Boundaries, Conventions, and Realism

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1. Natural vs. Artificial Boundaries

If you have been driving in Europe recently, you must have had that strange feeling. You see a sign that says 'Deutschland', or 'France', or 'España', and just drive through. No customs barrier, no passport control—just a sign. You say 'Ah!' and carry on; the sign could be a hundred yards further out and it would make no difference. Yet by crossing that line you enter a different world-district, magically separated from its surroundings—you enter a region where people suddenly speak another language, rely on their own authorities, share a different heritage, and struggle to solve *their* problems and to improve the quality of *their* common life. The line is there, even if you don't see it. That sign conceals a long history, perhaps even a thread of blood, though all you see today is a spread of asphalt, souvenir shops, motels, gas stations, abandoned customs houses. It is more difficult to get that feeling as you drive across the United States of America. Most drivers feel nothing at all as they pass the border between Wyoming and Idaho, a line whose embarrassing geometric straightness says very little about its history (or says it all). Yet even here there are differences, and Idahoans are proud of their license plates just as Wyomingites are proud of theirs. Such is the magic of boundary lines: they are thin, yet powerful; they separate, and thereby unite; they are invisible, yet a lot depends on them, including one's sense of belongingness to a country, a people, a place; they are abstract, in a way, yet people take them seriously and some states expend huge sums of money and sacrifice soldiers' lives to protect them, or to re-draw them properly. (Kashmir is one example where the drawing of boundaries—even the precise drawing of the Line of Control—is still central to the conflict.)

Not all boundaries are so magic, though—are they? As I was flying over Yellowstone Park, I did not, in fact, see the Idaho-Wyoming boundary, as

you don't see the boundary between Germany and France when you fly over Europe. Nor did I see the boundaries of the Park itself, or those of the Missouri Plateau earlier on. But I did have the clear and distinct impression of seeing *other* boundaries: the shoreline of Lake Erie, for instance, or the edges of the Missouri River. I saw the boundaries of Long Island when my flight took off. And I think at some point I saw the crater of a volcano, probably Bear Butte, though I am not positive about that. (It might have just been a small lake.) In his celebrated Romanes Lecture of 1907[1], the British Viceroy of India, Lord Curzon of Kedleston, introduced an important distinction in this regard, a distinction that is so intuitive as to be part of common sense, and that geographers officially embraced ever since. And it fits the bill. It's the distinction between *artificial* boundaries, or frontiers, on the one hand, and *natural* boundaries, or frontiers, on the other.

The boundaries I didn't see would be of the first sort. National and state borders are artificial insofar as they are our own making, the product of human decisions and stipulations, an expression of collective intentionality that translates into political, social, and legal agreements whereby it is determined where a certain territory begins and where it ends. So, too, are the boundaries of many other geographic entities, such as plateaus or wetlands or areas of a given soil type, though these may be induced by cognitive or cultural processes, or by scientific stipulation, rather than by legal or political practices. Such artificial boundaries may be drawn with great accuracy (a national border) or left somewhat vague, fuzzy, underspecified (the boundaries of a plateau); it depends on the importance we attribute to the relevant demarcations, on the role they play in our lives. But whether sharp or vague, they all qualify as "artificial" precisely because the demarcations are human-induced; they need not correspond to any genuine, physical or otherwise objective differentiations in the underlying territory. They are *de dicto*, so to speak, not *de re* boundaries.

Geographic boundaries of the second sort—the natural, or *de re* boundaries—would by contrast be characterized precisely by their apparent independence from our organizing activity. We can stipulate that one half of Lake Erie belongs to Canada and the rest to the US, and the dividing line will be an artifact. But the shoreline—the border of the whole lake—does not seem to depend on us. It's there regardless, it exists "on its own". Ditto for the boundaries of certain political or administrative entities, such as the Region of Sicily, whose limits are for the most part identified with the limits of the

Sicilian *island*; or such as Spain, which although connected to the continent, is separated from it by the admirably fashioned Pyrenean wall ("the most obvious of features—wrote Joseph Calmette—the plainest of lines, designed by nature in her boldest manner"[2]). Artificial boundaries may be subject to controversy. They can be ignored or deleted, and thereby go out of existence; they can be drawn anew, and thereby come into being. Not so with natural boundaries. We are free to ignore them for certain purposes, but we cannot ask a cartographer to omit them from a map of the world. In a physical map we may omit all political boundaries; but a political map will perforce include all physical boundaries—at least, physical boundaries that are visible at the relevant scale.

Now, it is, of course, an open question whether Lord Curzon's intuitive distinction is well grounded. That is precisely the question I want to address. First, however, let me emphasize that the question does not only arise in relation to the large-scale geographic world that we find depicted in ordinary maps and atlases. It also arises, for instance, in the smaller-scale world featured in a cadastre. Here, too, the parceling of land into real estate is not simply a geometrical affair. In some cases it would seem to rely on natural, preexisting physical discontinuities, such as creeks, rocks, cliffs, or ditches; in other cases, it is crucial that people *believe* that whoever fenced off a plot of land is the person who actually owns it, so collective intentionality appears to be necessary to explain the difference between landed property and raw land. And what goes for the cadastre goes for everything. Boundaries play a central role at *any* level of representation or organization of the world around us, and so does the relevant artificial/natural distinction. We think of a boundary *every* time we think of an object as of something separated from or distinct within its surroundings. There is a boundary (artificial) separating my part of the desk from my colleague's, my head from the rest of my body, or the sirloin from the ramp on a butcher's beef chart; there is a boundary (natural) demarcating the interior of this apple from its exterior, the hole from the donut, or shadow from light. Events, too, have boundaries, including temporal ones, and the distinction appears to apply equally well: the end of the war or my turning 21 years old would be examples of artificial boundaries; my birth and death or the point in the cooling process when water begins to solidify would be obvious candidates for natural boundaries. Even abstract entities, such as concepts or properties, may be said to have boundaries of their own. Those expressed by disjunctive predicates such as 'emerose' and 'grue', or

by phase sortals such as 'student' and 'jobless', would have *de dicto* boundaries. Those expressed by substance sortals and so-called natural kind terms, such as 'cow' or 'water', would have genuine, *de re* boundaries.

It is not an exaggeration to say that boundaries are at work in articulating every aspect of the reality with which we have to deal. They stand out in every map we draw of the world—not only the world of geography, but the world of nature at large, as well as the secular world that emerges through the weaves of our social and individual practices. And this ubiquity of boundaries goes hand in hand with that of the artificial/natural distinction, the apparent contrast between merely *de dicto* and genuinely *de re* demarcations, the opposition—in Barry Smith's more recent terminology—between *fiat* articulations and *bona fide* joints of reality.[3] It is not, therefore, an exaggeration to say that our question bites deeply: How tenable is the distinction? And how does the answer affect our overall metaphysical picture of the world? How does it affect our understanding of the identity and survival conditions of the very things that boundaries demarcate?

2. Boundaries and Things

To begin with, the relationship between a boundary and the entity it bounds demands clarification. Brentano, following a tradition that goes back to Abelard if not to Aristotle,[4] held that the distinguishing feature of boundaries lies in their being ontologically dependent on the entities they bound: a boundary "can never exist except … as belonging to a continuum which possesses a larger number of dimensions"[5]. And it is true: there are, in reality, no isolated points, lines, or surfaces. We cannot eat all the interior parts of an apple and just keep the surface—not the *skin* (which is a bulky part) but the perfectly two-dimensional entity that circumscribes the skin from the outside. We cannot display the boundary of our country in a museum, or steal the point of intersection between the equator and the Greenwich meridian. Not even God could do such marvels, *pace* Suarez.[6] However, this relation of dependency is symmetrical: it is equally impossible to have an apple without a surface, or a nation without a border (with few exceptions, such as Poland during the Era of Partition). Indeed, when it comes to *de dicto* boundaries, it would seem that the latter sort of dependency is especially strong, precisely insofar as those boundaries emerge from our social or cognitive *fiats*. Some entities begin to exist only when we draw their boundaries. Think of the

states of the so-called Northwest Ordinance, as they were literally brought into being by Thomas Jefferson's pencil (and ruler). Or think of when the colonial powers relied on cartography to subdivide the "heaten lands": the drawing of a few lines of ink was all it took to legitimize—and simplify—their territorial conquest in spite of any existing social and political structures. As Mark Monmonier put it, sometimes the pen really is mightier than the sword.[7] But even when the sword prevails, the outcome is a boundary which, though conforming with Brentano's thesis, bears witness to the double-barreled nature of the relevant dependency: were it not for those boundaries, those states would never have existed.

In fact, it is not even correct to speak of the relation between a boundary and *the* extended entity to which it must belong: every time we have a boundary, we have two entities, one on each side. Boundaries separate, but they separate two entities (or two parts of the same entity) which are *continuous* with each other. The Idaho-Wyoming boundary is thus a boundary of Idaho, but also a boundary of Wyoming. Who gets to claim ownership? Surely the boundary does not belong to *both*, for the two States do not overlap. And we cannot simply say that it belongs to *neither*: the two States use up the whole territory by definition—no boundary can be left as a thin, unowned slice *between* them. So? This is an old problem, and it goes without saying that it is not peculiar to geography. Euclid defined a boundary as "that which is an extremity of anything"[8], and Aristotle made this more precise by defining the extremity of a thing x as "the first thing outside of which no part [of x] is to be found, and the first thing inside of which every part [of x] is to be found.".[9] It is a definition that today we may also find in a dictionary. But what about the extremity itself—does it belong to x or to the complement of x? Consider the dilemma raised by Leonardo in his *Notebooks*: What is it that divides the atmosphere from the water? Is it air or is it water?[10] Or think of the boundary of a black spot on a white surface, as Peirce wrote in his *Logic of Quantity*.[11] What color is it—black or white? Also in relation to temporal boundaries, the puzzle arises. As Aristotle himself asked in the *Physics*, at the instant when an object begins to move, is it in motion or is it at rest?[12]

Here one cannot just dispose of the puzzle by treating it as a mere artefact of the modelling process. As Antony Galton points out, properties like color or material constitution only apply to extended bodies, so in a way it makes no sense to ask whether a lower-dimensional entity is air, water, or

colored.[13] Yet, at bottom the problem is one of *ownership*, not of physical characterization. The puzzle is purely topological and originates in the fact that space and time, hence the entities that according to common sense occupy space and endure through time, have the dense geometry of the continuum. There are no *adjacent* points, lines, or surfaces. Either they coincide, or they are separated by an infinity of further points, lines, surfaces. In terms of the classic doctrine that goes back to Bolzano, this means that when two regions or bodies are adjacent, one must be "closed", i.e., include the boundary among its parts, and the other "open".[14] It's no help to stigmatize the doctrine as "monstrous", as Brentano did.[15] What happens when we cut an apple in half?—he asked. *Which* half will come out "closed" leaving the other "open" and bleeding? Alas, this is the very problem at issue, and one cannot solve it merely by jeering at the apparent counterintuitiveness of the continuum.

Now, I like to think that precisely the distinction between *de dicto* and *de re* boundaries may help us solve the puzzle.[16] On the one hand, with regard to artificial boundaries of the first sort, it is true that the question of their ownership can hardly be settled without contravening to the principle of sufficient reason. To assign the Idaho-Wyoming border to Idaho, or to Wyoming, would amount to a peculiar privileging of one State over the other. But precisely insofar as such boundaries are our own making, it is also true that their actual ownership is no real issue. Simply, we have not *decided* which State gets to own the border, as we have not decided which hemisphere gets to own the Equator, or who gets to own the line separating my part of the desk from my colleague's. We have not decided because the decision would be of no practical consequence whatsoever. And this sort of indeterminacy is of no metaphysical consequence, either. To say that there is no fact of the matter, here, is not to endorse worldly indeterminacy, precisely because we are not dealing with *bona fide* facts; the indeterminacy pertains exclusively to our *fiat* practices. In this regard, the picture is no different from the one we get as we consider the *vagueness* of certain boundaries, such as the boundary of the Missouri Plateau. There is no clear-cut line separating the interior of the plateau from its exterior, but that doesn't mean that the plateau is a vague entity. It means that it is vague what we mean by 'the Missouri Plateau': nobody has been "fool enough", in David Lewis's phrase[17], to draw a precise line around its intended referent. It means that it is indeterminate (wide scope) whether certain parcels of land belong to the Missouri Plateau, not

that the Missouri Plateau is indeterminate (narrow scope) with regard to the inclusion of those parcels of land.

On the other hand, when it comes to *de re* boundaries—such as the margin of a black spot on a white panel, or the line separating water from the atmosphere—one might think that their ownership need not be up for grabs. After all, in such cases we are confronted with two entities, one of which is *figure* while the other is *ground*, and it would not be implausible to resolve the asymmetry in favor of the former. This "ecological" intuition may be found, for instance, in Ray Jackendoff.[18] The black spot wins the status of "figure" over its white exterior, hence the relevant boundary belongs to the spot, not the exterior. Water wins over air, which is only "ground", hence the relevant boundary belongs to the ocean, not the atmosphere. And the same could be said of the surface of an apple. We never have two closed bodies in contact with each other, only one body embedded in its surroundings, and it is the body—one could say—that gets to own the boundary. Only the apple is topologically closed; the background is open, and that is why the two can be genuinely in touch. As for Brentano's problem of explaining what goes on when we cut the apple in half, one could say that the dilemma betrays an incorrect model of the cutting process. Surely it would be arbitrary to elect one half as figure and the other as ground: after the cutting, each half is equally figure with respect to their common background, hence each will be enveloped by a complete surface. But that is not to say that such surfaces were already hidden inside the apple before the cutting. By dissecting an object we do not "bring to light new surfaces," as Ernest Adams has it[19], nor do we convert a *de dicto* boundary into two *de re* boundaries. Rather, topologically, when the cutting takes place the extant outer surface of the object is progressively deformed. A long, continuous process suddenly results in an abrupt topological change: there was one thing; now there are two. (Think of a splitting soap bubble.) There is indeed something deeply problematic about the abruptness of such a change, but never mind: whatever the explanation, the figure/ground account would go through.[20]

Still, I don't think this can be the whole story. Figure wins, ground loses. But what happens when two figures come into contact? Think of the Dover cliffs. Hard to construe them as an "open" background for the waters of the Channel. Even harder if we consider that the cliffs themselves stand out on the horizon: Should we say that they are open against the water, but closed against the sky? And what about the line along which they all meet—water,

rock, air? Whichever item gets the honor of figure, the other two should be ground, hence open. But how could they meet, then? The topology of the continuum forbids contact between two closed bodies, but also between two open bodies. Clearly something is going astray. Brentano would say that this is yet another proof of the inadequacy of classical topology, and would begin to speak of *plerosis* and other complicated things that supposedly yield a better fit with intuition and common sense. I would rather say that here intuition and common sense begin to show their limits, and there is a serious possibility that we embarked on a wrong path.

Indeed, to me it seems obvious that for certain *de re* boundaries, especially those that mark the limits of material bodies, the ownership problem does not even arise, for *on closer look* such boundaries are not what we think. On closer look, as we know, an apple is not a solid, continuous object. On closer look, material objects are just swarms of subatomic particles franctically dancing in an otherwise empty space (the "material" volume of an apple is really only one billionth of what we commonly measure), and speaking of their surfaces is like speaking of the "flat top" of a fakir's bed of nails, as Peter Simons' put it.[21] On closer look, therefore, it makes little sense to speak of continuous objects separated by a common *de re* boundary. It makes no sense to ask who gets to own *that* boundary. All there is are smudgy bunches of hadrons and leptons, and if we really wish to insist, we can say that each such thing is figure against an empty background. But the background is *empty*: there is *nothing* else that could claim ownership. To put it differently, on closer look the spatial boundaries of common material bodies involve the same degree of arbitrariness as those of any mathematical graph smoothed out of scattered and inexact data, the same degree of idealization of a drawing obtained by "connecting the dots", the same degree of abstraction as the figures' contours in a Seurat painting. It makes no sense to inquire about the owners of *those* boundaries, or rather, it only makes sense insofar as we recognize their ephimeral status as *fiat* demarcations that exist in virtue of our cognitive acts but that are not genuinely present in the autonomous (which is to say mind-independent) physical world—hence as *de dicto* boundaries. And we have seen that the ownership of such boundaries can be left indeterminate. Ditto when we move from objects to events. On closer look, as we know, a body's being at rest amounts to the fact that the vector sum of the motions of the trillions of restless atoms of which the body is composed, *averaged* over time, equals zero, hence it makes no sense to speak of the *instant*

at which an object begins to move.[22] Either we are dealing with a *de dicto* boundary, in which case we know how to handle the problem, or rather leave it unresolved; or we are dealing with particles that are *restlessly* in motion, in which case the problem does not even arise.

3. From Boundaries to Things

At this point, however, the very distinction between *de dicto* (artificial) and *de re* (natural) boundaries demands reexamination, and it is here that the question of its tenability bites deeply. Were it just a matter of boundaries, the exact extension of these two concepts might leave us unmoved; it is their intension that takes care of the problems. But once the *de dicto*/*de re* distinction has been recognized, it can be drawn across the board: not merely in relation to boundaries but also in relation to all those entities that may be said to have boundaries. If a certain entity enjoys natural boundaries, it is reasonable to suppose that its identity and survival conditions do not depend on us; it is a *bona fide* entity of its own. By contrast, if (some of) its boundaries are artificial—if they reflect the articulation of reality that is effected through human cognition and social practices—then the entity itself is to some degree a *fiat* entity, a product of our worldmaking. This is not to say that *fiat* entities of the second sort are imaginary or otherwise irreal entities. As Frege put it, the objectivity of the North Sea "is not affected by the fact that it is a matter of our arbitrary choice which part of all the water on the earth's surface we mark off and elect to call the 'North Sea'".[23] It does, however, mean that such entities would only enjoy an individuality as a result of our cognitive and/or social practices, like the cookies carved out of the dough: their *objectivity* is independent, but their *individuality*—their being what they are, including their having the identity and survival conditions they have—depends on the baker's action. (In the terminology of John Searle, they are "social objects": from a God's eye point of view you don't see a cookie just as you don't see a nation or the North Sea; you only see us treating certain chunks of reality as cookies, nations, or the North Sea.[24])

Now, the existence of *de dicto* boundaries, hence of *fiat* entities, is uncontroversial. We can even be more fine-grained, if we wish. We can, for instance, draw a further distinction between *fiat* entities that owe their existence to collective intentionality, or to the beliefs and habits of a community, as with geopolitical or social entites at large, and *fiat* entities that emerge in-

stead from the cognitive acts of single individuals, beginning with perception, which as we know from our experience of Seurat paintings has the function of articulating reality in terms of continuous boundaries even when such boundaries are not genuinely present. Individual *fiats* are more ephemeral than social *fiats* because they are rigidly dependent (on *these* acts, taking place *now*) rather than generically dependent (on the existence of relevant acts of a certain kind). We can also distinguish between those cases where a *fiat* entity is delineated or carved out as a proper part of a larger entity, as with our initial examples, and those cases where a *fiat* entity is obtained by circumcluding a number of smaller entities within larger wholes, as with Polynesia, the constellation Orion, or ordinary material bodies such as apples upon recognition of their microscopic structure, or as when we describe the world as consisting of forests, physaliae, schools of fish, swams of bees, fleets of ships, pairs of shoes.[25] (Natural language contributes to the generation of *fiat* entities also through the opposition between mass nouns, such as 'cattle', and count nouns, such as 'cow'. A hungry carnivore points towards the cattlefield and pronounces 'There is cattle over there'. How does this pronouncement differ, in its object, from 'There are cows over there'? Not, certainly, in the underlying real bovine material.) Regardless of all such refinements, it is clear that in each case *de dicto* boundaries are at work in articulating the reality with which we have to deal, and the entities obtained thereby are themselves of the *fiat* sort. Nor will such entities acquire a *bona fide* status upon further work on our side. As we have seen, no pre-existent inner surface is brought to light by a process of cutting. Indeed, administrative or political borders may in course of time come to involve boundary-markers (barriers, walls, barbed-wire fences, or electronic devices) that will tend in cumulation to replace what is initially a pure *de dicto* boundary with something more substantial. Yet, again, this is not a process of ontic transformation. Such markers can be very robust, but not so robust as to turn the artificial into the natural. The Chinese Great Wall has survived for centuries, but the Berlin Wall lasted a mere fifty years and Israel's "Separation Wall" in the West Bank has not been *recognized* by the International Court of Justice. On Sept. 22, 2005, the US Secretary of Homeland Security used his power to "waive in their entirety" the Endangered Species Act, the Migratory Bird Treaty Act, the National Environmental Policy Act, the Coastal Zone Management Act, the Clean Water Act, the Clean Air Act, and the National Historic Preservation Act to extend triple fencing along the US/Mexico border

through the Tijuana River estuary; a few months later, the San Diegans were playing volleyball with the Tijuanans using the fence at the beach border as a net. Even Romulus's plowshare could not make natural what natural is not; the blade cuts the soil, tears the grass, uproots all that lies on its *fiat* path.

Let us rather ask whether, and to what extent, it is appropriate to countenance the existence of natural, *de re* boundaries, hence of natural, *bona fide* entities that do not depend on our deeds. By itself, the concept is perfectly intelligible, and we should be thankful to Lord Curzon for emphasizing its political significance. As Lucien Febvre famously argued, the very notion of a natural frontier began to emerge in the nineteenth century precisely as an expression of the idea that in some cases the limits within which we are allowed to act are set by Nature itself: natural boundaries are "fixed by destiny", they represent "ideals to conquer and realize"[26]. It is one thing to take up arms on the crest line of the Pyrenees, quite another to sacrifice your life for a Jeffersonian line. It is not surprising that the Irish Republican Army wants the whole *island* of Ireland, but who would fight for the Wyoming Independentist Party? Still, even in relation to the geopolitical world, the natural/artificial distinction is all but robust. It is true that I had the impression of *seeing* the shoreline of Long Island from my plane. But it is also true that when you actually go there, ground-level, things look very different. What looked from the air like a sharp line turns out to be an intricate disarray of stones, sand, algae, piers, boardwalks, cement blocks, musk sediments, marshy spots, putrid waters, decayed fish. Ditto for the much celebrated Irish coast. And it's not just a matter of our disrespect for Nature; the worry would not change significantly if we took a close look at the coast of a virgin island in the middle of the ocean. Suppose we locate the boundary of the island at the water/sand interface. That boundary is constantly in flux, and it is only by filtering it through our cognitive apparatus—it is only by interpolating objects and concepts—that a clear-cut line may emerge. Even if both water and soil were perfectly still and each were materially homogeneous, it would be hard to locate the boundary with precision. One is reminded here of a question familiar from the early literature on fractals: Just where, and how long, is the coastline of Britain? When measured with increased precision, the coastline would furnish lengths ten, a hundred, a thousand times greater than the length read off a schoolroom map. As ever-finer features are taken account of, the measured total length increases, and Benoît Mandelbrot concluded that "there is usually no clear-cut gap between the realm of geography and

details with which geography need not be concerned".[27] Cartographers know this well: one works with calipers, but their opening is not fixed by Nature. And if there is no fact of the matter answering the question, "How long is the coastline?", one wonders whether it is even meaningful to think of the coast as of a natural, objectively determined boundary. One begins to wonder whether the island itself might not in some sense be the product of our subjective and approximate worldmaking. And what goes for islands goes for all *prima facie* natural geographical or celestial entities: lakes, rivers, craters, glaciers, mountain chains, whole planets. "Even stars?", asked Israel Scheffler. Yes, even stars, answered Nelson Goodman: "As we make constellations by picking and putting together certain stars rather than others, so we make stars by drawing certain boundaries rather than others"[28].

It is a short step, now, to extend such doubts to all those boundaries that intuitively belong to the *de re* category, hence all those entities that would seem to enjoy a *bona fide*, mind-independent reality. We have already seen that ordinary material objects tend to dissolve as soon as we acknowledge their microscopic structure: this apple is just a smudgy bunch of hadrons and leptons whose exact shape and properties are no more settled than those of a school of fish. Or perhaps they *are* more settled, for the causal connectedness of the apple appears to be stronger than that of a school of fish; yet this seems to be a matter of degree, not the sort of categorial difference involved in the *de re/de dicto* opposition. But never mind that line of reasoning; one need not resort to microscopes to realize that the notion of a natural object is far from being clear and distinct. Take this cat, Tibbles—a paradigm example of a living creature, hence a perfect candidate to the status of a *bona fide* individual. Regardless of its subatomic structure, the question of what counts as *it* has no clear answer. Tibbles is eating a chunk of tuna. When it was in the plate, that chunk was definetly not part of Tibbles. But now it is in Tibbles's mouth: Is it part of Tibbles? Will it be part of Tibbles only after some chewing? Only when Tibbles swallows it? Only at the end of the digestive process? Surely, whatever mewing-and-purring portion of reality we mark off and elect to call 'Tibbles' is something that exists in its own right; as with the North Sea, its objectivity is not affected by the fact that our stipulation is a matter of arbitrary choice. Yet surely the stipulation adds a *fiat* element to its individuality. Tibbles is not entirely a product of our own making; yet its identity and survival conditions will obtain only relative to us. And this would remain true even if our stipulation were not quite "arbitrary"—even if

it fully returned what Jack Wilson calls the "biological individuality" of our cat.[29] Alas, biology is a science, and as such it involves its own stipulations. A workshop being held at the University of Utah at this very moment, on the topic "Edges and Boundaries of Biological Objects", focuses precisely on the thesis that "delimiting biological objects cannot be determined by empirical facts alone; which facts are salient, and what counts as evidence, often depend on theoretical and conceptual context".[30]

What goes for objects goes for events, including biological processes. Earlier I mentioned a person's birth and death as obvious examples of *de re* temporal boundaries, yet the controversies on abortion and euthanasia seem to push for a different treatment. Sometimes it *is* a matter of our deciding whether a person is still alive. *We* decide whether her "vital" functions are still in force, and the criteria for such decisions give expression to our beliefs, our principles, our theories. Similarly, on closer look the initial boundary of a person's life is hardly fixed by Nature alone. Surely that boundary does not coincide with the person's birth—itself a rather intricate, messy, often protracted process (later cleaned up by the registry office)—but neither is there an earlier moment that fits the bill comfortably. Would it be: the moment of *fertilization*, when the membrane of the sperm cell fuses with that of the egg? Or upon formation of the *zygote*? When the zygote begins to undergo a process of genetic *replication* and cell *division*? Upon formation of the *morula*? The beginning of the *implantation* process? The beginning of the *gastrulation* process, which gives structure to the embryo? The candidates are many. We can base our decision on as many factors we like, including up-to-the-minute scientific findings—but a decision it is. And if it is a matter of our (arbitrary or informed) decision, then the boundary is not genuinely *de re* after all and even a person's life becomes, to some extent at least, a *fiat* process.

What about natural properties? Natural kinds? Natural taxa? Here things get more complicated, of course, since the relevant notion of a boundary—especially the notion of a *de re* boundary—is less clear. In fact, when it comes to such entities, the natural/artificial distinction intertwines with the whole realism/nominalism controversy, and our geographic metaphor is bound to sound naïve and dismissive. Still, even here it's obvious and well known that, on closer look, our parochial concerns—historical and cultural circumstances, practical interests and limitations, theoretical priorities—tend to play a major role in the maps we draw of the world. Surely quadrupeds do not form a "natural" kind. But it would be quite remarkable, to use Catherine

Elgin's example, if a taxonomy that draws the distinction between horses and zebras where we do aligned with categories fitting the cosmos as a whole, but indifferent to our human faculties and ends (including our interest in domesticating animals).[31] Surely emeroses do not form a natural kind—but neither do roses. Why settle on *Rosa chinensis*? Even in physics, our microscopic categories seem to suffer from a variety of human contingencies. If we construe different isotopes as variants of the same type of atom, it is because of certain reasonable interests that predominated in the development of our best theories. One could as well construe oxygen-17 and oxygen-18 as different types of atom altogether, hence as "natural" kinds of their own. Here the problem is not that there are no differences in the physical world; the problem is that there are *too many* differences, and to privilege some over the others is to draw a *fiat* line—like the dotted line demarcating this apple from its exterior, or Tibbles from the rest of the world. Besides, it is a fact that even within specific domains of inquiry, our scientific practices are not uniform. The thought that the taxa countenanced by biology (for instance) are *fiat* entities seems to clash with "the certainty of biologists on the objective reality of evolution", as David Stamos puts it.[32] Yet even today many taxonomists base their classifications more on phenetic than on phylogenetic criteria, regardless of the avowed principles under which they operate, and in phenetics a natural classification is simply one in which the members of each taxon are on the average more similar to each other than they are to members of other taxa "at the same level" (by itself a problematic notion). Maybe such taxonomists are being sloppy. Maybe the phylogenetic criterion is better. (It even fits the creationists paradigm, as the God of *Genesis* supposedly created all living things to reproduce "according to their kinds"[33]). But that's enough to cast the doubt: a criterion is a criterion. We should not shudder if, in the end, we read in the *Annual Review of Ecology and Systematics* that "taxa are human constructs" and "natural taxa are those that are natural to humans".[34] And we should not complain if non-human animals have different taste. After all, there are horses and zebras, but also zorses and hebras. (Didn't Locke even see "the issue of a cat and a rat"?[35])

4. Conventionalism and Realism

It's pretty clear where all this is going. In the *Phaedrus*, Socrates famously recommends that we should carve the world along its natural joints, trying

"not to splinter any part, as a bad butcher might do"[36], and we know that science and common sense alike have taken this advice very seriously. If all boundaries were the product of some cognitive or social *fiat*, if the lines along which we "splinter" the world depended entirely on our *cognitive* joints and on the categories that we employ in drawing up our maps, then our knowledge of the world would amount to neither more nor less than knowledge of those maps. The thesis according to which all boundaries—hence all entities—are of the *fiat* sort would take us straight to the brink of precipice, to that extreme form of conventionalism according to which "there are no facts, just interpretations". On the other hand, to posit the existence of genuine, *bona fide* boundaries—to think that the world comes pre-organized into natural objects and properties—reflects a form of naïve realism that does not seem to stand close scrutiny.

We know how the compromise solution goes. Perhaps all boundaries are, on closer look, *de dicto* boundaries. It doesn't follow that they must be utterly *arbitrary*, i.e., lack any foundation in reality. It is like beef or veal, says Umberto Eco: "In different cultures the cuts vary, and so the names of certain dishes are not always easy to translate from one language to another, yet it would be very difficult to conceive of a cut that offered at the same moment the tip of the nose and the tail".[37] In other words, perhaps there are no obligatory paths, no one-way streets in the realm of Being; it still does not mean that anything goes. Some paths will still display a "no entry" sign, some constraints or "lines of resistance" may still be there, making it hard to cut the beast as we like. Out of metaphor, there may still be objective limits to our freedom to carve the world, and it is precisely in this spirit that the realism/conventionalism dichotomy is supposed to be handled. If it is presumptuous to think that the boundaries depicted on our physical maps are perfectly accurate, it is also implausible to think that they are completely off the mark. If it is implausible to think that biology can identify the exact moment at which a person's life begins, it is also implausible to suppose that life begins before fertilization, or at kindergarten. The very notion of "natural kind" to which scientists refer would not betray a commitment to naïve realism but, rather, a form of scientific realism whose cash value is first and foremost *pragmatic*. Just as the maps in our atlases have become more and more accurate, so will the maps drawn by the sciences. And just as cartographers are often forced to redraw their maps as a result of unexpected geo-political changes (the artificial boundary of Israel, but also the *prima facie* natural

boundary of sand between Lybia and Egypt, which keeps drifting under the wind), so biologists and other scientists will not refrain, if necessary, from updating their maps of nature, in an effort to achieve greater accuracy and truthfulness. (The taxonomic misadventures of the platypus would be a good illustration of this fact. What sort of beast is that? Not a MAMMAL, for it lays eggs. Not a REPTILE, for its blood is warm. Not a BIRD, for it's got four legs. For over eighty years, the naturalists were baffled: as René-Primevère Lesson observed in 1839, that double-damned beast had set itself "athwart the path of taxonomy to prove its fallaciousness".[38] Yet it was there, and eventually the category MONOTREME was created *ex novo*.)

Now, I have no intention of denying the pragmatic reasonableness of this stance. But I do not share its fundamental optimism, as I do not recognize the distinction between metaphysical realism and scientific realism if not, indeed, on a deflated understanding of the term 'realism'. That nobody cuts the beef in funny ways does not mean that the laws of nature prevent it. It means that in spite of our cultural diversities, the culinary taste and aesthetic sense of human beings display surprisingly robust regularities, literally as well as out of metaphor. Consider the debate on unrestricted composition. There is no question that we feel more at ease with certain mereological composites than with others. We feel at ease, for instance, with regard to such things as the fusion of Tibbles's parts (whatever they are), or even a platypus's parts; but when it comes to such unlovely and gerrymandered mixtures as Lewisean trout-turkeys, consisting of the front half of a trout and the back half of a turkey, we feel uncomfortable.[39] Such feelings may exhibit surprising regularities across contexts and cultures. Yet, arguably they rest on psychological biases and *Gestalt* factors that needn't have any bearing on how the world is actually structured. As James van Cleve has pointed out, even if we came up with a formula that jibed with *all* ordinary judgments about what counts as a natural fusion and what does not, it wouldn't follow that there may exist in nature only such objects as answer the formula.[40] If anything, it would follow that the factors that guide our judgments of unity impose systematic constraints on our *fiat* articulations.

Besides, the controversies on biotechnology demonstrate that even such factors are less robust than one might think. We feel horror and disgust for such unlovely and gerrymandered mixtures as chimeras and genetically modified organisms, but we have long learned to feed on orange-mandarines, yogurth, peppermint, and seedless grapes, and we didn't have many scruples

when it came to forcing zoological categories to make room for mules and poodles. According to the Royal Horticultural Society, in less than 150 years we have managed to fill the world with over 110,000 orchid hybrids. Either we are adamant that DNA is our model for an organism's individuality—and this is a metaphysical thesis that demands argument—or we must recognize that even the "no entry" signs on the way of Being are on closer look an expression of our contingent biases, reasonable as they might be. Of course, we are free to fight for or against such biases and to study their network in the spirit of honest descriptive metaphysics. After all, the world as *we* represent it is the only world we really care about, for it is the world on which we bet everything, including our happiness. That's why Husserl called it the *Lebenswelt*.[41] Nonetheless, that would not be a way of solving the dilemma between realism and conventionalism; it would be a reasonable way of getting rid of it altogether.

For those who think that the dilemma ought to be addressed explicitly, however, I am going to conclude with three remarks aimed at deflating, at least partly, the sense of collapse that usually comes with the conventionalist hypothesis, understood in the radical sense according to which there would be no *de re* boundaries whatsoever, whether "one way" or "no entry".

To begin with, one should not mistake the conventionalist hypothesis with the ghost of Berkeleyan *idealism*. As I have described it here, the notion of a *de dicto* boundary is intelligible only to the extent that we acknowledge an appropriate real basis for the sorts of demarcation that are effected by our pencils, trenching tools, and cookie cutters. Even assuming that all boundaries are of this sort, and wholly arbitrary, it does not follow that *everything* is the product of a *percipemus*. This is why I stressed that the cognitive dependence of a *fiat* entity affects its individuality but not its *objectivity*. This may well be seen as a "last-ditch effort" to save realism, as Andrew Cortens dubbed it,[42] but so be it. That the factual material onto which we project our categories should itself be a cognitive construct is a different, stronger thesis, which I do not even understand except in the figurative sense made popular by the thought experiments of rational skepticism (Cartesian demons, brains in a vat, the Matrix). From this perspective, conventionalism is not to be mistaken with Goodmanian *irrealism*, either. For Goodman—and for Richard Rorty—all we learn about the world is contained in right versions of it; "and while the underlying world, bereft of these, need not be denied to those who love it, it is perhaps on the whole a world well lost".[43] For a conventionalist,

the world is boneless, impoverished, almost bankrupt, but our love for it is not at stake. For Goodman, a world-version need not be a version of *the* world, just as a Pegasus-picture need not be a picture of Pegasus. For a conventionalist, all the maps we draw are indeed maps of one and the same reality. Putnamian *relativism*, then? Even less. For Hilary Putnam, the "cookie cutter" metaphor founders on the question, "What are the 'parts' of the dough?".[44] No neutral description is available to compare a Leśniewskian world (with *x*, *y*, and the fusion of *x* and *y*) and a Carnapian world (with only *x* and *y*), and assigning a univocal meaning to 'exists' is already "wandering in Cloud Cockoo Land"[45]. For the conventionalist, the metaphor holds and 'exists' corresponds to the standard existential quantifier. The number of *fiat* entities is up for grabs; but the parts of the dough, which provide the appropriate real basis for our *fiat* acts, are whatever they are and the relevant mereology is a genuine piece of metaphysics. (As far as I am concerned, composition is unrestricted, hence the mereology is Leśniewskian; so either Carnapians are not speaking with their quantifiers wide open, as when we say 'There is no beer' meaning 'There is no beer in the refrigerator', or else they are objectively wrong. Others might favor a different account. For instance, one may describe the conflict as stemming from the appeal to different "counting criteria", as Searle suggested,[46] or from a disagreement about whether composition is "innocent", in Lewis's sense.[47] But surely the world could not care less about our criteria and our jury verdicts.)

Second, what's so bad with conventions being arbitrary? We have just seen that, from a pragmatic perspective, it is not the putative *de re* structure of the world that drives our ways of carving it up, in our folklife as well as in science, but the robustness and utility of certain ways against the ephemeralness and futility (if not the absurdity) of others. If we just replaced Socrates's natural joints with Jefferson's pen strokes, then it would be a disaster, and unfortunately that's exactly what happens in some cases. The decision to annex Alaska to the US echoes the chef's unlikely resolution to prepare a dish with a veal's tail and the tip of its nose, and the thought of classifying people on the basis of their skin color or their intelligence quotient isn't much better than the idea of drawing the Dutch-Belgian border through the houses of Baarle. Nonetheless, in most cases the arbitrariness of our conventions, those that govern our social interactions as well as those that are accorded scientific dignity, epitomizes a democratic reasonableness that treasures experience and cooperation. Conventionalism, just like pre-Kantian empiricism, does

obliterate any substantive differences between the laws of nature and train timetables, as Maurizio Ferraris complains.[48] But timetables are not drawn up at random. They ensue from the necessity to *solve*, in an arbitrary but efficient way, coordination problems that can be extremely complex and that could seriously impair our daily deeds. If we come up with a timetable that works poorly, we change it. If a convention fails to measure up to our expectations, we replace it with a new, hopefully better one. Ditto with the laws of nature. For a conventionalist, not all biological taxonomies (for instance) are on a par. Some are better than others, because they better support the "laws" that govern biology's coordination game (laws of variation, selection, organic evolution, population growth, etc.). One may object that this sort of pragmatic efficiency calls for more than arbitrary, *fiat* demarcations. But the burden of proof is on the objector, not on the friend of conventionalism. Linnaeus's *Systema Naturae*, the bible of all classical taxonomies, was soaked with essentialism—and the platypus didn't fit in.[49] Darwin, by contrast, was adamant that the term 'species' is one "arbitrarily given for the sake of convenience to a set of individuals closely resembling each other"[50]—and his theory is much better.

Indeed, the arbitrariness of conventions does not even rule out that in some cases there is a single best way to go, a single best theory. On David Lewis's classic account, conventions are arbitrary insofar as they always admit of "equally good alternatives".[51] If a problem has a unique solution, then the solution is not conventional. By contrast, as I understand the term here, conventions are arbitrary insofar as they do not depend on the *bona fide* structure of the world. This need not imply that there always be at least two equally good choices that we could make; it simply implies that it is up to us—*in nostro arbitrio*—to make the choice. Hence I agree with Mark Heller: in some cases, "the adopted convention may be the single best choice, even the obvious best choice".[52] We may adopt a convention precisely *because* it is the best choice, but an arbitrary choice it is. It follows, therefore, that when it comes to the monism/pluralism debate concerning the status of scientific taxonomies (hence: theories), a conventionalist may even side with the monist, at least relative to a certain domain of inquiry. A conventionalist may be a monist, not insofar as there is a unique *correct* way of carving up the world, but insofar as there may be a unique *best* way of doing that.

Finally, for those who, like myself, believe in the significance of so-called prescriptive (or: revisionary, revolutionary, hard-core) metaphysics, it

is worth emphasizing that even a radical conventionalist stance across the board need not yield the nihilist apocalypse heralded by post-modern propaganda. The pervasiveness of *de dicto* boundaries does not coincide, for instance, with the death of the individual. On a Putnamian metaphysics, *there are* no individuals except in a relative sense. On a Goodmanian metaphysics, we *make* individuals by drawing boundaries as we like, and this goes "all the way down".[53] Not so for my conventionalist, or not necessarily. For a conventionalist, the identity of a cat, like the identiy of a cookie, a people, a nation, or a constellation, turns out to lack authonomous metaphysical thickness. But other individuals may present themselves. For instance, on a Quinean metaphysics, there is an individual corresponding to "the material content, however heterogeneous, of some portion of space-time, however disconnected and gerrymandered".[54] (What then distinguishes a material "substance" from other individuals is a detail, namely, "that there are relatively few atoms that lie partly in it (temporally) and partly outside".) That the content of some such portions of space-time have *de re* boundaries is a possibility, but it is equally possible that the only boundaries are those warranted by geometry. Either way, the corresponding notion of an individual is perfectly intelligible. The relevant identity conditions are perfectly determinate, and one may suppose that it is perfectly determinate, for any property, whether any given individual possesses it. Such individuals are perfectly nonconventional, yet the overall picture is one that a conventionalist is free to endorse. The conventionalist stance simply entails that *which* of them come to play a role in our life is up to us. From a God's eye point of view, they are all equally real. It's just that only some are salient for us, only some make us "feel comfortable", and only some are selected by us through the imposition of more or less precise and official *de dicto* boundaries. (Heller is one philosopher who explicitly endorses this view.[55])

Evidently, a metaphysics of this sort presupposes the existence of a large, all-embracing four-dimensional "dough". But we have already seen that such a presupposition is not incompatible with a conventionalist stance. Nor is reference to the boundaries warranted by geometry vetoed by that stance, as though it surreptitiously reintroduced *de re* demarcations. As we have outlined it here, the *de dicto*/*de re* distinction does not apply to the geometric boundaries of space-time any more than it applies to the boundaries presupposed by set theory. They are bare boundaries, so to speak: they are not "artificial", but neither are they "natural". As for the overall plausibility of the

theory, this is not the place to embark on an articulated defense. Surely the intuitive plausibility is pretty low, and perhaps also its scientific tenability. Yet, philosophically the deflationary purism of a theory of this sort would have some advantages, including the extermination of the essentialist cancer that besets those metaphysical theories that try to save common sense against the paradoxes of persistence, vagueness, and material constitution.

But, as I said, this is not the place to embark on an articulated defense of such metaphysics. (And it is but an example. A Sidellean metaphysics of "pure stuff" would do just as well.[56]) The relevant point is that, also in relation to the third worry, the conventionalist hypothesis need not result in a delegitimization of all philosophical inquiry; only a redistribution of the relative tasks and concerns of the different fields of inquiry, including metaphysics along with physics, psychology, or sociology. The costs are obvious, for epistemology and also for ethics. But so are the advantages. There are, on this view, no obligatory or forbidden paths; conventionalism is as liberal as it gets, and it is up to us to erect the "one way" or "no entry" signposts that we find appropriate, just as it is up to us to remove them when things take a turn for the worse. As Michael Dummett put it, the picture of reality as an amorphous lump, not yet articulated in discrete objects, is a good one "so long as we make the right use of it".[57] Most importantly, given that even common sense is far from being an all-or-nothing affair, except for certain surprising regularities, it is up to us to acknowledge our parochial limits without camouflaging them as "natural". At least then we would stop pretending that boundary wars have a "just" solution. To conclude on a rhetorical note, if there is a solution, let's face it, it lies in the reciprocal and democratic agreement among all interested parties, hard as it might be to achieve it.[58]

Notes

[1] Lord Curzon of Kedleston, *Frontiers. The Romanes Lecture*, Oxford, Clarendon Press, 1907.

[2] J. Calmette, 'La frontière pyrénéenne entre la France et l'Aragon', *Revue des Pyrénées*, 25 (1913), 1–19, at p. 1.

[3] B. Smith, 'On Drawing Lines on a Map', in A. U. Frank e W. Kuhn (eds.), *Spatial Information Theory. A Thoretical Basis for GIS*, Berlin, Springer, 1995, pp. 475–484; extended version as 'Fiat Objects', *Topoi* 20 (2001), 131–148.

[4] See P. Abelard, *Logica ingredientibus*, commentary on Porphyry's *Isagoge*

(partial Eng. trans. by P. V. Spade: 'From the "Glosses on Porphyry"', in P. V. Spade, *Five Texts on the Mediaeval Problem of Universals*, Indianapolis: Hackett, 1994, pp. 26–56, at p. 26). Compare Aristotle, *Metaphysics*, K, 2, $1060^{b}12$ff.

[5] F. Brentano, 'Vom Kontinuierlichen' (1914), in his *Philosophische Untersuchungen zu Raum, Zeit und Kontinuum*, ed. by S. Körner and R. M. Chisholm, Hamburg, Meiner, 1976, pp. 3–49, at p. 14 (Eng. trans. by B. Smith: 'On What Is Continuous', *Philosophical Investigations on Space, Time and the Continuum*, London, Croom Helm, 1988, pp. 1–48, at p. 10).

[6] See F. Suarez, *Metaphysicae Disputationes*, XL, 5, 41.

[7] M. Monmonier, *How to Lie with Maps*, Chicago, University of Chicago Press, 1991, at p. 90.

[8] Euclid, *Elements*, Bk I, Df 13.

[9] Aristotle, *Metaphysics* Δ, 17, 1022^{a}.

[10] Leonardo da Vinci, *The Notebooks*, selected Eng. trans. ed. by E. MacCurdy, London, Reynal and Hitchock, 1938, at pp. 75–76.

[11] C. S. Peirce, 'The Logic of Quantity' (1893), in C. Hartshorne and P. Weiss (eds.), *Collected Papers of Charles Sanders Peirce*, Vol. IV, Cambridge (MA), Harvard University Press, 1933, pp. 85–152, at p. 98.

[12] Aristotele, *Physics*, VI, 234^{a}ff.

[13] A. Galton, 'On the Ontological Status of Geographical Boundaries', in M. Duckham *et al.* (eds.), *Foundations of Geographic Information Science*, London: Taylor and Francis, 2003, pp. 151–71, at p. 167.

[14] B. Bolzano, *Paradoxien des Unendlichen* (a cura di F. Přihonský), Leipzig, Reclam, 1851 (Eng. trans. by D. A. Steele: *Paradoxes of the Infinite*, London, Routledge & Kegan Paul, 1950); see especially § 66.

[15] F. Brentano, 'Nativistische, empiristische und anoetistische Theorie unserer Raumvorstellung' (1906), in his *Philosophische Untersuchungen zu Raum, Zeit und Kontinuum*, *op. cit.*, pp. 164–177, at p. 174 (Eng. trans. by B. Smith: 'Nativistic, Empiricist and Anoetistic Theories of Our Presentation of Space', *Philosophical Investigations on Space, Time and the Continuum*, *op. cit.*, 138–149, at p. 146).

[16] Here I draw on B. Smith and A. C. Varzi, 'Fiat and Bona Fide Boundaries', *Philosophy and Phenomenological Research* 60 (2000), pp. 401–420.

[17] D. K. Lewis, *On the Plurality of Worlds*, Oxford, Blackwell, 1986, at p. 212.

[18] See e.g. R. Jackendoff, *Consciousness and the Computational Mind*, Cambridge (MA), MIT Press, 1987, Appendix B.

[19] E. W. Adams, 'On the Superficial', *Pacific Philosophical Quarterly* 65 (1984): 386–407, at p. 400. In the same spirit, D. Zimmerman speaks of "a part of the object which was first imbedded in the [object] and then disclosed wearing a new skin" ('Could Extended Objects Be Made Out of Simple Parts?', *Philosophy and Phenomenological Research* 56 (1996): 1–29, at p. 25).

[20] Here I refer to my 'Boundaries, Continuity, and Contact', *Noûs* 31 (1997), pp. 26–58, esp. p. 42.

[21] P. M. Simons, 'Faces, Boundaries, and Thin Layers', in A. P. Martinich and M. J. White (eds.), *Certainty and Surface in Epistemology and Philosophical Method. Essays in Honor of Avrum Stroll*, Lewiston, Edwin Mellen Press, 1991, pp. 87–99, at p. 91.

[22] Here I concur with Galton. See his 'Instantaneous Events', in H. J. Ohlbach (ed.), *Temporal Logic: Proceedings of the ICTL Workshop*, Saarbrücken, Max-Planck-Institut für Informatik, Technical Report MPI-I-94-230, 1994, pp. 4–11.

[23] G. Frege, *Die Grundlagen der Arithmetik*, Breslau, Köbner, 1884 (Eng. trans. by J. L. Austin: *Foundations of Arithmetic*, Oxford: Basil Blackwell, 1950), § 26.

[24] See J. R. Searle, *The Construction of Social Reality*, New York, Free Press, 1995.

[25] On all this, see B. Smith, *op. cit.*, as also his 'Agglomerations', in C. Freksa, and D. M. Mark (eds.), *Spatial Information Theory. Cognitive and Computational Foundations of Geographic Information Science*, Berlin, Springer Verlag, 1999, pp. 267–282.

[26] L. Febvre, *La terre et l'évolution humaine. Introduction géographique à l'histoire*, Paris, Alben Michel, 1922, at p. 354 (Eng. trans. by E. G. Mountford and J. H. Paxton: *A Geographical Introduction to History*, New York, Knopf, 1925, at p. 297).

[27] See B. B. Mandelbrot, 'How Long Is the Coast of Britain? Statistical Self-Similarity and Fractional Dimension', *Science* 156 (1967): 636–638. Some philosophers take questions such as these, and the lack of a definite answer, to be a sign of ontological vagueness; see e.g. B. J. Copeland, 'On Vague Objects, Fuzzy Logic, and Fractal Boundaries', *Southern Journal of Philosophy* 33 (Suppl.): 83–96.

[28] Cfr. I. Scheffler, 'The Wonderful Worlds of Goodman', *Synthese* 45 (1980): 201–209, at p. 205, and N. Goodman, 'Notes on the Well-Made World', *Erkenntnis* 19 (1983): 99–108, at p. 104 (see also Goodman's original reply in 'On Starmaking', *Synthese* 45 (1980): 210–215, at p. 213).

[29] J. Wilson, *Biological Individuality. The Identity and Persistence of Living Entities*, Cambridge, Cambridge University Press, 1999.

[30] *Edges and Boundaries of Biological Objects*, Annual Colloquium, University of Utah, Department of Philosophy, March 13–15, 2008. The quote is from the electronic flyer at http://www.phylosophy.org/eb.

[31] See C. Z. Elgin, 'Unnatural Science', *Journal of Philosophy* 92 (1995): 289–302, at p. 297.

[32] D. N. Stamos, *The Species Problem. Biological Species, Ontology, and the Metaphysics of Biology*, Lanham (MD), Lexington Books, 2003, at p. 131 (n. 35).

[33] *Genesis* 1:12, 21, 24–25.

[34] R. R. Sokal, 'Phenetic Taxonomy: Theory and Methods', *Annual Review of Ecology and Systematics* 17 (1986): 423–442, at p. 424.

[35] J. Locke, *Essay*, § III.vi.23.

[36] Plato, *Phaedrus*, 265^{d}.

[37] U. Eco, *Kant e l'ornitorinco*, Milano, Bompiani, 1997, at p. 39 (Eng. trans. by A. McEwen: *Kant and the Platypus. Essays on Language and Cognition*, New York, Harcourt Brace, 1999, at p. 53).

[38] I got the quotation second-hand from Eco, *op. cit*., at p. 216 (Eng. trans. at p. 250), though I was not able to locate the source.

[39] D. K. Lewis, *Parts of Classes*, Oxford, Blackwell, 1991, at p. 7.

[40] See J. van Cleve, 'Mereological Essentialism, Mereological Conjunctivism, and Identity Through Time', *Midwest Studies in Philosophy* 11 (1986): 141–156, at p. 145.

[41] E. Husserl, 'Die Krisis der europäischen Wissenschaften und die transzendentale Phänomenologie', *Philosophia* 1 (1936): 77–176 (Eng. trans. by D. Carr: *The Crisis of European Sciences and Transcendental Phenomenology*, Evanston (IL), Northwestern University Press, 1970), §9h.

[42] A. Cortens, 'Dividing the World into Objects', in W. P. Alston (ed.), *Realism and Antirealism*, Ithaca (NY), Cornell University Press, 2002, pp. 41–56, at p. 54.

[43] N. Goodman, 'Words, Works, Worlds', *Erkenntnis* 9 (1975): 57–73, at p. 60. Compare R. Rorty, 'The World Well Lost', *Journal of Philosophy* 69 (1972): 649–665.

[44] See H. Putnam, *The Many Faces of Realism*, LaSalle (IL), Open Court, 1987, Lecture 1, esp. p. 19.

[45] H. Putnam, *Ethics without Ontology*, Cambridge (MA), Harvard University Press, 2004, at p. 85.

[46] See J. R. Searle, *op. cit.*, at p. 163.

[47] See D. K. Lewis, *Parts of Classes*, *op. cit.*, at p. 85.

[48] M. Ferraris, *Goodbye Kant!*, Milano, Bompiani, 2004, at p. 17.

[49] C. Linnaeus, *Systema naturae, sive, Regna tria Naturae systematice proposita per classes, ordines, genera & species*, Leiden, de Groot, 1735.

[50] C. Darwin, *The Origin of Species by Means of Natural Selection*, London, Murray, 1859, at p. 52 (repr. London, Penguin Classics, 1985, at p. 108).

[51] See D. K. Lewis, *Convention. A Philosophical Study*, Cambridge, Cambridge University Press, 1969.

[52] M. Heller, *The Ontology of Physical Objects. Four-Dimensional Hunks of Matter*, Cambridge, Cambridge University Press, 1990, at p. 44 (n. 44).

[53] See N. Goodman, 'Notes on the Well-Made World', *op. cit.*, at p. 107 (n. 6).

[54] W. V. O. Quine, *Word and Object*, Cambridge (MA), MIT Press, 1960, at p. 171.

[55] See M. Heller, *op. cit*.

[56] See A. Sidelle, *Necessity, Essence, and Individuation. A Defense of Conventionalism*, Ithaca (NY), Cornell University Press, 1989.

[57] M. Dummett, *Frege. Philosophy of Language*, London, Duckworth, 1973, at p. 577.

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