

Spinoza's Vacuum Argument

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1. Introduction

Spinoza said that the only extended substance is the whole extended world and that finite bodies are not substances, i.e. are not worthy of a thing-like status in a fundamental metaphysics. He had reasons for this doctrine, though they do not occur in his official 'demonstration' that there is only one substance (*Ethics* 1, proposition 14). One reason was the view that an ultimately thing-like status cannot be accorded to something that is divisible. That was certainly Leibniz's view, and there are textual grounds for attributing it to Spinoza also, though the evidence for that is somewhat diffuse. But there is also an argument that occurs in a localized manner, in a passage I shall quote below; and my purpose in this paper is to expound it.

There are two reasons why this is worth doing. One is that the argument is intrinsically enjoyable: once it has been properly reconstructed, it is sharp and elegant and cogent. The other is that the argument points the way to an interpretation of its conclusion—i.e. of the doctrine that bodies are not substances—that helps one to understand other things in Spinoza. The interpretation of Spinoza's metaphysics of

the extended world emerging from this argument is better than most of what one finds in the secondary literature on Spinoza. And the literature seems not to contain so much as a serious *mention* of the argument that is my present topic.

2. The argument

The argument occurs inconspicuously in the course of a long explanatory Note appended to proposition 15 of Part 1 of the *Ethics*. Here it is:

If corporeal substance could be so divided that its parts were really distinct, why, then, could one part not be annihilated, the rest remaining connected with one another as before? And why must they all be so fitted together there is no vacuum? Truly, of things which are really distinct from one another, one can be, and remain in its condition, without the other. Since therefore there is no vacuum in Nature (this is discussed elsewhere), but its parts must so concur that there is no vacuum, it follows that they cannot be really distinguished, i.e. that corporeal substance, insofar as it is substance, cannot be divided.¹

¹ For my translations throughout this paper, I have relied almost entirely upon a soon-to-be-published translation of Spinoza's works by E. M. Curley [Princeton University Press].

The interpretation of this which I favor is not the most obvious one. There is a rival that stays much closer to Spinoza's words than mine does. But I reject the rival interpretation because it represents the passage as arguing from a premise that Spinoza did not accept to a conclusion that is hardly intelligible, whereas on my account it argues from a premise that Spinoza did accept to a crystal-clear conclusion that nicely fits the rest of what he says about the extended world. Either he efficiently expressed a dreadful argument or he made a clumsy job of expressing a superb one; and I prefer the latter hypothesis.

3. The wrong interpretation

The two interpretations differ in ways that flow from their differing understandings of the term 'vacuum', and thus of the statement 'There is no vacuum in nature'.

The wrong interpretation takes 'vacuum' in a very natural manner: you have a vacuum whenever you have a region of space that does not manifest any mass. (Here and throughout, take 'mass' as a stand-in for whatever empirical property you think marks the crucial difference between empty space and matter.) On this interpretation, the statement 'There is no vacuum in nature' means that *everything* extended has mass.

If that is Spinoza's premise, then his argument must go as follows. If you could hold all bodies still while annihilating one of them and leaving the rest intact, that would have to create a vacuum, i.e. something extended and massless. So from the premise that there is no vacuum we can infer that *such a vacuum-producing event cannot happen*. But why can it not happen? It must be because one body could not be annihilated while leaving all the others intact. Why not? Well, because what happens to one body is logically tied to what happens to the others. Why? Because bodies are not

really distinct parts of the extended world. Q.e.d.

That argument was used in the contrapositive direction by Locke: assuming that the annihilation of one body implies nothing for any other body, Locke uses the possibility of such an annihilation as proof of the possibility of 'vacuum' in the sense of something extended and massless (*Essay* II.xii.21). That is a good argument. But taken in our present direction, from the denial of vacuum to the denial that bodies are distinct from one another, it is worthless.

For one thing, it requires the premise not merely that there is not but that could not be a vacuum. Why should anyone think that there *could not be* massless regions of space? I can think of no reason, and there is no independent evidence of Spinoza's holding any such opinion, or even of his holding merely that there *are not* any massless regions of space.

Also, the conclusion of this argument is confusing and obscure: it says that bodies must fail to be 'really distinct from one another', so that the annihilation of one would result in... what? The others' closing in to fill the gap? I cannot what else emerges from the argument. But that conclusion is just silly—as though bodies failed to be 'distinct' from one another because they are joined by metaphysical rubber-bands—as well as being quite out of touch with the main lines of Spinoza's thought.

4. What Spinoza means by 'vacuum'

To get the argument right, we have to get 'There is no vacuum' right, which involves getting 'vacuum' right. The key to this is Spinoza's 'this is discussed elsewhere' (*de quo alia*), which is presumably a reference to the only other place in his writings where vacuum is mentioned—namely a passage in an early work whose short title is *Descartes's Principles*. In that work, Spinoza presents in his own fashion some doctrines that are

Descartes's rather than his own; but he agrees with many of them, so that often he is speaking for himself as well as for Descartes. I am sure he writes with conviction about vacuum. Here is the core of what he says about it:

The nature of body or matter consists in extension alone. . . Space and body do not really differ [because] body and extension do not really differ, and space and extension do not really differ. . . It involves a contradiction that there should be a vacuum [i.e.] extension without bodily substance. . . For a fuller explanation, and to correct the prejudice about vacuum, [Descartes's] *Principles* II.17–18 should be read. The main point there is that bodies between which nothing lies must touch one another, and also that nothing has no properties. (Spinoza, *Descartes's Principles* II. 2–3.)

To see what he is getting at, consider the question: If we pump all the air out of a vacuum jar, what is left in it? There cannot be literally *nothing* left, for if there really is nothing between the two sides then they will be in contact with one another, i.e. the jar will have collapsed. We might try to keep them apart, while not allowing that there is something in the jar, by saying that there is a *distance* between its sides. But Descartes has a good reply to this in the part of his *Principles* to which Spinoza refers. Distance, Descartes says, is a mode—a property or quality or measure—and there must be something it is *of*: you can have a mile *of road*, or a yard *of fabric*, but you cannot have just a sheer mile or a naked yard:

If it is asked what would happen if God removed all the body contained in a vessel without permitting its place to be occupied by another body, we shall answer that the sides of the vessel will thereby come into direct touch with one another. For two bodies must

touch when there is nothing between them, because it is manifestly contradictory for these two bodies to be apart from one another, or that there should be a distance between them, and yet that this distance should be nothing; for distance is a mode of extension, and without extended substance it cannot therefore exist. (Descartes, *Principles* II.18)

The moral is that if one is to speak of vacuum one must speak of it as *something extended*: it may lack mass, solidity, impenetrability, etc., but it must be thought of as something that has size and shape—not as a nothing that has size or shape, a case of size and shape that are not the size and shape of anything.

This is true and good. But Descartes partly spoils it by making two bad terminological decisions, in each of which he is followed by Spinoza. First, he took 'vacuum' to mean something like 'extended nothing', i.e. to mean something nonsensical. Second, he used the terms 'body' and 'matter' to mean nothing more than 'that which is extended', so that for him the adjective 'corporeal' meant merely 'extended'.

Where it would seem better to say that extended items divide into matter or body (which has mass, solidity, etc.) and vacuum (which lacks mass, etc.), Descartes allows the terms 'matter' and 'body' to sprawl over the whole realm of that which is extended, and lets 'vacuum' stand only for a non-realm, namely the territory of the nonsense-concept of 'extended nothing'.

Thus, when Descartes wants to say that the pumped-out jar does not contain a *cylindrical nothing*, he expresses this by saying that it does not contain 'vacuum'; and that is all he consideredly means by that remark. Similarly, when he says that the pumped-out jar still contains bodily substance, all he means is that it contains *something extended*—the 'something' might well be what *we* would call 'vacuum',

i.e. something extended but lacking mass, solidity, and so on. His whole point—expressed in unfortunate language which makes a philosophical truth sound like a scientific falsehood—is that there cannot be a region of space ‘in which there is absolute nothing’ (*Principles* II.16.)

As one might expect, Descartes sometimes forgot that he was using ‘vacuum’ and ‘matter’ in these peculiar ways, and took himself to be committed to holding that wherever there is extension there is mass, from which he then inferred things that do not follow from his considered premise that where there is extension there is something extended. But my present concern is not with those strayings but only with what he did primarily mean by ‘matter’ and ‘vacuum’; for it is those primary meanings which are taken over by Spinoza, consistently and with no muddle or forgetfulness.

When Spinoza says that there cannot be vacuum, then, he does not mean that there cannot be stretches of space that do not manifest solidity, mass, gravitational force, or whatever. He is not predicting what you will find if you ransack the physical universe. His point is a conceptual one: if the two sides of the jar do not touch, it follows logically that there is something between them. With that in our hand, let us return to his vacuum argument in the *Ethics*.

5. The right interpretation of the argument

I shall express the argument in my own way, and leave it to you to reread Spinoza's text and decide whether I am right about what he was getting at.

Suppose there are three contiguous cubic bodies—A, B, and C—of which the middle one, B, is annihilated while every other body in the universe, including A and C, is held still. The annihilation of B is to be thought of as B's being driven clean out of existence, in as radical a manner as we can coherently suppose. It does not matter that such

annihilation is physically impossible; we are concerned here with what is logically possible and logically necessary.

In particular, we are concerned with the following logical fact. If before the annihilation A and C do not touch one another, and if during the annihilation they not move, *then it follows with logical necessity that at the end of the annihilation they still do not touch one another*. What does their not-touching consist in? What is the positive fact from which flows the negative fact that they are not in contact with one another? Let us look at three answers to this.

First answer: ‘A and C do not touch because there is sheer distance between them—an extended nothing—a rectangular expanse that is not an expanse of anything. That explains the logical consequence emphasized above: there was a something in there; it was annihilated; so of course what remains is a nothing.’ That is the answer that Spinoza is rejecting when he says that there is no vacuum, meaning no extended-nothing. So we need another account of what the apartness of A and C consists in.

Second answer: ‘Since it is wrong to say that there is nothing between them, it must be right to say that there is something between them. (As Berkeley said: “We Irishmen are apt to imagine that something and nothing are next neighbours.”) Since nothing moved during the annihilation of B, what lies between A and C after the annihilation cannot have moved in from elsewhere. So it must have got there without moving, i.e. must have come into existence in that place immediately upon the annihilation of B.’ Unlike the first answer, this second one makes perfectly good sense; and it is a defect in Spinoza's argument that it does not mention this possibility. Still, we can see what Spinoza could have said to justify rejecting it—namely that it makes a mystery of the emphasized logical consequence. How can it possibly follow with logical necessity that if one thing is driven out

of existence a new thing of exactly the same size and shape comes into existence exactly then and there? We are invited to postulate a new 'something' to replace the old 'something' and thus to see the annihilation as being accompanied by a creation; but one event cannot logically require another event—there is no conceivable explanation of how such a logical consequence could be valid.

The **third answer** is the one I take Spinoza to be arguing for. It goes like this: 'What we are calling the annihilation of B is not, strictly and metaphysically speaking, a going out of existence of a thing. Rather, it is an *alteration*—a qualitative change in something that remains in existence throughout. Instead of the replacement of a massy thing by an extended nothing, or by a new un-massy thing, what happens is that something—namely a region of space—stays in existence all along and merely alters from being massy to being un-massy. The annihilation of the body B was just a thinning out (so to speak) in that region of space, so that the "something" lying between A and C after the annihilation of B is the very same "something" that lay there before B was annihilated.'

This third answer, unlike the first, is not nonsense. It describes empty space as something extended but lacking in certain empirical qualities; and there is no incoherence in that. And unlike the second answer, the third shows why the emphasized logical consequence is valid. For it is free to interpret the premise that during the annihilation A and C do not move as meaning that any region lying between A and C at the start of the annihilation still lies between them at the end of it; and the 'annihilation' is unproblematic, since it is a mere qualitative alteration of that region. The logical consequence was mysterious when the situation was represented as the replacement of something by something else; but now we can put it on a par with replacement of the heat of a cup of coffee by its coolness—there is no mystery

about why 'annihilating' one entails 'creating' the other.

6. The resultant picture

The metaphysical moral is that bodies should be understood in terms of—to put it in shorthand—thickenings of regions of space. Spinoza sees the extended world as a single item, perhaps called Space, that is qualitatively varied from region to region: some regions at given times qualify as bodies, other as empty space. It is a single thing rather than an assemblage of regions, for several reasons of which I here give just one. (Others will be discussed in a book I am writing, tentatively entitled *Spinoza's Arguments*.) It is that of the infinitely many alternative ways of dividing Space into regions, none is metaphysically privileged; so that if we wanted to make regions metaphysically more basic than Space, we could not know which regions to select.

That is not to say that any division into regions must be purely arbitrary—a mere mathematical *jeu d'esprit*—for we can reasonably mark off certain regions as qualitatively different from their neighbors in ways that interest us. But those qualitative differences belong to empirical science rather than to fundamental metaphysics. Furthermore, they are seldom if ever permanent: what we mainly have reason to mark off as such subjects for special attention are not *regions* but rather *continuous sequences of regions-at-times*—namely the ones we call 'bodies'.

In deciding exactly which sequences to count as individual bodies, we shall be deciding whether to allow that two bodies can occupy the same place at the same time. This vexed question will thus be made to depend on a matter of conceptual convenience; it will not drive us down to the deep metaphysics of the concepts of body and of occupancy, because at the deepest metaphysical level neither of those concepts has application.

That is one example of the liberating virtues of Spinoza's way of looking at the extended world. It is indeed a bit of metaphysics that is brimming with health and vitality. Another example is its freedom from the assumption that whatever occupies space must be either a body or a construct out of bodies—so that *forces* must be tendencies-toward-movement of bodies, *waves* must be movements of bodies, and so on. Spinoza can reject all such narrowing assumptions, e.g. allowing for the possibility of waves that do not consist in undulations of particles.

7. Space as a container

With the outlines of Spinoza's doctrine of the extended world before us, we can now deal with a certain gap in his vacuum argument. In reply to the question 'What is there between A and C after B has been annihilated?' I produced three answers: **(1)** 'Nothing but sheer extension', which Spinoza rightly rejects; **(2)** 'A thing that has just come into existence', which Spinoza could reasonably have rejected; and **(3)** 'The same thing that was there before the so-called "annihilation",' which is Spinoza's own answer. There is, however, a fourth possible answer, expressing a view about bodies and space which may have been more widely held than any other. It is that before the annihilation there were two things between A and C—a region of space and the body B—and that after the annihilation of B there remained only the region of space. That seems intelligible, and it does justice to the consequence that all the fuss was about: if of two things one is annihilated, of course it follows that there is just one thing left—there is no mystery about that! How, then, can Spinoza justify rejecting this account of the matter in favor of his own?

Well, for a start he can point to all the troubles that arise over the concepts of body and of occupancy if they are allowed to appear at the most fundamental level. But there

is something more positive than that to be said. I believe that it is part of what Spinoza had in mind; but I base that only on my impression of what he is up to in this part of his work—I have no textual evidence for it.

The basic objection to the view that before the annihilation there were two things between A and C is just that it is ontologically extravagant for no good purpose. On this double-occupancy view, what we at first have between A and C is the body B and also a region of space R which has exactly the same shape and size as B itself. Now, Spinoza has an account of what it means to say that R is occupied by a body at time T—namely that R has certain empirical properties at T and that the place-time R-at-T belongs to a sequence of place-times satisfying certain conditions. The rival view denies that R *has* those properties, saying instead that it *contains a body that has* them. The body is inserted between the space and the properties, like a silk lining between a hand and a leather glove. But this lining makes no difference; it is a purely verbal insertion, and so we should cut it out.

Of course space contains bodies. I am not denying that. My point is just that the concept of body does not belong at the deepest metaphysical level: it is to be defined one level up, in terms of the concepts of 'region of space' and 'qualitative variety'. We could not distinguish regions of space from one another unless they were qualitatively varied, the variations being subject to dependable regularities; but that is not to say that we could not distinguish them unless they contained bodies.

8. More textual evidence

According to Spinoza's account, just one basic extended thing—Space—is qualitatively ('modally') varied from region to region. That this is indeed his picture of things is confirmed a little later in the Note containing the vacuum

argument. Here is what he says, in the words of a sound, conservative translation of Latin:

Matter is everywhere the same, and. . . its parts are distinguished in it insofar as we conceive matter to be affected in different ways, so that its parts are distinguished only modally, but not really. For example, we conceive that water can be divided and its parts separated from one another—insofar as it is water, but not insofar as it is corporeal substance. For insofar as it is substance it is neither separated nor divided. Again, water, insofar as it is water, is originated and destroyed, but insofar as it is substance it is neither originated nor destroyed.

Here it is again, in words that express Spinoza's thought a little more clearly to modern ears:

Space is everywhere the same, and. . . its parts are distinguished in it only to the extent that we take it to be qualitatively varied, so that its parts are marked off qualitatively but not really. For example, we think of water as something that can be divided and its parts separated from one another—but this is only considered as *water*, not considered as *what is extended*. For considered as what there basically is, it is neither separated nor divided. Again, water considered as water can be brought into existence and annihilated, but considered as what there basically is, it cannot be brought into existence or annihilated.

If that is a fair rewrite, then this passage expresses the view I have taken Spinoza to be arguing for in his vacuum argument.

One last piece of evidence. Suppose that we ask Spinoza: 'What would be involved in a real annihilation of a body, i.e. an annihilation that was metaphysically a going out of existence of something and not a mere alteration in a region of space?' If I am right about his position, he would have to reply: 'That would be *the annihilation of a region of space*, which does not make sense unless one means it to be the abolition of space as a whole.'

With that in mind, read this extraordinary thing that Spinoza says in a letter to a friend:

Men are not created, but only generated, and their bodies existed before, although formed differently. From this you can infer something which I willingly accept, namely that if a single part of matter were annihilated the whole of extension would vanish in that moment. (Letter 4.)

The first sentence, taken on its own, could reflect any of several metaphysical positions, e.g. the view that the material world consists of sempiternal atoms floating in a container-space. But the second sentence points uniquely toward the metaphysical position I have attributed to Spinoza. On the basis of that position, the sentence is perfectly true; I can find no other basis on which it is other than madly extravagant and unwarranted.