product of the network?*
- *How do the processes to which blood is subjected within the establishment's multiple departments influence the ontologies of blood?*
- *How can the network of the establishment's departments produce multiple versions of blood through different types of product, even though the network is the same for each?*

Furthermore, if we adopt the notion of the immutable mobile, we may ask questions including:

- *How do the network configurations of different blood establishments in Europe keep the ontology of blood stable?*
- *When and how do they fail to do so?*
- *How much change to the network configuration is acceptable?*
- *When does it produce a different entity?*

Moreover, the perceivable network can guide our observation to highlight differences between the functional units of the network. This helps to delineate the occasion on which a given "story" is told, given that the meaning of an object – as well as the form in which it is reproduced –changes with the network within which it is thought to be embedded (Latour & Woolgar, 1986). It is therefore necessary to consider the analytic hybrid (Strathern, 1996), in order to avoid *the dangers of going native* (Latour & Woolgar, 1986, pp. 38-39). This means that the adoption of a strictly emic approach to the conceptualization of a field can cause the analysis to neglect concepts that are used as "social phenomena" in themselves. The notion of the analytic hybrid means that it is informed by the researcher's analytic gaze instead of by the emic gaze of the insiders.

To exemplify the search for an analytic hybrid, we refer to a study by Sheikh et al. (2016, p. 107), in which the authors delineate a hybrid in an attempt to

> (…) explain the co-existence of the moral ideal of gifting and legally mandated trade, and to unfold how the tension between the two produces 'silencing' as well as economically ineffective modes of organization.

They propose including legally mandated trade structures alongside the "altruist network" in which blood donors and blood establishments are intuitively cast. In drawing on a network imagination of the analytic hybrid, we may thus ask such questions as:

- *How is blood embedded within a network that moves beyond that delineated by spokespersons in the field of observation?*
- *Which existing actors are left out of the narrative (whether deliberately or non-deliberately)?*
- *Does blood change if we include such actors?*

The aspect that differentiates the analytic hybrid from the perceivable network is that the analytic hybrid moves away from what the researcher is told by the respondents to think of other actors and new networks.

Network objects inform the research questions in important ways. The rigidity and sometimes functionalist assumptions of the network metaphor have nevertheless caused theorists to move beyond it (De Laet & Mol, 2000; Law, 2002, 2009; Mol & Law, 1994). For example, what should one think of instances in which the object stops being immutable? What happens when the object disintegrates? What happens when its elements change? What happens when the nature of their functional connections changes? What happens if some of the most vital elements of the network change? What happens if blood establishments are capable of producing blood products *in vitro* and donors are no longer necessary to achieve or maintain the sufficiency of the blood supply? What happens if new drugs are developed that eliminate the therapeutic use value of blood products? Does this change the nature of blood as a product of the network, or does it remain the product of the network although in a new form? Networks can "break down" when one or more elements ceases to perform their functional tasks or when these tasks are dropped from the network. In these cases, should we discontinue our assessment of the object, given that it is now characterized as a "failed" network? Alternatively, should we shift our understanding of the object by re-imagining it in a new space, in which "failure" makes sense as "adaptation"? Mol and Law (1994) suggest that we should

> make the move as that made by actor-network theory when it analyzed the way in which networks generate and supplant regions. (…) [A]sk whether there are other spaces around, spaces that have topological properties which aren't like those of regions or networks (1994, p. 653).

For this reason, the authors introduced a third topological space to guide our understanding of the social world. This guide was later elaborated upon in Mol's work with De Laet (2000) on the fluid technology of the Zimbabwe Bush Pump.

FLUID SPACE

Although fluid space bears a partial resemblance to the idea of network space, it does not require every element in the network to be and remain stable (Law & Mol, 2001). The object itself may be built up from various elements, and various typifications of the social relationships revolving around it can exist at the same time. Law and Mol (2001, p. 613) conceptualize such an object as a *mutable mobile*.

Fluid objects move in a *fluid spatiality*:

> Although the connections which make a shape invariant in fluid space change shape, they do so gradually and incrementally. (…) [L]inks slowly change their character. From time to time bits, so to speak, fall off. New bits are patched on. (…) There is a sameness, a shape constancy, which does not depend on any particular defining feature or relationship, but rather on the existence of many instances which overlap with one another partially (Law & Mol, 2001, p. 614).

Summarizing the characteristics of fluid spatiality from the literature (De Laet & Mol, 2000; Law, 2002; Law & Mol, 2001; Law & Singleton, 2005; Mol, 2002; Mol & Law, 1994), we delineate six conceptual tools that are helpful in guiding observation and analysis: (1) the mutable mobile, (2) the fluidity of effects, (3) the fluidity of the evaluation of effects, (4) the absence of clear boundaries, (5) a world of mixtures, and (6) the absence of the actor behind the object.

In fluid space, there is no fixed structure for the elements making up the object. Moreover, change is necessary for the object to sustain itself (Law, 2002). The fluid object is variable, in terms of the elements that are incorporated within its constellation, as well as in terms of the elements that are needed (De Laet & Mol, 2000). Some elements may change their function, adopt a function previously performed by another element, or even drop a function. These variations do not cause the object to break down or dissolve. The fluid object constitutes (1) a *mutable mobile* (Law & Mol, 2001).

Fluid objects are also (2) variable in the effects they produce. For the classic example of the Zimbabwe Bush Pump (De Laet & Mol, 2000), variable effect production does not stop at the various degrees of success in the production of water. It can do "(…) something even better: it becomes a source of pure, fresh, *clean* water. And so the Bush Pump turns out to be a technology that provides not just water but also health" (De Laet & Mol, 2000, p. 231; emphasis in original). Moreover, in being supported by the state, it seems to build a connection to the nation, while *also* appearing to depend on and concomitantly build the local community (De Laet & Mol, 2000, p. 237). Given its manifold effects in terms of success, the ways in which the Zimbabwe Bush Pump may fail are obviously manifold as well (De Laet & Mol, 2000).

Effect fluidity presupposes yet another fluidity: (3) the fluidity of effect evaluation. This applies to the quality standards used, as well as to the nature of the relationship between indicator and measured effect (Mol & Law, 1994). Continuing the example of the Bush Pump, the fluidity of quality standards is most prominent when discussing its health-promoting effects (De Laet & Mol, 2000, pp. 242-243). First, an absolute measurement of health standards says little within a context in which such standards are practically unattainable or in which international norms produce negative side effects at the local level. A second consideration is the nature of the relationship between the indicator – in their case, *E.coli* counts

– and the measured standard – in their case, "health." "It is not a direct or a rigid relation; it is fluid. And it depends not only on the *number* of *E.coli*, but also on who(se) they are" (De Laet & Mol, 2000, p. 243; brackets and emphasis in original).

The fluidity of elements (and their function), effects, and the assessment of effects is accompanied by a general (4) lack of clear boundaries in fluid space (Law, 2002). In modernist Euro-American notions of space and objects, dichotomization is a key feature, and the construction of typologies that are both exhaustive and exclusive appears to be the holy grail of the social sciences (Haraway, 1987, 1988). Creating opposition through the definition of boundaries allows the objects separated by the boundaries to "both make sense," thereby blocking "the exit to a world made up of entirely different entities", and thus ignoring the possibility that, "what is opposed may also collaborate" (Mol, 2002, pp. 144-145). Thinking along the lines of fluid space, however, allows us to study objects that do not come with a stable identity and lack "clear-cut boundaries" (De Laet & Mol, 2000, p. 227). In general, this means that fluid objects can be conceived of as being embedded in multiple network-like constellations without one necessarily prevailing over the other in or causing changes to, the ontology of the object (De Laet & Mol, 2000, pp. 228-231).

> The fluidity of the Bush Pump's boundaries does not imply that it is vague or random; that it is everywhere or anything. (…) [T]he Bush Pump's various boundaries define a limited set of configurations. They each, one might say, enact a different Bush Pump. But these different Bush Pumps have in common that they are indeed a pump (De Laet & Mol, 2000, pp. 237-238).

Given the absence of clear boundaries in a fluid topology, it constitutes (5) "a world of mixtures" (Mol & Law, 1994, p. 660). Along with notion of the mutable mobile, this feature is what differentiates fluidity most clearly from the network-space imagination. The objects we discover in fluid space may represent different versions (i.e., multiples) of one object (i.e., a singularity). Nevertheless, these different versions allow the identification of changed elements, without the changes radically altering the fluid object. Change is necessary in a fluid space, but a change can occur only in a piecemeal fashion (Law, 2002).

All of this variability – the multiple singularity of the fluid object – thus (6) obscures which actor is central to its existence. In other words, fluidity exists with regard to who or what is to be considered "the actor behind" the object (e.g., the inventor, the go-to engineer, the expert, the funding agency). Moreover, the fluidity of this actor is regarded as part of the fluid object's success (De Laet & Mol, 2000). The absence of the actor behind the fluid object seems to lend it the advantage of drawing support from everyone.

These six analytically separate characteristics of fluid space can guide a researcher's focus in approaching a messy object, including with regard to the following questions:

- *How is it that some objects are different versions of an original without changing the overarching denomination?*
- *How is it possible for the elements that make up a certain processing method in the production of blood products to vary without the different products resulting from these varying methods being something entirely different?*
- *Why may we cast blood in the European blood supply in a national, regional, and European network at the same time without the network constellation making it entirely different?*
- *How could a fluid method for quality assessment be used in an organization as rigid as a blood establishment?*
- *How could such fluid measurement actually be part of its success?*
- *Is the anonymity of the donor – as the actor behind the blood product – part of the success of the blood establishment?*

Returning to the four blood stories of gift, economy, safety, and group membership, fluidity can help us to interpret, not how and why they become separated, but exactly how they be mixed without causing problems. Fluidity helps us to understand how, in some cases, the interrelationship between all of these versions – blood is something you give; it is something that is paid for by the recipient (or the recipient's insurance); it is something sacred and safe, in addition to having a dangerous and life-threatening potential; it is something that one shares with one's fellow citizens, family – is part of both its success and its failures, without radically changing our basic conception of blood in the blood supply.

To summarize our consideration of fluidity and to construct a bridge to our final space imagination, we have mediated several of the properties of ANT that have been identified as problematic. More specifically, ANT scholarship has been criticized for "effacing invisible work and (…) committing itself to an inappropriately rigid and centered version of relations" (Law & Singleton, 2005, p. 341). Nevertheless, several concerns remain. When should we consider a fluid object of blood as changing from the mixture of its components into something different? When should we regard plasma as something different from the whole blood that was donated at collection? What if *making* it different actually helps to keep the object the same? There must be some "tipping point" at which the elements of the object, the boundaries within which it exists, or the pace at which it changes and adapts lead us to say that the object has *changed* – that a rupture has occurred in the homeomorphism of the fluid object (Law, 2002). Law and Mol (2001) propose using the notion of "rupture" to start formulating a fourth spatiality: *fire space.* The questions posed in *fire space* include:

- *What if rupture causes continuity instead of discontinuity?*
- *What if sudden change and variability are necessary for the object to hold its form?*

FIRE SPACE

Just as fluid objects are similar to yet different from networks, fire objects are related to fluids. In this case, however, instead of gradual change, the problem of difference becomes a question of juxtaposing

multiple ontologically different, enacted versions of an object (Law & Singleton, 2005, p. 342; Mol, 2002). A second way in which fire space moves away from fluidity is through its attempt to mediate the reproach that post-ANT persisted in colonizing "the other" and omitting elements from the picture. As argued by Law and Singleton (2005, pp. 342-343), "An object is a presence. (…) But, whatever the form of its presence, this also implies a set of absences," therefore, "an object is a pattern of presences and absences." A *fire object* is:

> (…) an object that jumps, creatively, destructively and more or less unpredictably, from location to location. It is an object in the form of a dancing and dangerous pattern of discontinuous displacements between locations that are other to (but linked with) each other. Perhaps it flows too, perhaps it is a fluid object. (…) But it is also, or so we believe, much more dynamic, more sporadic, less predictable, and, yes, more discontinuous than is suggested by the metaphor of flow. (…) it lives in and through the juxtaposition of uncontrollable and generative othernesses (Law & Singleton, 2005, p. 347).

Law and Mol (2001, pp. 615-616) propose three suggestions concerning fire space and the objects that reside within it. First, as its basic premise, the continuity of a shape can be considered an effect of the discontinuity in fire space. Second, in fire space, an object is constantly both present and absent, in line with the metaphor of "flickering," or "oscillation." Third, fire space contains a present center, which is related to multiple absent remotes or others. In summary, continuity is derived from (1) discontinuity, (2) the presence and absence of otherness, and (3) a star-like pattern in simultaneous absence and presence (Law & Mol, 2001, p. 616). To clarify this space, Law and Mol refer to the example of a mathematical equation for determining the gust response (commonly experienced as turbulence) of an aircraft wing. In their view, this expression could be regarded as a network that "connects and defines the relations between a set of terms" (Law & Mol, 2001, p. 616). Stating that this object is a network, however, ignores the fact that the enactment of this object is "a complex association between that which is present in the expression and that which is not (…) it loses sight of the irreducible discontinuity between what appears on the paper and what does not" (Law & Mol, 2001, p. 617). The existence of the product of the equation, which is the determination of acceptable gust responses, therefore depends on the absence of the non-acceptable gust response. There is thus

> an oscillation or a flickering between present-presence and absent-presence (…) which is the key to what is distinctive about the enactment of this object, the key to giving it a relatively stable and determinate shape" (Law & Mol, 2001, pp. 617-618).

Few examples of the use of fire space in empirical research exist. In one of the few examples, Anders Blok (2011) uses the space imagination as part of his study on controversies involved in the regulation of the whaling industry. Blok discusses how multiple enactments are used by both the pro-whaling and

anti-whaling camps and how these "ontologically different versions of whales [are] mutually reinforcing their heterogeneous realities" (Blok, 2011, p. 69). In the context of whaling, therefore, the fire object of whales retains its current form of messy controversy-without-change, given the continuous juxtaposition of the whale enactments in the *ethno-epistemic assemblages* of pro-whaling and anti-whaling actors. In blood-supply management, a similar controversy is repeatedly presented as a *nontroversy*. In the organization of blood-donor selection, one party's arguments – evidence-based policy – supersede those of the other party – claims for inclusion – in importance and validity. In such a case of nontroversy, the debate has been won before it takes place. We can nevertheless study such cases using the conceptual and analytic sensitivity to be gained from fire space.

Drawing upon the notion that (1) in fire space, the problem of difference becomes a matter of juxtaposing multiple ontologically different, enacted versions of the object; and that (2) fire space can help us move away from bracketing out the "other," toward conducting an inclusive study of controversy; the framework of fire space allows us to study matters that never seem to change radically, despite constant challenges. More general research questions include:

- *How does discontinuity between multiple versions of the object in fire space produce the continuity of the object in other spaces?*
- *In what way is the object both present and absent, in line with the metaphor of oscillation? In what way is there a version of the object acting as a present center, which is related to multiple absent remotes or others?* In other words:
- *How do the other versions of the fire object build the central object through multiple juxtapositions?*

If we transpose these theoretical questions to the empirical example of safety through donor selection, these questions can be reformulated as follows:

- *How does the discontinuity in what is deemed a safe donor produce the continuity of blood as safe?*
- *In what way is blood both safe and under continuous suspicion of being unsafe?*
- *In what way is the safe donor built up from the juxtaposition of all these versions of a donor who is unsafe?*
- *Why are unsafe donors rigorously classified according to the reasoning behind the deferral, with the group of safe donors making up a seemingly unitary entity?*

CONCLUSION

In this theoretical-methodological essay, we have attempted to follow Law and Singleton in their proposition of the social topology framework as a tool for studying messy objects (2005). We have focused on blood as a messy object and studied it in a Belgian Blood Establishment. Previous studies have dealt with the messiness of blood through an epistemological response, casting it into four "blood stories": the gift relationship, the blood economy, biological citizenship, and blood safety. We have

attempted to transcend these dominant narratives, all of which are examples of what Mol (2002) has termed *perspectivalism*. We argue that grasping the entanglement of technological, biomedical, political, and socio-technical aspects of this "bio-object" (Vermeulen et al., 2012) warrants an ontological response. We use the social topology framework to this end (Law & Mol, 2001; Mol & Law, 1994). For each space (Euclidian, Network, Fluid and Fire), we provide a comprehensive summary of the theory, delineate specific elements from the theory in order to induce conceptual sensitivity and propose research questions that follow from these elements.

In Euclidian space, blood is (or becomes) a black-boxed object that moves from a region to another, from a body to something or someone else. In this space, the entanglement of blood is silenced. Overcoming the black-boxed nature of blood, the space imagination of networks informs a discussion of blood as the product of a network made up of stable relationships between heterogeneous elements. The research questions that follow from such a space imagination contribute to efforts to highlight differences between the functional units of the network and to identify the occasion on which a given "blood story" is told. Network space thus allows us to investigate how the entanglement of technological, biomedical, political, and socio-technical aspects of blood is organized by allocating different elements to different parts of the network. By separating the ontologies of blood, conflict is avoided. The third space imagination, that of fluids, allows us to interpret, not how and why the ontologies of blood as being inspired by the "blood stories" become separated, but exactly *how they can be mixed without causing problems*; how the interrelationship between all of these versions can sometimes be part of both its success and its failures, without radically changing our conception of blood in the blood supply. Fluidity thus allows us to understand situations that have previously been conceptualized as network "breakdowns" or "failures" as "adaptations." Finally, through our consideration of fire space, and its focus on continuity-discontinuity and presence-absence, we demonstrate its utility as a tool for studying controversial issues that are presented as *nontroversies.* In these cases, there is a conflict between the ontologies of blood, although some representations of the object supersede others without explicit discussion. Fire space thus allows us to study entanglement where the contradictions and discussions that such entanglement evokes are effaced.

In presenting a theoretical answer to a methodological issue, we have also presented many questions. These theoretically informed research questions can help to uncover the multiple ontologies of an object through ethnographic research. Our essay builds upon insights from Annemarie Mol, John Law, and Vicky Singleton, with the goal of providing a comprehensive summary of the analytic benefits to be gained from their thought and theory (Law & Mol, 2001; Law & Singleton, 2005). This summary

highlights how inspiration can be taken from their work by transposing their theory for adaptation to other fields of inquiry. Their framework can be used to study objects and empirical contexts other than those that initially gave rise to the conceptualization of the various spaces. It is important to note that the various space imaginations should not be seen as either exclusive or hierarchical. They co-exist. It could even be that a combination is exactly what is needed to help researchers in their endeavor to uncover the ontology of objects. In this regard, the exercise in social topology exemplified in this essay could both help and challenge ethnographers to question their most basic assumptions when observing objects: those concerning the spaces in which these objects can and do reside.

This essay represents a small step in the endeavor to demonstrate how social topology can be used as a tool to guide a researcher's focus and research questions in the ethnographic study of objects. It also demonstrates that not all of the four spaces are suited to studying the *entanglement* of multiple ontologies. When formulating research questions from the Euclidian space imagination, we risk studying blood as a *black-boxed object,* thereby *silencing* the entanglement. Network space moves beyond black-boxing to demonstrate clearly how the multiple ontologies of blood become separated into the functional elements of the network. It nevertheless becomes more difficult to demonstrate how they are mixed and combined, or how they can contradict or supplement one another. In contrast, the post-ANT space imaginations of fluid space and fire space both allow for contradiction and richness in studying objects. In our opinion, this is exactly what we need when attempting to grasp the entanglement of the technological, biomedical, political, and socio-technical aspects of our *bloody* "bio-object" (Vermeulen et al., 2012).

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