Graham Harman’s Tool-Being: Heidegger and the Metaphysics of Objects (2002) was an interesting book. Its reading of Heidegger’s tool-analysis, I thought, was original and productive, its scholarship was thorough, its writing vigorous and engaging. The first two chapters of the book struck me as important and promising: here, perhaps, was a return to the things themselves that might open significant new pathways in contemporary philosophy. “The central theme of this book,” Harman wrote, is the way in which “entities tear away from the shapeless totality...the stance in which specific beings take up a relation to their own being.” “My approach,” he continued, “is based neither on a credulous realism nor on some devious taste for substance abstracted from all relation. It relies only a single, undeniable fact: the fact that there are discernible individual entities at all.”

Wrong side of the ontological difference,’ one of my friends quipped at the time. But I felt this was a philosophical effort worthy of attention. Harman pursued his theme by generalizing Heidegger’s tool-analysis, such that the reversal of readiness-to-hand into presence-at-hand was not only a phenomenon proper to the intentionality of Dasein, but was proper to any relation among any objects whatever. Relations among objects, Harman argued, are such that they always involve a selective constitution which differentially specifies individual entities as individual. A boulder need not be experienced as “a boulder” by an intentional consciousness in order to function in the world as a discrete and distinct object; it still manifests specific qualities and powers as something distinct in its relation to a tree during an avalanche, or in relation to an animal attempting to pass by it on a narrow path. It is through such selective relations that objects, Harman argued, are torn out of immersion within the contexture of the world: drawn into distinction, constituted as individual entities.

The final chapter of Harman’s book, however, took a disappointing turn—one that has proved insurmountable for his work since then, not to mention that of his followers now flying the flag of “object-oriented ontology.” Here, Tool-Being turned toward an argument that the distinction of specific objects depends upon their withdrawal from relations altogether. Objects are “vacuum-sealed” (TB 283) Harman claimed. They are absolutely distinct
only insofar as they are “devoid of all relation” (TB 225). Harman’s argument, if such it may be so called, was that no particular relation can ever exhaust “the reality” of an object, or “sound out every last fugitive echo of its being” (TB 223). Here is a specimen of his reasoning on this point:

No description of the bridge by a human being, and no touching of the bridge by the sea or hill that it adjoins, can adequately mimic the work of this bridge in its being. No perception of the bridge-thing, however direct a perception it may be, can accomplish the very actuality that the bridge brings about. The bridge is irreplaceable in an \textit{absolute} sense. To repeat, the tool-being of an object is the reality of that object quite apart from any of its specific causal relations, and unexchangeable for any grand total of such relations. Even if we were to catalog exhaustively the exact status of every object in the cosmos vis-à-vis this bridge, it would still be possible to conceive of other entities that might occupy a different stance or relation to it, if only they had entered the fray of the world. In this way, bridge-being is sheer reality, devoid of all relation. Tool-being withdraws not just behind any perception, but behind any form of causal activity as well. (TB 225)

Harman judges that since the “reality” of an object isn’t exhausted by causal relations, it must exist in “vacuum-sealed isolation” (TB 287). Couldn’t the bridge be constituted by the current context of its relations with other entities \textit{and} be differentially constituted by relations with new entities and contexts? The closest Harman comes to engaging this modest suggestion is his oft-repeated argument that if the objects of the world were constituted by their relations there could never be any change at all, because objects would hold nothing “in reserve” that might alter those relations.² He is fond of noting that Aristotle once said something similar. Such an argument supposes an initial stasis from which “every object in the cosmos” would be unable to break free; it doesn’t allow for the possibility that the constitution of objects and relations is \textit{never} absolutely stable, so that change need not derive (and how could it?) from their non-relational, “vacuum sealed” interiors.

Sadly, the concluding pages of \textit{Tool-Being} descend from here into an impenetrable fog. Harman acknowledges that in order for his ontology to be consistent objects must be non-relational—yet it must also be possible for the kidnapped Duke of Braunschweig, a pair of diamonds, a late landscape by Poussin, a genuine arrowhead from North America, a lock of hair from the late Elisabeth of Bohemia, and a specific rare Korean manuscript by an anonymous Zen master to count as an object, a substance (TB 284-287). If the “weirdness” of such scenarios is not sufficiently titillating to defer skepticism, the only compensation Harman offers for the collapse of his ontology into absurdity, irrelevance, and infinite regress is that other philosophical positions wouldn’t be able to rectify the incoherence of his own argumentation:

In a certain sense, the tool-being of a thing exists in vacuum-sealed isolation, exceeding any of the relations that might touch it. But now it also seems true that some sort of relationality is needed to create at least \textit{some} tool-beings. Until the Duke of Braunschweig is abducted, the pair of diamonds remains nothing but a ‘being of reason.’ However, neither of the other philosophical positions that I have criticized is any better equipped to clarify the situation. (TB 287)

This was the unfortunate conclusion of an initially promising book, and the stupor in which \textit{Tool-Being} ends has not been rectified by Harman’s subsequent writings. The most striking thing about the book’s conclusion is that it leaves us with no meaningful criterion for the constitution of objects at all. And by the time we are halfway through Harman’s next book, \textit{Guerrilla Metaphysics}, we realize that his account of causality will be predicated upon concepts drawn from analyses of metaphor and humor—\textit{a} substantial drawback for an ontology pretending to displace the centrality of human consciousness within the history of philosophy. Should any of this seem unpersuasive, we are submitted to the rhetorical \textit{coup de force} of constantly reiterated allusions to parrots and glaciers and quarks, etc., etc. Since all kinds of objects are often mentioned, this must really be a philosophy of objects. Distraction is what passes for epistemology.
More than ten years after the publication of Tool-Being, what has become of this program? Despite the precipitously diminishing returns of Harman’s work, despite clear-headed assessments of its pop-philosophical opportunism by former allies,4 and despite the thoroughgoing lucidity with which its conceptual incoherence has been diagnosed,5 “object-oriented ontology” has succeeded in establishing itself as an apparently viable academic trend. (Philosophical circumspection is not a great strength of American humanities departments). New Literary History has devoted a special issue to “object-oriented literary criticism,”6 and two of the movement’s “founders”—Ian Bogost and Timothy Morton—have recently been plenary speakers at the annual conference of the Society for Literature, Science, and the Arts.7 Perhaps, then, we might turn to Morton’s new book, Realist Magic: Objects, Ontology, Causality (2013), to assess the present state of “OOO” and the fruits of its influence within the American academy.

Morton tells us that “Realist Magic is an exploration of causality from the point of view of object-oriented ontology.”8 Indeed, the book carefully toes the party line of “OOO,” citing Harman with a frequency bordering upon obsequiousness and lauding his “seductive prose” in the acknowledgments (RM 9). The book risks not even a single quibble with Harman’s positions. Within the framework of those positions, Morton argues that “causation is wholly an aesthetic phenomenon” (RM 19). Aesthetic events, he insists,

are not limited to interactions between humans or between humans and painted canvases or between humans and sentences in dramas. They happen when a saw bites into a fresh piece of plywood. They happen when a worm oozes out of some wet soil. They happen when a massive object emits gravity waves. (RM 19-20)

“The aesthetic dimension is the causal dimension,” he tells us. “It still astonishes me to write this, and I wonder whether having read this book you will cease to be astonished or not” (RM 20). This is indeed an interesting claim; so let’s see what sort of arguments Morton makes on its behalf, quoting sufficient material for us to get a sense of their substance and style.

But first of all, Morton might interject, it isn’t really a matter of “arguments.” The book is more like a series of riffs. And it’s true, Realist Magic doubles down on a rhetorical strategy frequently adopted by Harman: the deployment of a style so effusive, so strenuously goofy and flippant, that anyone who engages the work closely enough to criticize it will (hopefully) appear stuffy and obtuse: such pedantic critics will seem to have missed out on all the anxiously projected fun. “One object plays another one,” Morton writes. “This empty orange juice bottle is playing the table in this airport, waggling back and forth as the table sways due to a wonky leg” (RM 71). Should you find the cutesy anthropomorphism of such passages banal and conceptually vacuous, you’re just taking yourself too seriously.

Yet Realist Magic asks to be taken very seriously indeed. Claiming that object-oriented ontology is “congruent with the last century of physics,” Morton is quick to point out that the results of the latter should nevertheless be considered secondary to the primacy of his own philosophical position:

This congruency is a good sign that an object-oriented theory of causality is on the right track. But it is not strictly necessary: if anything the necessity goes the other way around. In other words, quantum theory and relativity are valid physical theories to the extent that they are object-oriented. (RM 31)

Within the parameters of Morton’s rhetoric, those who hold that the validity of physical science does not, actually, depend upon its alignment with a recently articulated theory of vacuum-sealed objects withdrawn from all physical relations are guilty of “scientism” (RM 164). He insists that:

It’s about time humanists started telling scientists how to think again, as science seems to be defaulting to some quite old stereotypes. Which brings us again to OOO, the only non-reductionist, non-atomic ontology on the market. (RM 165)
There is a more modest sense in which I agree with some aspects of what Morton has in mind here. It is true, I think, that science requires for its foundation certain logical structures and conceptual categories which can either be implicitly presupposed or explicitly articulated. In this sense, by framing of a coherent conceptual scheme within which scientific procedures and results may be interpreted, philosophy can make a crucial contribution to scientific coherence. And while philosophy must be informed concerning the results of the physical sciences, it cannot be entirely subordinate to them—precisely because it is at least a co-condition for understanding those results.

But the tone of the snake oil salesman in Morton’s prose (“the only non-reductionist, non-atomic ontology on the market”) is not incidental: like every form of quackery, Morton’s version of “OOO” denigrates the same evidence of science and mathematics that it relies upon elsewhere—in some unrecognizably mutilated form. And this double maneuver requires for its operation a very credulous reader indeed. At one moment, Morton parodies the rhetoric of what he calls “post-postmodern thinking” in the following terms: “Hey, look at me! I’m totally entangled with not-me!’ ‘I am the walrus! And I’ve got the quantum theory to prove it.’ Do you though? A counter-argument might demonstrate that quantum theory is profoundly object-oriented” (RM 165). This is indeed an objectionable rhetoric, but it’s one that Morton himself deploys, constantly referring to hackneyed pop-scientific clichés about entanglement and action at a distance in order to suggest the alignment of “OOO” and quantum mechanics:

> It seems as if the ideal causal event would be a totally invisible and inaudible one. Yet we know from phenomena such as entanglement and superposition that such events, strangely and ironically, refute clunking in other ways, for instance by producing so-called action at a distance. (RM 95)

Or elsewhere:

> Quantum entanglement is truly random. What does this mean? It means for instance that in certain highly repeatable conditions the likelihood of a photon being polarized in a certain direction is totally uncertain before a “measurement” takes place....”Totally uncertain” means that no matter how much information you have, you won’t be able to predict the state of the photon. This is patently not the case with dice and billiard balls. Totall uncertain means uncertain in itself, rather than when we measure. One explanation for this total uncertainty is that a photon is in two or three different orientations simultaneously. This violates...the Law of Noncontradiction. (RM 25)

The problem with such passages is that the interpretation of phenomena like entanglement, superposition, and action at a distance—particularly their ontological interpretation—is itself a matter of debate both in quantum physics and in philosophy of science. But there is no real engagement with these debates in Morton’s book. Consider, for example, the position on such questions developed in Michael Epperson’s and Elias Zafiris’s recent book, Foundations of Relational Realism: A Topological Approach to Quantum Mechanics and the Philosophy of Nature (2013). Grounding their approach in consistent histories interpretations of quantum mechanics, Epperson and Zafiris forward a clear, plausible, and technically informed argument that Boolean logic, the principle of noncontradiction, and the principle of the excluded middle are in fact requisite for any meaningful interpretation of quantum mechanics, epistemological or ontological (31). “Even in quantum mechanics,” they write,

> calculated superpositions of potential outcome states necessarily presuppose discrete, observable, actual initial and final system states and their logical relation, and it is only via the later that predictive calculations are confirmed retrodictively. The electron, in other words, is always observed as actualized, in either one state or another, in satisfaction of PNC [Principle of Noncontradiction], and never observed as potentialized—i.e., as a superposition of potential states in violation of PNC. In this way, superpositions are properly understood as relations of successive actual states, initial and final, via an appropriate measurement interaction. (RM 37)
Whether or not one informed party or another agrees with this approach to understanding quantum mechanics within the framework of classical logic, it derives from a well-established interpretation of quantum mechanics (the consistent histories interpretation) of which Morton seems to have no cognizance, or which he chooses to ignore. It is not at all a fact, but a matter of present debate, whether the phenomena described by quantum mechanics are properly understood to violate the principle of noncontradiction.

Judging by his citations, most of the tidbits of post-classical physics Morton references are drawn from David Bohm’s books, *Quantum Theory* (1951) and *The Special Theory of Relativity* (1965). At one point he praises Bohm for challenging “the reigning Standard Model proposed by Neils Bohr” (RM 103), and elsewhere he argues that Bohr’s interpretation of quantum mechanics is responsible for “a longstanding taboo on ontological probing beneath the closed hood of quanta, which is why the ‘ontological interpretation’ of David Bohm and Basil Hiley has been vilified” (RM 170). Yet several sentences later he finds “Bohm’s version” guilty of undermining objects, insofar as it relies “on there being real entities that may enclose infinitesimal layers of smaller entities all the way down” (RM 170-172). Since this is a cardinal sin for “OOO,” it would seem a serious charge against Bohm. And earlier Morton includes Bohm in his mockery of various materialist ontologies: “if you really want to be a far-out materialist, you should go for monism, like Parmenides, Spinoza, or David Bohm” (RM 164). So which interpretation of quantum mechanics will Morton have us believe is consistent with “OOO”? Morton’s constant recourse to Bohm makes it clear that he leans heavily upon the latter’s books for his grasp of relativity theory and quantum mechanics. Why does Morton rely so heavily upon Bohm if the latter’s understanding of the relation between quantum mechanics and objects inconsistent with his own? The upshot of Morton’s pretension to tell scientists “how to think” is apparently the freedom to say just what he wants about science, picking and choosing the interpretive framing of his remarks without much attention to their consistency with his own ideas or their position within debates that already exist. Surely he can do as he pleases, but why should scientists listen to Morton tell them how to think when his thinking about the relation of his work to their own is disoriented and predicated upon superficial scholarship?

If the results of *Realist Magic*’s dabbling in quantum mechanics are negligible, let’s consider an example of how it treats the relation between philosophy and relativity theory. While attacking Whitehead’s process philosophy, Morton offers a supposed “refutation” of what he denigrates as “lava lamp materialism.” He claims that Whitehead’s account of process requires a static temporal frame in which processes take place (RM 166). Rather than reconstructing Whitehead’s theory of process in order to argue for this reading, pointing out exactly where and how Whitehead relies upon a static temporal frame, or grappling with the chapter on “Time” in Whitehead’s *The Concept of Nature* (1920), Morton instead indulges in an absurd thought experiment concerning the transformation of a “blob” into an apple. He claims that process philosophy depends upon yet cannot think the temporal frame in which such becoming occurs, and then he warns that:

Relativity will not help here, if you feel like defending lava lamp materialism. Relativity simply means that the frame is also blobby (Gaussian) rather than rigid (Galilean). It’s still a frame, still ontologically outside the entity. Imagine wrapping the graph around an orange. Congratulations. You now have exactly the same problem, wrapped around an orange. (RM 167)

It is hard to judge whether Morton really expects his readers to accept this as a valid characterization of the relation of Gaussian curvature to Cartesian space, or of the relation between time and geometry in relativity theory—or whether he simply expects us not to care. It’s hard to believe that Morton thinks his analogy makes sense or bears meaningfully upon the topic at hand (the role of time in Whitehead’s process philosophy or in relativity theory). Evidently we are meant to chuckle, but the passage well exemplifies the pure nonsense to which *Realist Magic* frequently resorts, papering over an incapacity for legible philosophical writing with an overbearing jocularity, tinged with a sort of careless aggressivity. Such passages substitute for persuasive arguments of the kind the author of *Realist Magic* is apparently incapable of making. And this strategy of substitution is particularly necessary when Morton is faced with a figure like Whitehead: a thinker trained in mathematics and physics, whose philosophy was deeply engaged with the development of relativity theory
and quantum mechanics as it unfolded. There is, of course, a voluminous body of scholarship on the relation of Whitehead’s thought to twentieth century science; but this is precisely the sort of scholarship a book like Realist Magic is too cheeky to engage with.\(^{14}\)

The poverty of Morton’s engagement with physics also extends to his forays into mathematics and logic. Attempting a more-set-theoretical-than-thou swipe at Alain Badiou, whom he faults for supposedly “preferring” the Zermelo-Fraenkel axiomatization of set theory to Cantor’s earlier work (RM 114), Morton demonstrates his own superior grasp of this material on the following page:

The set of real numbers contains the set of rational numbers but is infinitely larger, since it contains numbers such as Pi and the square root of 2. There appears to be no smooth continuum between such sets. So the set of real numbers contains a set that is not entirely a set of itself—the set of rational numbers sits awkwardly inside the set of real numbers, and it is this paradox that infuriated logicians such as Russell. Their “solution” is to rule this kind of set not to be a set— which is precisely to miss the point. (RM 115)\(^{15}\)

Yes, the set of real numbers is infinitely larger than the set of rational numbers, which it contains. But what does the remainder of this passage mean? “The set of real numbers contains a set that is not entirely a set of itself,” Morton states. When he says that the “set of rational numbers sits awkwardly inside the set of real numbers,” presumably he has in mind logical problems attendant upon fitting discrete parts (the rationals) into continuous wholes (the real number line). But even supposing we can make sense of these elliptical and sloppy formulations, what do they have to do with Russell’s paradox? Russell demonstrates the logical inconsistency of a set of all sets. His paradox results from a logical problem attendant upon predicating totalities. But no such predication is at issue in the relation of the rational numbers to the reals.

The obscurity here is clarified by a passage earlier in the book, in which Morton demonstrates that he does not understand Russell’s paradox at all—despite continually faulting Russell’s interpretation of his own finding. “Objects withdraw,” Morton writes, “yet they appear: \(p \land \neg p\) (\(p\) and \(\neg p\)). And objects contain beings that are not themselves, thus exemplifying Russell’s paradoxical (and for him, illegal) set of things that are not members of themselves” (RM 31). But the proposition that “objects contain beings that are not themselves” does not exemplify Russell’s paradox, since the latter, again, bears only upon totalities that could neither include nor exclude themselves among their predicates (the set of all sets that are not members of themselves).

If we attempted to construct the set of all objects, without including that total set as an object (which would then require another total set to include it) we could not do so. That is the import of Russell’s paradox, and it has nothing whatsoever to do with the claim that “objects contain beings that are not themselves.” It is not Russell’s understanding of his paradox, but rather Morton’s erroneous application of it, that precisely misses the point.

Again, such errors might be more easily forgiven were they not made by an author proposing alignment with his favored ontology as the primary criterion for scientific validity. As it is, however, they eviscerate the credibility of Realist Magic and testify to the hubris of Morton’s attitude toward science. But lest we think that the weaknesses of Realist Magic are restricted to its engagement with physics and mathematics, let’s consider one final passage in which Morton offers a critique of Marx. The context is a larger critique of theories of emergence. Earlier, Morton lauds Einstein for supposedly theorizing space and time as “emergent properties of objects” (RM 30). But later on, as it suits him, he says that theories of emergence depend upon “a kind of causal miracle”—and here Marx is called upon as an (improbable) example. Let me quote the whole passage so the reader can be sure nothing that might make sense of it has been omitted:

Consider the Marxist theory of industrial capitalism. From this standpoint, it turns out that the real problem with Marxism is that Marx is an idealist, or perhaps a correlationist. How can one justify such a fanciful notion? As a matter of fact, there are plenty of ways to do this. For instance, we could look at Marx’s antiquated anthropocentrism, which his beloved Darwin had blown sky high by the
Consider chapter 15 of Capital 1. There Marx outlines his theory of machines. The basic argument is that when you have enough machines that make other machines, you get a qualitative leap into full-on industrial capitalism. Marx never specifies how many machines this takes. You know it when you see it. If it looks like industrial capitalism, and quacks like industrial capitalism, then... So what this boils down to is a theory of emergence. Capitalism proper emerges from its commercial phrase when there are enough machines going ker-plunk or whatever. (RM 143-144)

This is what counts, for Morton, as a "more technical" argument. Remember—we are not reading the work of an overconfident undergraduate here, trying to find his way amid the complications of critical theory and thus protesting too much while understanding too little. We’re reading a book by the Rita Shea Guffey Chair in English at Rice University, whose previous two books were published by Harvard University Press. So what is going on here?

I’ve titled this review essay “The Nadir of OOO” because I think that the absurdities of Realist Magic are due at least in part to those it inherits from the incoherent ontology it wants to popularize and extend. In order to stake its claim to originality and supremacy, “OOO” has to fulminate against what it sees as a threatening field materialists, purveyors of “scientism,” process philosophers, Deleuzians, and systems theorists. It has to establish itself as “the only non-reductionist, non-atomic ontology on the market.” So Marx, as well, will have to be laid low. Since it would be prove difficult to mount a plausible or relevant critique of historical materialism from a perspective committed to a universe of objects withdrawn from relation, the object-oriented ontologist can only flail wildly at his target, hoping to construct arguments so preposterous that they can’t possibly be accused of trying to be serious. “Going ker-plunk or whatever”: the style affects an insouciance its desperation belies, and it amounts to self-parody.

What is the point, then, of talking about the book, even to criticize it? On a blog discussing Realist Magic, a reader says he wants to “dive deep enough into the object-oriented aspects of Morton’s thought to get some grasp of what he is trying to do.” The reader quotes a long passage concerning the essence of a cinderblock, which ends as follows:

You could explode a thousand nuclear bombs and you would not reveal the secret essence of the cinder block. You could plot the position and momentum of every single particle in the block (assuming you could get around Heisenberg’s Uncertainty Principle) and you wouldn’t discover the withdrawn essence of the block. Ten of the world’s greatest playwrights and film directors (let’s say Sophocles, Shakespeare, Garcia Lorca, Samuel Beckett, Akira Kurosawa and David Lynch just for starters) could write horrifying, profound tragedies and comedies and action movies about the block and still no one would be closer to knowing the essence of the block."

“Something tells me,” the reader writes, “if I can understand the passage above I might just be able to pick up what Tim is putting down.” But take care, dear reader: in order to pick up what Morton is putting down, you would need to understand less, not more. The difficulty of getting “some sort of grasp on what he’s trying to do” is inherent to the book, not any deficit of your own comprehension. Yet many readers, perhaps trying to find an initial foothold in philosophy and theory, will find themselves in a position from which this might not be apparent. And the problem with obscurantism is that its strategy is to reinforce incomprehension, rather than alleviating it. To the extent that this strategy can itself be clarified, its effect—the cultivation of ignorance and error—is mitigated. That is why it may be worth noting some reasons why no one should hope to understand anything by reading Realist Magic.

“OOO” seems to be relatively popular at the moment. But obscurantism usually gleans the sort of popularity that does not last. Despite the present popularity of “OOO” the conceptual weakness, the scholarly irresponsibility, and the rhetorical desperation of Realist Magic offer ample evidence that it is not aging well. Academic theory
NATHAN BROWN

will shortly try out a new flavor of the month—and the sooner the better, I suppose. It could not be more tasteless.

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NOTES

1. Cited hereafter in text as TB.
2. Levi Bryant reiterates this argument: “Were objects constituted by their exo-relations or relations to other objects, the (sic.) being would be frozen and nothing would be capable of movement or change. It is only where relations are external to objects that such change can be thought.” Levi R. Bryant, The Democracy of Objects. Ann Arbor: Open Humanities Press, 2011, 68.
4. Ray Brassier, associated with Harman through their participation in a symposium titled “Speculative Realism” in 2008, does not mince words in a 2013 interview (the context here is Harman’s continuing use of “speculative realism” as an umbrella category under which to position his own object-oriented ontology): “The ‘speculative realist movement’ exists only in the imaginations of a group of bloggers promoting an agenda for which I have no sympathy whatsoever: actor-network theory spiced with pan-psychist metaphysics and morsels of process philosophy. I don’t believe the internet is an appropriate medium for serious philosophical debate; nor do I believe it is acceptable to try to concoct a philosophical movement online by using blogs to exploit the misguided enthusiasm of impressionable graduate students. I agree with Deleuze’s remark that ultimately the most basic task of philosophy is to impede stupidity, so I see little philosophical merit in a ‘movement’ whose most signal achievement thus far is to have generated an online orgy of stupidity.” “I am a nihilist because I still believe in truth.” Interview with Marcin Rychter, Kronos 2 (2013): http://www.kronos.org.pl/index.php?23151.896
6. New Literary History 43.2 (Spring 2012).
9. “Clunking” is Morton’s shorthand for what he calls “billiard ball causality.”
11. Morton’s terminology seems to confuse the Copenhagen Interpretation of quantum mechanics developed by Bohr and Heisenberg, sometimes referred to as the “standard” interpretation, with the Standard Model of particle physics, developed in the 1960s.
12. He cites Bohm nine times in the four chapters of his book, compared to only five citations from other sources on post-classical physics.
13. Time is not, for Whitehead, a uniform static frame in which processes take place; the attribution of such a position to him is flatly incorrect. In the chapter on “Time” in The Concept of Nature, he writes: “We have first to make up our minds whether time is to be found in nature or nature is to be found in time. The difficulty of the latter alternative—namely of making time prior to nature—is that time then becomes a metaphysical enigma. What sort of entities are its instants or periods? The dissociation of time from events discloses to our immediate inspection that the attempt to set up time as an independent terminus for knowledge is like the effort to find substance in a shadow. There is time because there are happenings, and apart from happenings there is nothing” (66). It is integral to Whitehead’s philosophy that time is constituted by particular durations, and “a duration is discriminated as a complex of partial events, and the natural entities which are components of this complex are thereby said to be ‘simultaneous with this duration.’” Whitehead specifically corrects the sort of misunderstanding promulgated by Morton: “The word ‘duration’ is perhaps unfortunate in so far as it suggests a mere abstract stretch of time. This is not what I mean. A duration is a concrete slab of nature.” (53). Morton suggests that “if you really want to do an Einstein, time has to emanate from the object itself” (167). Whitehead’s philosophy meets just this criterion: time is not a static frame in which processes occur; as the passage above states: time is composed of durations, durations are complexes of partial events, and natural entities are the components of these complexes. Moreover, Whitehead holds that there is more than one time series in nature (70-73) while specifically criticizing modern materialism for viewing nature as an aggregate of
material that exists at successive extensionless instants of time (71).


15. Was Russell really “infuriated” by the paradoxes of set theory that he formulated? He seems to have had a rather sober correspondence with Frege concerning his findings.