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Democracy, Culture and the Modern Philosophy

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Toward a Continuous-Matter Philosophy[1]

Abstract:
In this paper I make a case for a philosophy of continuous matter, in dialogue with object-oriented ontology. A continuous-matter philosophy is one that focuses not on the identity, properties, and relations of discrete, countable objects, but on the nature of extended substances, both in relation to human experience and in terms of their own "inner life." I explore why and under what conditions humans might perceive the world as objects or as continuous substances, and the language that humans use for talking about both. I argue that approaching the world as continua requires the foregrounding of concepts that emphasize the *immanent* (internal to a region of space), the *inclusive* (with contrasting properties coexisting in the same substance), the *gradual* (manifesting differentially at different points), and the *generative* or virtual (involving the constant production of form and new gradients). I suggest that starting philosophy from

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Introduction

Speculative realism is a welcome attempt to think outside the Neo-Kantian assumption that human thought can never get beyond how things appear to humans and grasp how they are "in themselves." Within that broad movement, object-oriented ontology (OOO), as developed by Graham Harman, Timothy Morton, and others, helps us to think about how nonhuman entities of all varieties might have a life of their own, one that exceeds human knowledge and understanding, and engage in relations with each other in which humans may have no role. But can a speculative philosophy that starts from individuated, countable objects and sees the world through that lens really do justice to the "real"? In this paper, I will explore how and why we might grant independent ontological status to continuous, non-individuated kinds of matter such as air, water, rock, or metal that are not collections of objects or parts of objects, and what this might mean for speculative thought.

Object-oriented theorists, by definition, have a "thing ontology" (Steen 2016; Esfeld 2020). Thing ontologies regard the world as fundamentally composed of countable, concrete, individual entities such as atoms, primary substances—or in their case, "objects." A continuous-matter philosophy, by contrast, would be a "stuff ontology," in that it would assert that entities exist that are not countable things. In this paper, I want to try to stretch speculative thought in this direction—not just beyond the human sensorium, but beyond *objects*, and in particular into the realm of continuous matter.

I will not be presenting here a full articulation of a continuous-matter philosophy; instead, I will simply try to "clear the ground" for such a task, guided by the following questions: What role is played in human existence by volumes of matter without clear boundaries or internal structure? How might we also build speculative thought about continuous matter's own "inner life," independent of what it is for us? And might such an exploration have wider implications for speculative thought? In exploring these questions, I will draw materials from the empirical sciences, including physics. Thus, like other speculative realists and new materialists with whose

thinking my own has some affinity, such as Iain Hamilton Grant (2006), Karen Barad (2007), and Jane Bennett (2010), my approach will be to some extent "naturalistic," drawing on natural scientific understandings of reality. However, I will be problematizing object thinking not with the exotic but fashionable physics of quantum mechanics and the very small but the more familiar macroscale physics of materials, substances, and elements. I will also be drawing on other empirical disciplines, including psychology, linguistics, anthropology, and intellectual history.

In the next section, I talk about how continuous-matter physics can serve as an inspiration both for the very idea of a continuous-matter philosophy and for the sort of concepts we might use to develop it. In the following two sections, I focus on objects, first exploring the grammar that we use to talk about them, and the physical, biological, and cultural reasons why human beings might see the world in terms of objects, and then introducing the object-oriented ontology of Harman and Morton. In the following two sections, I turn to continua and the language we use to describe them, whether they appear as materials for human projects or as the surrounding elemental conditions for human and more-than-human life. I suggest that a continuous-substance ontology might be more fundamental to human experience than is often recognized. I then turn to the question of how we might think of continua in themselves, proposing that approaching the world as continua requires the foregrounding of concepts that emphasize the immanent (internal to a region of space), the inclusive (with contrasting properties coexisting in the same substance), the gradual (manifesting differentially at different points) and the generative or virtual (involving the constant production of form and new gradients). I close by suggesting that starting philosophy from continuous matter rather than from objects could have wider implications for speculative thought.

From Physics to Speculation

If speculative thought is to take seriously how human and more-than-human existence are conditioned by taking place within a differentiated and self-differentiating planet (see Clark and Szerszynski 2021), an object-oriented "thing" ontology could be seen as an unpromising place to start. The earth as a whole, moving in the interplanetary void, may qualify as a bounded, self-identical object (a status it achieved through a long process involving accretion, gravitational differentiation, and dissipative earth-system phenomena).

But *within* the extended body of the earth, defined to include its atmosphere, discrete objects separated by a medium and in relation or interaction with each other are arguably the exception rather than the rule. Most of the earth consists of vast, extended volumes of matter. On a smaller scale, even individual objects have continuous matter within them, upon which we might want to reflect without reducing it either to the object of which it is a part or to the status of an individual component.

The term "continuous-matter philosophy" is modeled on "continuous-matter physics," the name for an area of physics that treats matter as if it were not made of atoms and molecules but instead were infinitely divisible (Lautrup 2005). Physicists approach the phenomena exhibited in matter at the macroscopic scale at which we encounter it — the rigidity, elasticity, and plasticity of solid bodies; the flow, viscosity, turbulence, vortices, and surface tension of fluids; gravity, density, pressure, and buoyancy; the conservation of mass, momentum, and energy — not as if matter were made up of individual atoms and molecules, but as if it were a continuous substance. This is "continuous-matter physics."

The epistemology and ontology of this kind of physics can be described in a number of ways. First, continuous-matter physics can be seen as a purely methodological device, a useful and efficient approximation that can be used to describe the behavior of matter at the macroscopic scale where precise molecular structure and processes have only a negligible role. Viewed this way, continuous-matter physics is a limit of statistical physics, when the number of molecules and molecular interactions becomes effectively infinite (Ibid.: 6).

But we can also regard the very possibility of a continuous-matter physics as pointing to something ontologically significant. It is because behavior at the macroscopic scale is compatible with a diverse range of phenomena or ontological entities at the microscopic scale that continuous-matter physics is possible. This suggests that different spatiotemporal scalar levels can operate as more or less isolated "causal domains," which has major philosophical implications for our conceptions of the real. Furthermore, continuous-matter physics involves a very different way of looking at matter. As Lautrup puts it, in this branch of physics, "material particles are taken to be truly infinitesimal and properties are described as smooth, continuous functions of space and time. Continuum physics is therefore a theory of fields" (Ibid.: 9).

Ideas from continuous-matter physics, as we shall see, can provide interesting material for speculation. Once we leave the world

of individuated objects, which are the kind of object they are because of their composition and internal structure, and which can be in different kinds of relation with other objects, much of our conventional philosophical vocabulary — of identity and difference, of essence and accident, of kind and individual, of relation and non-relation — starts to founder. We need to find or develop analogues to such concepts that are appropriate for a continuous-matter philosophy — analogues which may not always follow the same logic as the concepts that we use for objects — and for that, continuous-matter physics concepts such as fields can be very useful. But before we focus on continua and how to think about them, let us first look at what we mean by objects.

Objects

Objects are by definition individuated entities. This typically involves clear spatiotemporal boundaries, but the grammar of how we talk about objects reveals the perhaps more fundamental features of the idea of an object — things like identity and quantification. Thus objects can be counted, can take the definite or indefinite article, can be qualified by terms like "this" or "another." Objects can also take predicates — we can talk about a green "x" and a blue one. Objects typically, but not always, have an inner structure, which contributes to them being the "sort" or "kind" of objects that they are — that they are a tree and not a log, a television and not a computer. This means that if we divide an object of a certain kind, although we may then have two objects, these are not normally two objects belonging to the same class as the original one. Objects also have relations of different sorts with other objects — causal, spatial, functional, intentional, logical relations, and so on. And these relations can be internal — an intrinsic property of the object that helps make the object what it is — or external and accidental.

Findings from psychology can be a useful way in here, especially those exploring human-object perception before it is indelibly shaped by culture and language. Cognitive psychologist Elizabeth Spelke and colleagues (1995) define the four main principles that seem to structure the perception of something as an object in the world. Infants seem initially to apply these in a way that is suitable for the everyday physical objects that they typically encounter — people, cups, toys, dogs — learning how to separate them from their environment, from each other, but also as a particular class of phenomena that are distinct from some other existents that they encounter, especially those that are fluid. The first principle,

which helps to define the boundary and identity of an object, is the principle of *cohesion*: that the parts of an object move together, defining both the boundary of the object and the kind of object it is. The other three principles are more about how objects should behave: the principles of *continuity*, in both space and time (objects do not bilocate, or wink in and out of existence), *solidity* (objects do not pass through each other), and *contact* (objects other than goal-directed agents such as people only affect each other if they touch)—though note that the last three principles can apply not only to objects, but also to amorphous substances like "ground" (Bloom 2000: 97). As children develop and expand their range of experiences, these principles seem to be not so much abandoned as bent and stretched, as the child learns that there are different kinds of object—such as animate and inanimate—to which these principles apply in different ways.

Later we will have reason to re-examine how exactly pre-linguistic infants experience the world. But there are certainly many reasons why human beings might indeed be constituted in a way that primes them to regard the world as made up of "things." After all, we are creatures of a particular kind of realm in the extended body of the earth: the interface zone between its solid and fluid compartments. We do not just inhabit this realm; we are a product of it. Objects at our kind of scale can be seen as parts of the earth's surface that have broken away. Indeed, from a planetary mobilities perspective, motile animals including human beings, as well as the machines that humans use to transport themselves and other things, can be regarded as a special case of discretized solids that the earth generated as a solution to the problem of how to move solid matter around more easily (Haff 2010; Szerszynski 2016).

The nature of our animal bodies also arguably biases us toward objects. Our sheer size is important (Haldane 1928); even the horizontal division between the solid earth as an object and the sky as a largely empty medium is far less clear to insects and other small creatures, for whom the ground as a surface generally dissolves into an entangled volume (Ingold 2011: 119), and for whom even the air can sometimes feel like a viscous enveloping substance. Also, the topology of our bodies—the bodies of motile gut-based heterotrophs (Butterfield 2011)—may prime us to see the world as objects, whether they are motile ones that are above or below us in trophic chains of predator and prey species, or static ones that we can put in our mouths and chew. Plants, with their ability to photosynthesize, are autotrophs, and are thus probably more oriented to the mass nouns of sun and rain and soil (Marder 2013). Even fungi, which like us are

heterotrophs, "eat" not by enveloping but by penetrating solid media with their hyphae. Our motion too can make the world seem more discrete — we encounter things and leave them behind. Our hands are evolved to grip, manipulate, sense and communicate, and help to turn things into objects (Tallis 2003).

But human culture and language also shape object-thinking. According to some, the Western and modern emphasis on things rather than processes, and on individuated objects rather than participatory "dwelling," comes from an emphasis on sight as a way of knowing (Jay 1993; Levin 1993). The very word "object," after all, comes from the Medieval Latin *obiectum,* "a thing put before (the mind or sight)."[2] And sight more than other senses does seem to split subject and object, to create a distance between the two, and to individuate object from object.

However, this might not always have been the case. In classical Greece, apprehending an object's form was not experienced in a Cartesian way, as sense impressions from a silent world being made intelligible by the mind; to experience a *form* was understood as possible because both subject and object always already participated in an ordered physical, moral, and aesthetic cosmos (Dupré 1993: 19). Anthropologist Tim Ingold (2000b) argues that it is not sight per se but a particular culturally learned way of seeing that is to blame for objectification. Robert Romanyshyn (1989) links the rise of this world-orientation to that of linear perspective, whereas Walter Ong (1982: 72) argues that it was the move from oral to literate and particularly alphabetic cultures that transformed the experience of sight, encouraging an atomizing, distancing stance to a world now seen as made up as "carpentered" objects. The English language seems especially oriented toward object-thinking, which suggests that it may not be a coincidence that OOO flourishes particularly in the Anglosphere. However, Ingold insists that a "pre-objective level of perception" remains in some sense as a substrate to object-oriented human experience: "behind the discovery, whether visual or auditory, of a world already made," he insists, "there lies ‹…› a level at which sensory awareness rides on the cusp of the very movement of the world's coming-into-being" (2000a: 254).

I will return later to the idea of a "primordial" non-object focused way of perceiving the world. But first I will look at how object-oriented ontology thinkers talk about objects, focusing on the work of Graham Harman and Timothy Morton.

[2] All etymological derivations in this paper are from https://www.etymonline.com.

Object-Oriented Ontology

Harman defines an object minimally as an entity that "is irreducible both to its components and its effects" (2016: 41). For Harman, objects are not just amorphous "aggregates"; they are more than their components (though their components themselves can be objects, and they themselves can be components in other larger objects — the cosmos is objects "all the way up and down" (Harman 2005:19). But objects, he insists, are also more than their relations and effects — here he is distinguishing himself from the strong relationality of writers such as Bruno Latour (1993) or Karen Barad (2007). In particular, objects "withdraw" from humans — they are more, much more, than how we experience them. The objects that Harman discusses typically behave in ways that conform to Spelke's principles of cohesion, continuity, solidity, and contact; but for Harman — and even more so for Morton — the object is not so much a spatiotemporal entity as a conceptual and metaphysical one. And, more importantly, for Harman the task of speculative thought is to get *beyond* the natural-object perception of human beings — whether as investigated by psychologists like Spelke or by phenomenologists like Maurice Merleau-Ponty and Alphonso Lingis — to enquire about the deep hidden reality of objects.

Harman's project, like those of other speculative realists, is thus broadly anti-Kantian, in the sense that it insists that we can talk about things in the world above and beyond how they appear to us as humans. But in other ways his OOO is an extension of Kant's project. "Speculative realism" as a wider movement takes its name from the argument made by Kant in the *Critique of Pure Reason* (1998) that "speculative reason" can think beyond direct human experience, in the realm of the "supersensible' — as long as it knows its own limits. But in OOO it is not just humans that cannot fully encounter or "know" things in themselves (Harman 2005: 92–93). Objects too are isolated *from each other* — they are "vacuum-sealed" (Ibid.: 2). If humans are fallen, only seeing the world "through a glass darkly" (1 Cor. 13:12), so too the whole cosmos is fallen. Even where objects are made of other objects, they cannot fully know the objects that make them up (Harman 2005: 94).

Corresponding roughly to the distinction between a "substance" and its "relations," Harman distinguishes between the "real" and the "sensual" object. The real object has independent existence, beyond its relations, and has "real qualities," "physical" properties that make it what it is — that make it *this* rather than *that* kind of object. The sensual object, by contrast, is the object as present to a mind

or another object, so is dependent on another, encountering object, and has "sensory qualities," which are contingent on the nature of that perceiving object. Real objects cannot touch or interact with each other directly; neither can sensual objects. But a real object can touch a sensual object.

Harman presents his OOO as resolving some problems with the "new materialism" of writers such as John Law, Annemarie Mol, Karen Barad, and Jane Bennett. I agree with Harman that the new materialist position is often guilty of "duomining" — a combination of "undermining," treating objects as aggregates of their constituent parts (which leaves no room for the emergence of novel properties and powers) and "overmining," reducing objects to their effects and relations (which leaves no space for change or for unactualized powers and potentialities) (Harman 2016: 7–20). I also agree that new materialism often privileges the human as creating multiple realities or collapsing them, and that we need to attend to how objects might relate to or withdraw from each other without human involvement.

But the object-focus of OOO is problematic for any serious treatment of continuous matter — rather like a procrustean mold into which we are forcing the unruly, amorphous material of continuous substance. Harman suggests that we have a stark choice: objects or chaos. He dismisses the idea that we can split the difference between objects and continua through Henri Bergson's concept of the virtual that is "both heterogeneous and continuous," suggesting that this is trying to "have the many and the one simultaneously without paying the price" (Harman 2011: 9). Harman seems to rule out the idea that anything interesting can be said about non-individuated, continuous matter at all (Harman 2016: 19–20).

Morton's (2013) "hyperobjects" are arguably closer to what I am talking about. Like Harman, Morton insists that his hyperobjects are real objects in their own right, real things even if not thought of. And, like Harman, Morton treats all objects as in effect subjects, as encountering each other: he suggests that "all entities whatsoever are interconnected in an interobjective system" (2013: 82). But Morton's hyperobjects are a specific *kind* of object, and one that is designed to stretch our concept of object, to include "things that are massively distributed in time and space relative to humans" (Ibid.: 1).

Morton's hyperobjects vex Spelke's four principles of cohesion, continuity, solidity, and contact to breaking point, leading us much closer to an ontology of continuous matter. Hyperobjects are not just big; they are discontinuous; like global warming, they can manifest in different unconnected places. They occupy a multi-dimensional phase space so we can only see parts at a time. "Hyperobjects seem

to come and go, but this coming and going is a function of our limited human access to them" (Morton 2013: 74). Hyperobjects are "viscous," "sticky'—they breach the principle of contact, we cannot disentangle ourselves from them. They also surround us, like the continuous, elemental media of air and water. However, Morton's concept of "interobjectivity" still implies an absolute rather than graded form of alterity and otherness, so will be of limited help to understand matter that displays various kinds of continuity. And though the idea of the hyperobject might help us think about relations across boundaries between different material volumes, what about relations *within* continuous matter? How can we talk about the material world in ways that do not assume either a structured object with internal coherence, or multiple objects in relation? In the next section I will shift focus from objects to continua, looking at the language we use to talk about continua in general—words such as substance, material, element and medium.

Continua

In this section I will explore two main modes in which continua enter human experience—as material for human projects, and as a background, environing condition of our planetary existence. But let us start by clarifying what we mean by calling these substances "continua." The word "continuous," meaning "joined" or "uninterrupted" is related to "contain," from the Latin *continuus*, literally "to hang together." Part of this continuity is about a lack of an external boundary: continuous media might be very big in comparison to the human scale, like the vast compartments of the earth system. Continua of any size might also lack a clear boundary, like the top of the atmosphere or the edge of a cloud.

But the continuity of continua also refers to the lack of *inner* boundaries—of the "ruptures" implied by the word "inter-ruption." This is how "continuous" is being used in "continuous-matter physics." Continua are amorphous, without form—or are at least treated as such—so that even small or bounded entities can thus be regarded as continuous matter. Generally, this meaning of "continuous" might lead us to focus on homogeneous substances, in a single phase of matter (solid, liquid, or gas), perhaps chemically diverse but nevertheless mixed down to the molecular level. Of these, some might be fluid, and when observed on human timescales lack any stable internal structure or boundaries; others might be solid—volumes of rock or ice for example—but their amorphousness makes them similarly unamenable to object-thinking.

But continua might also have inner structure. They might be "colloids": substances (mist, foam, sand, gel) that appear broadly homogeneous at one spatial scale, but at a smaller mesoscale have a complex topological structure usually involving matter in different phases (Szerszynski forthcoming). Such colloids are not clearly bounded and structured objects; but neither are they mere collections or assemblages, since as a mass they have emergent macroscale properties (Ostwald 1917). Metals, though not strictly colloids, have a mesoscale structure of crystals. Other things we think of as "stuff" might have macroscale heterogeneity but lack a regular or repeated internal structure (Prasada et al. 2002). Even matter that has a clear compositional structure such as flesh (made out of organs and cells) or a crowd (made out of people) might also be treated as continuous in some circumstances.

How do we talk about these? We saw above that the language we use for objects involves identity, quantification, predication, and a certain logic of relations. The language we use about continuous matter is different. For a start, with continua, people of all linguistic cultures typically use not *count* nouns but *mass* nouns, like "water," "air," "rock," "sand," "metal," which behave very differently. One might generalize by saying that where we *count* objects, we *measure* continua. Mass nouns cannot take the indefinite article ("a" or "an") or a bare number; if we want to express quantity we have to add a "classifier" or "unitizer"—we say not "two waters" but "two *cups of* water" With mass nouns, identity and alterity also work differently: to express difference we say not "another water" but "another *cup of* water," or point to the continuum's properties ("fresh water" versus "salty water"). Mass nouns are also typically less tied to inner structure. In fact, mass nouns—especially the ones we are concerned with here, which refer to continuous matter—are often "nonatomic," "homomerous" or "divisive" in their reference: as Pelletier (2010: 124) puts it, "[m]ass terms ‹…› permit something that the mass term is true of to be arbitrarily subdivided and the term to be true of these parts as well"; if we take a portion of mud and divide it, we are left with two portions of mud.

We sometimes call continua "substances." "*Substance"* is of course a term freighted with philosophical meaning; for any realist philosophy, substances are the fundamental things that underlie reality—substances literally "stand under" the phenomenal world. The pre-Socratics saw substance (*ousia*), as the stuff out of which things are made—whether water (Thales), or atoms (Democritus). But for the Aristotle of the *Categories* (1963), the primary, fundamental substances are particular concrete and individual objects, to which

predicates such as kind (the secondary substance of universals), how many, and so on, can be attached. In Aristotle's later writings such as the *Metaphysics* (1956), substances are still objects, but now understood as a combination of matter and form, emphasizing the idea that primary substances are not amorphous. Harman with his "thing" ontology in many ways continues the Aristotelian tradition of seeing objects as the primary substances. In this view, objects can be made of other objects; but mere aggregates of objects that do not themselves have the status of an object — or the formless matter out of which objects are made — are not substances in this sense.

I suggest that we typically relate to continua in one of two ways. First, continua enter into our projects as materials: we let them flow or gather them into stocks; we take them and pour them into containers; we mold them into forms or use them as ingredients. Ingold (2011: 25) lists the various materials used by nomadic pastoralists in making tents, so many of them mass nouns: bone, skin, hair, horn, dung. If we call these materials "substances," then this is to invoke the latter's non-philosophical, everyday meaning. In Aristotle's *Metaphysics* (1956), the closest concept to this meaning is probably not *ousia* but *hyle*, his material cause — that out of which something is made. Aristotle's model of making is hylomorphic — seeing objects as a combination of matter (*hyle*) and form (*morph*). But Ingold (2011) develops a rather different philosophy of materials and making. He emphasizes the importance of understanding matter through not the consumption of completed objects (in which materials fade into the background) but their production (Ibid.: 26). Viewed in this way, he suggests, materials become not passive recipients of form but active partners in the production of artifacts.

The second main way that human beings encounter continua is as elemental media that surround and separate individuated objects like ourselves. In Harman's use of the term, an "element" is a component, aspect or feature of a sensual object. But Harman seems to open up the door to another meaning of "element" by quoting Levinas's concept of the "sensory ether," where the latter suggests that this "element has no forms containing it; it is content without form" (Harman 2005: 37). The concept of element being alluded to here relates to another term, "*medium,"* which in Harman's thought is the ontological site at which interaction between objects, and between wholes and parts, take place. Here he is closer to the themes of this paper, but still subordinates what I am calling elemental media to the individuated objects that they surround.

Ingold can help us think about elemental media as things in and for themselves, as can media historian John Durham Peters. Ingold

rejects an ontology that divides the world into objects that exist against a background landscape; instead, he builds on the suggestion of James Gibson (1979) that the fundamental categories of the phenomenological world are material (solid), medium (fluid) and the surfaces between them. Ingold suggests that humans "swim" in the plenum of a fundamentally material world, consisting of volumes of continuous matter with constant metabolic exchange between them (2011: 24). Peters for his part argues that elemental media play important ontological roles. Depending on the kind of objects they surround, elemental media carry influences between the objects: they condition their properties, capacities and behavior; they also separate them — thus contributing to their identity — and put them into relation. Media, Peters suggests, are "our infrastructures of being, the habitats and materials through which we act and are" (2015: 15).

Nevertheless, it is not only objects that "withdraw" from human knowability; it seems to be the case that, at least for entities such as ourselves, continua — whether in the form of material substances that are taken up into objects, or that of elemental media that surround and create the conditions of possibility for objects — also withdraw in their own way. Whether they are inside or outside objects, continua tend to be backgrounded, forgotten, treated as merely infrastructural (Ibid.: 34; see also Irigaray 1999) — suggesting that their dismissal as ontologically irrelevant might paradoxically be a sign of their distinctive ontological status. Later, we will want to ask how substances are to themselves and each other. But for now we will focus largely on how they appear to us. In the next section I will explore the idea that the "mass-logic" ontology of continuous matter might be more fundamental than the "count-logic" ontology of objects: a continuous-matter ontology seems to organize the originary experience of human beings, but also endures as a grounding world-relation — especially if not occluded by object-oriented linguistic cultures.

Sorting the World

Many psychologists argue that human infants have the inborn capacity to make some sort of conceptual distinction between one object and another, and between object-like things and substance-like things, largely based on how they seem to expect things to behave (see, e.g. Carey 2001). However, philosopher Maxine Sheets-Johnstone (1999) argues that the primordial infantile experience of the world is not of objects, even of objects in motion, but motion *itself* — and especially our own tactile-kinesthetic sense of our

self-moving. As Sheets-Johnstone puts it, humans are "movement born": we come into existence as subjects in the "primal animation" of a tactile-kinesthetic body that feels its own movement (1999: 218). Being able to perceive and to act — to be intentional — is based in our experience of that primal animation.

This suggests that our sense of bounded objects might be derivative, emerging firstly from our growing experience of our own moving, sensing body, and from sensory experience of other entities that seem to share our own animation. Out of a primal animacy — and one that I will suggest is closer to the "mass" logic of continuous substances than the "count" logic of objects — we seem to develop a conception and understanding of other existents, whether objects or substances, through first our own embodied tactile-kinesthetic-sensory experience, and then through language.

For while object perception in its most general sense is not dependent on language acquisition, it is certainly shaped profoundly by it. For children to conceive of the world as being made up of objects belonging to various kinds and having different properties, they have to learn not just to divide the world up into separate spatio-temporal or functional particulars, but also what W. V. Quine (2013: 82) called "divided reference," where the same word is understood as referring to more than one entity — and also to the class of entities to which they all belong. Infants thus move from thinking and saying "dog" to thinking and saying "this dog," "another dog," "two dogs," "nice dog," and "dogs" in general. This linguistically mediated conceptual move is arguably necessary for understanding the concept of an object as used by OOO theorists — and it involves sortals and predicates. Sortals are concepts that classify an entity of being of a particular "sort" or "kind" (dog, mother), whereas predicates are words that say something about the entity (such as "is good"). Sortals are typically stated or implied when we make statements of identity ("Fido is a dog," or "we are watching the same program") or quantification ("there are three dogs"). In everyday speech we might use "object" or "thing" as a sortal, but for most philosophers "object" is too vague to help with quantification or individuation. Learning a language involves learning the logic of the more specific semantic terms that philosophers recognize as sortals, such as "book," "dog," "person," "mother," each of which have their own logic of individuation, quantification, persistence, and causation, and thereby follow their own versions of Speke (Carey 2001).

If understanding the concept of *objects* involves mastering predication and the singular-plural distinction, understanding the world as also including *substances* involves grasping the singular–mass

distinction. As we have seen above, mass nouns such as "water," "air," "rock," but also "wool," "technology," "humanity," can be objects or subjects in the grammatical sense, but behave differently to count nouns. And they can be far more mutable. As Quine puts it (in language that echoes Morton's description of hyperobjects), mass nouns are "protean" (Ibid.: 90–1); they can shift in their sense from singular to plural, and often appear as a "single sprawling object" (Ibid.: 89).[3]

This area of research is highly contested, but I want to suggest that perceiving the world in mass terms may be at least as primordial and foundational to human experience as an object-oriented ontology. When infants first start to acquire speech, typically uttering "nominal occasion sentences" consisting of a noun like "Mama" or "cup," they chiefly use words as if they are names for individual entities, and in ways that seem to blur the object-continua distinction — they only seem to have what Melissa Bowerman and Stephen Levinson (2001: 4) call "proto-concepts" of objects and substances. As Carey puts it, children "naming" a cup or their mother seem to recognize existents "which exemplify cuphood, or Mamaness, and have particular expectancies about objects with such properties, without representing Mama as a single enduring individual, or representing 'cup' as a distinct sortal from 'book'" (2001: 203). Quine argues that these are mass in logic; for the infant, "the mother, red, and water are ‹...› all of a type; each is just a history of sporadic encounter, a scattered portion of what goes on" (2013: 84). Mass nouns and proper names have a similar logic: Quine suggests that in adult mass-noun constructions like "water is fluid," "the mass term is much on a par with the singular term of "Mama is big" or "Agnes is a lamb" (Ibid.: 89).

But once infants acquire more language, these cognitive and experiential processes are developed and shaped in particular directions as the infants learn the grammatical rules of their first language (Carey 2001). The English language seems to have a bias toward spatiotemporal objects, and it is in English that the contrast between count and mass maps most closely onto the distinction between objects and continua (although there are exceptions, such as mass nouns that are collections of objects, such as "furniture") (Prasada et al. 2002: 147). However, other languages are very different indeed; some languages seem to assume that the primary "substances" (in the philosophical sense) are not individual spatio-

[3] Quine's ontology was of course a "thing" ontology — for him there are only objects and sets.

temporal objects, but mass entities that "come and go," like Morton's hyperobjects. These "classifier" languages seem to take not objects but *substances* as their starting point.

One example is the Yucatec Maya language, in which all inanimate nouns are treated like mass nouns. They cannot take plurals — just like amorphous substances such as water and sand, they have to be unitized with classifiers (think "two *gallons* of water," "three *buckets* of sand") before they can take a plural. As John Lucy puts it, "where *English lexical structure routinely draws attention to shape, Yucatec lexical structure routinely draws attention to material*" (1992: 89). Japanese is similar, in that all entities other than humans, regardless of whether they are an amorphous substance or a discrete object, have to be unitized before they can be quantified, and the default assumption when confronted by a new word is that it names not an object but a substance (Imai and Gentner 1997).

Anthropologist Helen Verran's discussion of West African languages such as Yoruba is very pertinent here. Whereas in English objects are basically *spatiotemporal particulars* to which *qualities* or *predicates* (including numbers) are applied, in Yoruba things are *sortal particulars* — that is, things that are defined as inherently possessing certain qualities according to their kind — to which only *modal terms* (i.e., modes of presentation) can be applied (Verran 2001: 137). Thus, when an English speaker says "it is sweet," they are assigning a quality to a spatiotemporal particular; but in Yoruba "sweet" is a verb — a sweet thing "sweets," by its very nature. And numbers in Yoruba work less like adjectives than adverbs; they describe *how* things appear: whether as a group or as a collection of individuals, and also as a collection of how many (Ibid.: 67); a singular or plural is just the mode of appearance of a mass noun. The "primary substances" of Yoruba logic are discontinuous "sortal particulars" that present in mass, singular, or plural modes. What they are *not* are objects in the conventional sense. There are echoes here of Ingold's materials: while objects "exist," he suggests, materials "occur" (2011: 30).

Where does this leave us? It is as if we humans start to experience the world in mass terms, rather than bounded, enduring objects belonging to kinds; then the experience of a human agent (both oneself and others) creates the space for thinking in terms of bounded objects; and object status is then (in ways that depend on the particular language acquired) extended to other animate and inanimate entities. Some kind of object-substance split seems universal, as if required by human existence. But continuous materials, while being backgrounded, especially in some linguistic cultures, remain as a fundamental strata of human experience. We step into

mud here and step into mud there—whether or not it is "the same" mud, it is still mud.

Continua in Themselves

So far, I have mainly been talking about continua in human experience. But how can we think about substances apart from how we encounter them? In this section, I will make four suggestions about how to talk and think about the secret inner life of continua, each organized around a contrast between the kind of concepts suitable for objects and those appropriate for continua. Object-oriented thought seems to prioritize concepts that are *transcendent* (relying on strong ideas of identity and alterity), *exclusive* (forbidding the simultaneous application of contradictory predicates), *absolute* (involving predicates that either apply or do not), and *completed* (regarding objects as the stable result of their ontogenesis). By contrast, approaching the world as continua—as "stuff'—requires concepts that emphasize the *immanent* (involving relations internal to an entity), the *inclusive* (permitting the coexistence of contrasting or contradictory properties), the *gradual* (allowing properties to manifest differentially at different points), and the *generative* (involving the constant production of form). This contrast between object-thinking and continua-thinking is not a strict one, and is more like a first approximation to stimulate speculation. However, I will suggest in the conclusion that the very leakage of these ways of thinking across the object-continua divide suggests that starting speculation from continuous matter rather than from objects can also change the way we think about objects.

Immanent

First, with continua we are compelled to think about "immanent" properties and relations. As we saw, regarding the world as made of individuated, self-identical objects requires a logic of "divided reference," which involves a number of conceptual separations or transcendences. An object transcends the subject before which it is placed; it also exists in relations of alterity and difference with other objects; it also transcends the sortals or kind to which it belongs. By contrast, I want to suggest, thinking about continuous matter requires us to use concepts that are more immanent in character.

I am not using the word immanence to necessarily imply a "flat ontology" of radical immanence. I am simply using the term to stress that the emphasis with continua is not on identity and alterity, and

relations with other entities, but on differences and relations that are internal to a region.[4] Furthermore, the immanence-transcendence contrast as I am using it here does not map onto that between internal and external relations. In the logic of relations, "internal" relations are not necessarily spatiotemporally internal to an entity. Indeed, examples of internal relations usually involve relations between separate objects (such as "mother" and "daughter") — though they might also obtain between universals or continua. What makes a relation between two entities internal to one of them is whether it is a necessary part of that entity being what it is (relative to the kind of sortal to which it belongs), or whether it is merely contingent and thus "external." For Harman, the sensual object — the object as it is for us — is inherently relational by definition; but the "real" object and its "real" properties are non-relational — they involve neither internal nor external relations (Harman, in Brassier et al. 2007). The one qualification that Harman is likely to make here is that an object might have a set of internal (i.e., non-accidental) immanent relations with its components — what Harman calls "domestic relations," and Bryant "endo-relations" (Bryant 2011: 68) — that makes it the kind that of object that is.

One way to see the transcendent-immanent contrast applying to the way we talk about objects and continua involves the application of comparatives. It is not a perfect mapping, but objects seem to have an affinity to external comparisons ("x is y-er than z"), whereas continua encourage "internal comparatives," a kind of reflexive comparison in which entities are compared to themselves at other points in time or space (see Tabatowski 2019). In talking about continua, for example, we might say that this metal is harder than that metal, but we might also make internal comparisons — "the water is colder here than over there," or "the water is warmer than it was this morning." With continua, it seems, internal comparisons may be internal in a way that is similar to how internal relations are internal — somehow integral to the very nature of continuous matter.

Inclusive

Second, with continua we seem to need to apply predications that overlap with each other in ways that we would not do with determinate objects. The concepts that we use to think and talk about classic, individuated objects belonging to kinds are likely to obey

[4] Although with continuous matter the distinction between internal and external in this sense is not always so sharp.

the classical "rules of thought" of identity (A=A), noncontradiction (A≠¬A) and excluded middle (A∨¬A). In other words: objects are identical to themselves; statements about objects cannot be both true and false at the same time; and if statements are not true they are false, and vice versa. With continua and their internal contrasts, by comparison, we seem to be pulled into a more inclusive logic, where contradictory predicates may simultaneously apply.

One way to capture this contrast is through the concept of "internal difference" or "difference in itself." Georg Wilhelm Friedrich Hegel and Gilles Deleuze, despite the huge differences between their philosophies, both critique a form of representational, propositional logic that only sees difference as a negation of identity and as thus, derivative. Hegel (1977: 35) contrasts an "ordinary" or "ratiocinative thought" that starts from identity with "speculative thought," which for him involves abandoning the principle of noncontradiction and sees Being as itself contradictory. Central to Hegel's argument here is the unsettling of the very logic of subject and predicate, as stabilized by the knowing subject (Ibid.: 38; 2010: 67). For his part, Deleuze develops Henri Bergson's concept of "multiplicity" into an idea of "difference in itself." In *The Logic of Sense* (1990), Deleuze asks us to contrast two ways of thinking about the relation between difference and similitude — "only that which resembles differs" and "only differences can resemble each other" — suggesting that these represent two radically different ways of looking at the world: the first "invites us to think difference from the standpoint of a previous similitude or identity," the second "to think similitude and even identity as the product of a deep disparity" (1990: 261) — Deleuze firmly aligning himself with the latter.

Investigating and thinking about continua repeatedly confronts us with the task of grappling with a logic of differentiality and contradiction — of how to conceive and talk of entities that seem able to bear contradictory properties at different times or even at the same time — rigidity and plasticity, fluidity and solidity, transience and persistence, heat and cold, continuity and discontinuity. We need ways of talking about how continua can be "other to," or "out of step with," themselves (Simondon 1992: 300).

Gradual

Third, building on the first two characteristics I have outlined above, concepts suitable for continua tend to involve matters of degree. For contrast, let us once again start by considering the logic of individuated objects. In the subsection on immanence above, I said

that whereas with objects we might use gradable *external* comparatives — "X is taller, heavier, greener, etc. than y" — with continua we might more typically use gradable *internal* comparatives — "X is colder [than itself]." But here I want to shift the focus a bit, suggesting that when we think about Harman's determinate "real" objects the intuitive starting place is in fact the application of *nongradable*, absolute adjectives, and the use of gradable adjectives is secondary, external, accidental.

By contrast, in the case of continua, right from the start we are likely to be drawn to gradable predicates — ones that apply to their subjects to a greater or lesser degree — hot, heavy, viscous, rigid, moving (Kennedy and Louise 2005). Whether continuous matter is encountered as material for a project or as a surrounding, elemental medium, or thought of speculatively in itself, it is not so much about whether something is heavy or light, hot or cold, but *how* heavy, *how* light. And, what is more, different parts of a given volume of continuous matter might exhibit these qualities to a different degree. As we move through continua, we might be drawn to using "degree achievement" terms, such as "widen," "narrow," "darken" or "warm," to describe the shifting degree to which the material has a given property (Deo et al. 2013: 97). We can do this with objects too, for example we might say "the cake gets sweeter toward the bottom," thus treating them for certain purposes as continuous matter.

Prefiguring the next subsection on the "generative," the grammar of these degree achievement terms — "widen," darken" — seem to imply change. However, the continuous, gradual nature of internal difference within continua is not solely a matter of change over time: it can involve continuous variation along diverse "axes" — some temporal, some spatial, some neither. This brings us into the realm of "gradients." The term "gradient" was initially used to refer to the steepness of slope of a railway, then applied by extension to barometric pressure, and finally became a central concept in mathematical physics, defined as the rate of change of a variable with respect to a change of position across a field.

Harman is dismissive of the concept of continua and gradients, suggesting that we need discontinuities in the world to be able to speak about it. "Everything is split up according to definite boundaries and cut-off points rather than along continuous gradients," he insists (2016: 15); and the world's capacity to generate complexity and surprise "must be due to fully formed individuals at every scale" (Ibid.: 20). Harman presents us with a stark choice: either we accept that the world is made of individuated objects with real properties that are not fully knowable, or we are forced to regard it as an

undifferentiated plenum whose properties are fully on display in whatever it happens to be doing at any one time.

The concept of "field"—crucial in continuous-matter physics—can help us avoid Harman's application of the either-or logic of the excluded middle here. Field concepts can suggest ways of moving from the transcendent, exclusive, and absolute language of properties of and relations between individuated, countable objects, toward ideas of wider relations within a continuum. With continuous-matter thinking it is not just the *matter* that is regarded as continuous; difference and relation have also to be conceptualized continuously, and the idea of fields provides one way of doing that.

As historian of science Mary Hesse summarizes, in mathematical physics a field is "a region of space in which each point ‹…› is characterized by some quantity or quantities which are functions of the space coordinates and· of time" (1962: 192). Fields were first posited as a way of understanding the motion of fluids. In Leonhard Euler's *Mechanica* of 1736, a fluid was analyzed not as corpuscular matter, but as a continuous substance, treating its volume as an evolving field in which properties and forces were differentially present at each point (Ibid.: 192–93). In 1845 George Stokes showed how this way of thinking also applied to solid media, and in 1851 William Thomson formalized and generalized the concept of the field, showing that the same equations work across very different fields, including those like electromagnetism that can exist in empty space (Ibid.: 195, 209).

Fields can be seen as a meshwork of gradients that collectively summarize the forces that are at play at each individual point in the continuous field; but they also express non-individuated relations of multiplicity across a volume of continuous matter. Field thinking was a new ontology, one that pushed physics beyond the mechanical philosophy of Newton and carved out the possibility of something being "physical" even when not material, and of "energy" as something that can exist even where there was no matter (McMullin 2002). Field equations were not the Newtonian equations of reversible motion, radiating forces and instant action, but those of flow, viscosity and elasticity, and action that takes time to unfold depending on the nature of the material (Ibid.: 28; Hesse 1962: 196). Field relations are crucial for understanding the internal motion of fluid media, but also the immobility of static continua, especially when held in the dynamic equilibrium of balanced forces.

The mathematical physics of fields is of course a historical, contingent human creation (Mirowski 1989), and one whose operation is inseparable from apparatuses and human performances (Barad 2007). However, no less than the experience of human embodiment or of

human craft practices, it can be fertile ground for speculative thought. If continua have something analogous to the countable relations that obtain between individuated objects — both "domestic" (interior) and "foreign" (exterior), and both internal (necessary) and external (contingent) — then field ontologies can help us conceive of these: as a set of continuous relationships between points and regions and properties of a substance, some of which are inherent to what makes an example of continuous matter what it is, and some accidental.

Generative

Fourth, with continua, even more than with objects, we have to think about potentiality. Harman's (2016: 21) object-oriented ontology focuses on the completed object, and thus prioritizes being over becoming. In Gilbert Simondon's (1964) philosophy of the object, by contrast, it is the process of ontogenesis that is metaphysically prior, and the concrete individual only has a "relative reality," as an effect or phase of that wider process. He suggests that we should thus "understand the individual from the perspective of the process of individuation rather than the process of individuation by means of the individual" (Simondon 1992: 300). With continua, I want to suggest, we are even more firmly compelled to place a priority not on being but on becoming, not on the actual but on the potential.

Aristotle (1956: 1050a) in his *Metaphysics* identified formless matter with potentiality and the formed body with actuality — for example, regarding building materials as a potential house. However, in Aristotle's hylomorphic schema, *hyle* (matter) is seen as passive, and its potential as ultimately derivative of the objects of which it may become part. By contrast, I want to suggest that continua have potentialities that belong to the continua themselves.

Crucial to the generative potentiality of continua are their "intensive" properties. The concept of the intensive was first elaborated by the physicist Richard Chase Tolman (1917). "*Extensive*" properties are properties such as length, volume, and mass that are additive — for example, the mass of any entity or aggregate is the sum of the mass of its components. By contrast, "*intensive*" properties such as temperature, pressure, and density (and others listed above as characteristic properties of continuous matter such as viscosity, surface tension, elasticity, and rigidity) are independent of system size — for example, the temperature of an entity is not the sum of the temperatures of its components.

Deleuze linked Chase's concept of the intensive with Bergson's (1921) conceptualization of difference as an explosive force within

things that creatively and inventively generates novelty. Deleuze also takes from Bergson the idea of the "virtual" as a way to understand this genesis of new forms; virtualities are latent but *already real*, present in the world, even though they may or may not be actualized (Deleuze 1988). Deleuze and Félix Guattari draw out how extensive properties are more characteristic of the stable, actual, completed form of an object, whereas intensive properties are more associated with virtuality and becoming as they cannot be altered without limit before they introduce bifurcations and changes in kind (see, e.g., Deleuze and Guattari 1987: 33).

In the partial differential equations used in mathematical physics to express relations within gradients and fields, the variables seen as independent are generally extensive and the ones seen as dependent (such as temperature, pressure, or electrical charge) are generally intensive — as if the extensive, actual mass and spatial configuration of an entity is the metaphysical ground out of which intensive forces are generated and on which they play. But in continuous matter the relationship between the extensive and the intensive is more complex.

For example, in fluid continua held away from equilibrium by a flow of energy there is a constant restless dance between the extensive and the intensive, the actual and the virtual. Simondon can help us here, arguing as he does that becoming takes place "in a system that contains latent potentials and harbors a certain incompatibility with itself," and is always only "a partial and relative resolution" (1992: 300). Becoming, then, is "a capacity beings possess of falling out of step with themselves ‹...›, of resolving themselves by the very act of falling out of step" (Ibid.: 300–01). Planetary continua such as the atmosphere are kept "out of step with themselves" by the flow of energy through the earth system from the sun and the earth's hot core, and are thus constantly involved in generating new forms of multiplicity within themselves. Under such conditions, "fleeting emergent powers" (Elder-Vass 2005) continually arise, as virtual singularities divide the planet's matter and shape its behavior into different emergent phenomena, as fluid matter slides over and confronts itself in phenomena such as storms, avalanches and inversion layers, without these powers being gathered into stable or self-reproducing entities.

Conclusion

In this paper I have pursued the idea that a speculative ontology focused on objects might not be able to do justice to continuous matter, whether considered in its role in human experience or in terms

of its own inner nature. As human beings, we encounter continuous matter as material to be incorporated into our artifacts and projects; we also experience continua as constituting the environments and infrastructural backgrounds that surround us and condition our existence and powers, and those of the other objects that make up our world. We should also, I have suggested, direct speculative attention to the inner life of unbounded, continuous matter, going on even where no individuated objects or subjects are present. My conclusion is that it is a mistake to see continuous matter as just "disappearing" into objects without remainder — whether as an actual or potential part of an object, or as a collection of objects — and thus as lacking ontological significance as a topic for philosophical thought. I have shown how insights from psychology, anthropology, and linguistics support the idea that a mass-noun ontology of continuous substances might be an intrinsic feature of human experience — one which is shaped, perhaps backgrounded and sometimes even dimmed by language and culture, but is never far away. I have also drawn on ideas from continuous-matter physics to see how we might develop concepts that can serve in our continuous-matter philosophy as analogues to the concepts that we use for discrete objects — identity, difference, relation, number, and so on.

Over the course of the paper, I have made some provisional contrasts between the sort of concepts that seem to be involved in thinking about objects, and those that seem to be needed for engaging with continua. We might summarize (and simplify) these contrasts as follows: Objects are individuated; continua are non-individuated. Objects are countable; continua are measurable. Objects are structured; continua are unstructured. Objects "exist"; continua "occur." Objects invite external comparisons; continua call for internal, reflexive comparisons. Objects take noncontradictory predicates; continua exhibit contradictory properties. Objects have countable relations; continua have continuous, "field" relations. Objects take nongradable predicates; continua take gradable predicates. Objects are fundamentally extensive; continua are fundamentally intensive. Objects are completed, continua are in formation. Objects are actual; continua are virtual.

Of course, all of these are generalizations: in each case we can probably think of exceptions. But note that the exceptions are usually on the side of the objects: objects too are in formation, can change, have internal comparisons, can take gradable adjectives. And there are at least two ways of looking at this asymmetry. Echoing Deleuze's suggestion that the world looks very different if we look at the relation between identity and difference from the side

of identity and similitude or from the side of difference, and Simondon's similar observation about the relation between the individual and individuation, we can similarly approach the object-continua relation either from the side of objects, or from the side of continua.

The key objective of developing a continuous-matter philosophy is arguably to give continuous matter its due—to see it as more than a potential object, part of an object, or in some other way falling short of object status. But a continuous-matter philosophy can also change the way we think about objects. A continuous-matter philosophy does not necessarily involve rejecting the reality of objects, reducing them to illusory epiphenomena of fundamentally continuous phenomena, as often seems to be implied by thinkers such as Simondon (1992: 300) or Bennett (2010: 227). However, if we turn our philosophical point of view around, looking at objects from a starting point based in continuous matter rather than the other way round, we may find that objects, too, start to look more strange and interesting.

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