

From Newton, *De gravitatione et æquipondio fluidorum* (revised translation and interpolated comments by H. Stein):

[Note: The paper is an evidently uncompleted Latin manuscript on hydrostatics (the title under which it has come to be known is simply the opening phrase of the work). Its date is uncertain, although the preponderance of scholarly opinion puts it in the late 1660's. Most of the paper consists in a long digression on the concepts of space and of body; following this digression, a further series of definitions, and two axioms, there are just two propositions and five corollaries, and the paper breaks off.--Although this paper may date from early in Newton's career, the contents of the digression have a connection both with the scholium on space, time, place, and motion in the *Principia*, and with a curious passage in Locke's *Essay* (in IV. x. §18). As to the latter, the statement that "possibly, if we would emancipate ourselves from vulgar notions, . . . we might be able to aim at some dim and seeming conception how matter might at first be made" did not occur in the first edition (1690); the change was made in the second (1694), and it aroused great curiosity what the theory of creation could be that Locke was hinting at. The second French edition of the *Essay* contained a note to this passage by the translator, Pierre Coste: "Here Mr. Locke excites our curiosity, without being inclined to satisfy it. Many persons, imagining that he must have communicated to me this mode of explaining the creation of matter"--Coste had served as Locke's amanuensis for several years, and had translated the work under Locke's supervision--"requested, when my translation first appeared, that I would inform them what it was; but I was obliged to confess that Mr. Locke had not made even me a partner in the secret. At length, long after his [Locke's] death, Sir Isaac Newton, to whom I was accidentally speaking of this part of Mr. Locke's book, discovered to me the whole mystery. He told me, smiling, that he himself had suggested to Mr. Locke this way of explaining the creation of matter; and that the thought had struck him one day, when this question chanced to come up in a conversation between himself, Mr. Locke, and the late Earl of Pembroke. He thus described to them his hypothesis:"--and there follows a brief statement of the same account of the creation of matter that appears in the present paper.--The passage from Coste's note has been given in the version to be found in A. C. Fraser's edition of Locke's *Essay* (reprinted, Dover Publications, 1959), vol. II, pp. 321-322, n. 2.

All emphases (italics) in the following are supplied, for purposes of clarification, by the translator, except for one passage (explicitly noted) that is emphasized in the original. The capitalization of words follows Newton exactly.]

It is fitting to treat of the gravitation and equilibrium of fluids and of solids in fluids by a twofold method. So far as the subject belongs to the Mathematical sciences, it is right that I abstract as much as possible from Physical considerations. And for this reason I have undertaken to demonstrate its individual propositions strictly, in the manner of the Geometers, from abstract principles sufficiently known to the student.

Then, because this doctrine may be judged to be in a way akin to natural Philosophy, in so far as it is applied to the elucidation of many of its Phænomena, and further that its use may thereby be made especially clear and its principles perhaps confirmed, I shall not hesitate to illustrate the propositions from abundant experiments as well: but in such a way that this freer sort of discussion, disposed in Scholia, shall not be confused with the former, treated in Lemmas, propositions, and corollaries.

The bases from which this science is to be demonstrated are definitions of certain words, and axioms and postulates denied by no one. And of these I treat forthwith.

Definitions

The terms quantity, duration, and space are too well known to be susceptible of definition by other words.

Def: 1. A place is a part of space that a thing fills adequately.

Def: 2. A body is that which fills a place.

Def: 3. Rest is remaining in the same place.

Def: 4. Motion is change of place.

Note. I have said that a body *fills* a place, that is, so saturates it as utterly to exclude other things of the same kind (other bodies) as if it were an impenetrable being. A place could, however, be said to be a part of space that a thing adequately occupies [*inest*: literally, "is in," as contrasted with *implet*, "fills"]; but as only bodies are here considered and not penetrable things, I have preferred to define it to be a part of space that a thing fills.

Further, since body is here proposed for investigation not in so far as it is a Physical Substance endowed with sensible qualities but only in so far as it is extended, mobile, and impenetrable, I have not defined it in a philosophical manner, but abstracting the sensible qualities (which Philosophers too, if I am not mistaken, ought to abstract, and attribute to the mind as various modes of thinking excited by the motions of bodies), I have posited as many properties as are required for local motion. . . .

For the rest, since in these definitions I have supposed space distinct from body, and have determined motion with respect to the parts of that space, not with respect to the positions of contiguous bodies [this latter being the procedure advocated by Descartes in his *Principles*], that this may not be received as gratuitously contrary to the Cartesians, I shall undertake to dispose of his [Descartes's] Figments.

I can summarize his doctrine in the following three propositions: 1st That to each body there belongs according to the truth of the matter only one proper motion. (Artic 28, 31 & 32 part 2 Princip:) which is defined to be the Translation of one part of matter or one body from the neighborhood of those bodies immediately contiguous to it, and which are regarded as at rest, to the neighborhood of others (Art 25 part 2, & Art 28 part 3 Princip). 2nd That by a body translated by a proper motion according to this definition may be understood, not only a particle of matter, or a body composed of

parts mutually at rest, but *anything* that is transferred all together--even though this may itself in turn be composed of many parts which have other motions among themselves. Art. 25, part 2, Princip. 3rd That besides this motion proper to each body, innumerable many others may in fact be in it *by participation* (or in so far as is a part of other bodies having other motions) (Art 31, part 2 Princip): Which however are not motions in the philosophical sense and speaking with reason (Art 29 part 3) and according to the truth of the matter (Art 25, part 2 & Art 28 part 3:) but only improperly and in the ordinary sense. (Art 24, 25, 28, & 31 part 2, & Art 29, part 3.) That kind of motion he is pleased to describe (Art 24 part 2, & 28 part 3) as *the action by which any body travels from one place to another.*

And just as he sets up twofold motions--namely, proper and derivative--so he assigns twofold places from which these motions are performed: the surface of the *immediately surrounding* bodies (Art 15 part 2), and the situation with respect to *any* other bodies (Art 13 part 2 & 29 part 3).

Now in truth not only do its absurd consequences convince us how confused and discordant with reason this doctrine is, but even Descartes himself, by contradicting himself, is seen to acknowledge the fact. For he says that the Earth and the other Planets, speaking properly and in the philosophical sense, are not moved, and that he speaks without reason and only in the ordinary way who declares the same to be moved on account of [their] translation with respect to the fixed stars (Art 26, 27, 28, 29 part 3). Afterwards, however, he posits in the Earth and the Planets a tendency to recede from the Sun as from a center about which they are moved, so that they are held in balance at their [respective] distances from the Sun by the like tendency of the circulating Vortex Art 140 part 3. What then?--is this tendency to be derived from the true and Philosophical *rest* of the Planets according to Descartes, or rather from the [ir] ordinary and non-Philosophical *motion*? And Descartes further says that when a Comet first enters the [solar] vortex and (approximately retaining its position among the fixed stars) does not yet yield to the impetus of the Vortex, but in relation to it is transferred from the vicinity of the contiguous æther and therefore (to speak philosophically) whirls around the sun, it tends less to recede from the sun than later, when the matter of the Vortex has dragged the Comet along with it and made it (in that same philosophical sense) to be at rest. Art 119 & 120 part 3. The Philosopher, then, just is not consistent with himself: now using the ordinary motion, which a little earlier he had rejected, as the basis of Philosophy, and now rejecting as nugatory that motion which he had earlier declared to be the sole true and philosophical one according to the nature of things. And since the whirling of the Comet about the Sun in his Philosophical sense does not effect a tendency to recede from the center, which the whirling in the ordinary sense is able to effect, surely motion in the ordinary sense ought to be acknowledged as the more philosophical.

[There follows here a series of further points in which, Newton claims, Descartes contradicts himself. Next, Newton remarks that besides these contradictions within the Cartesian teaching, the doctrine he has summarized above can be seen to be absurd

from its consequences; again a somewhat lengthy series of such points is given--eight in all--of which it will suffice to paraphrase the last: On Descartes's account of motion, Newton says, it is impossible to make sense of the notion of the speed of a body, or of that of the line of its trajectory; in particular, therefore, one cannot even *formulate* the first principle of the theory of motion, namely that a body moving without resistance will continue with constant speed in a straight line. To show this, Newton asks us to consider the problem of identifying--now--the "place" that was occupied by the planet Jupiter a year ago. According to Descartes, the place of a body is defined by the bodies that immediately surround it (point 1 in Newton's summary of Descartes above). But where, now, are the bodies that immediately surrounded Jupiter a year ago? (On Descartes's theory, these would be chiefly particles of what Descartes calls "the second element" and Newton calls "the æther"--the minute particles that make up the main matter of the vortices which, according to Descartes, carry the planets around with them in their swirling.) Newton answers that any such bodies--and, indeed, any other bodies that one might choose to refer the position of Jupiter to--will have changed their own positions, relative to one another, in the course of the year (and one may add that if there were bodies contiguous to Jupiter of the sort Descartes supposed, these bodies may be expected to have become widely dispersed in the interval). Therefore, Newton concludes, *there is nothing now in the world* that can be identified as (by Descartes's criterion) the former place of Jupiter. But this argument is quite general: it applies to any body, and, in principle, to any, even very short, interval of time. It follows that the series of places occupied by a body in the course of time--the line of its trajectory--simply does not exist (or rather, the phrase "the line of its trajectory" has no meaning) on Descartes's terms; so neither speed nor line of motion can be defined. Newton concludes:]

. . . It follows indubitably that Cartesian motion is not motion, for it has no velocity, no direction, and hence there is no space or distance traversed by it. So it is necessary that the determination of places, and hence of local motion, be referred to some immobile being, such as extension alone, or space in so far as it is seen to be truly distinct from body. And this the Cartesian Philosopher may the more willingly acknowledge, if only he notices that Descartes himself had an idea of extension as distinct from bodies, which he wished to distinguish from corporeal extension by calling it "generic." Art. 10, 12, & 18, part 2 Princip. And that the whirlings of the vortices, from which he deduced the force of the æther in receding from the centers (and therefore his whole mechanical Philosophy), are tacitly referred to this generic extension.

Furthermore, since Descartes in Art 4 & 11 Part 2 Princip claims to have demonstrated that body in no way differs from extension (abstracting, namely, hardness, color, weight, cold, warmth, and the other qualities that a body can be without--so that there remains at last only its extension in length, breadth, and depth, which therefore alone belongs to its essence); and since this is regarded by many as a [genuine] demonstration, and is as I believe the only reason why credence can be given at all to this opinion: in order that no doubt shall remain concerning the nature of

motion, I shall reply to this argument by saying what Extension is, what body, and in what way they differ from one another. For since the distinction of substances into thinking and extended, or rather into thoughts and extensions, is the principal foundation of the Cartesian Philosophy, which he contends to be even better known than mathematical demonstrations: its overthrow in respect to extension, in order that truer foundations of Mechanics may be laid, I hold for no small thing.

It may perhaps now be expected that I define extension to be either substance or accident or else simply nothing¹. But not at all so: for it has a certain mode of existence proper to itself, which suits neither substances nor accidents. It is not substance: first, because it subsists, not absolutely of itself,² but as, so to speak, an emanative effect of God, and a certain affection of every being [or “every thing”: *omnis entis affectio*]; then, because it does not stand under the kind of characteristic affections that denominate substance, namely *actions*, such as are thoughts in a mind and motions in a body. For although Philosophers do not define substance to be a being that can act upon something, nevertheless they all tacitly understand that of substances, as for instance is plain from this, that they would easily concede extension to be a substance like a body if only it could be moved and could exercise the actions of a body; and on the other hand, they would by no means concede a body to be a substance if it could neither be moved nor arouse any sensation or perception in any mind whatever. Moreover, since we can conceive clearly of extension existing as it were without any subject, as when we imagine extramundane spaces or any places void of bodies; and we believe it to exist wherever we imagine there to be no bodies, nor are we able to believe that it would perish with the body if only God were to annihilate some body; it follows that it does not exist in the manner of an accident inherent in any subject. And thus it is not an accident. But far less can it be said to be nothing, since indeed it is more “something” than is an accident, and rather approaches to the nature of substance. Of nothing, no Idea is given, nor has it any properties, but of extension we have an Idea the clearest of all, namely by abstracting the affections and properties of body so that there remains only the uniform and unlimited stretching out of space in length breadth and depth. And furthermore its many properties are concomitant with this Idea; which I shall now enumerate, in order to show not only that it is something, but what it is.

1. Space can be distinguished everywhere into parts whose common boundaries we are accustomed to call surfaces; and these surfaces can be distinguished everywhere into parts, whose common boundaries we call lines; and these lines in turn can be distinguished everywhere into parts that we call points. . . .

2. Space extends to infinity uninterruptedly on all sides. . . .

¹In this last alternative, Newton presumably alludes to the ancient atomists’ characterization of the void as “non-being.”

²*Absolute per se*: to subsist “per se” is the standard (medieval) defining characteristic of substance.

If anyone now objects that we cannot imagine infinite extension to exist; I concede: But at the same time I contend that we can *understand* it. We can *imagine* a greater extension and then a still greater one, but we *understand* that there exists a greater extension than any we can imagine. And hence, by the bye, the faculty of understanding is clearly distinguished from the imagination.

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If Descartes now says that extension is not infinite but rather indefinite, he should be corrected by the Grammarians. For the word indefinite is never applied to that which actually is, but always relates to a future possibility signifying something not yet determined and definite. Thus before God had decreed anything about the creation of the World (if there was ever a time when he had not), the quantity of matter, the number of the stars and all other things were indefinite; which now, the world once created, are defined. . . . But I see what Descartes feared, namely, that if he had posited space as infinite, it might have constituted God, because of the perfection of infinity. But not at all: for infinity is not a perfection except as imputed to perfect things. Infinity of intellect, power, happiness, &c is the highest perfection; infinity of ignorance, impotence, misery, &c the highest imperfection; and infinity of extension is [or is not] a perfection according to the character of the [things] extended.

3. The parts of space are immobile. . . . For just as the parts of duration are individuated by their order, so that (for example) if yesterday could change places with today and become the later, it would lose its individuality and be no longer yesterday but today: So the parts of space are individuated by their positions, so that if any two could interchange their positions, they would at the same time interchange their individualities, and each be converted numerically into the other. The parts of duration and of space are understood to be the same as they truly are solely by their order and mutual positions; nor have they any other principle of individuation beyond that order and those positions--which therefore cannot change.

4. Space is an affection of a being just as a being.³ No being exists or can exist that does not have relation in some way to space. God is everywhere, created minds are

³The expression "being as being"--Latin: *ens quatenus ens*--is borrowed directly from the Aristotelian tradition, in which "being as being," or "being as such," is the standard definition of the subject-matter of first philosophy or metaphysics. It should be noted that, in the first place, Latin possesses no article--so that the very same Latin phrase can be construed as meaning "a being as a being"; and, in the second place, that the word *ens* can be used quite concretely to mean a (particular) *thing* (cf. both our own use of the word "entity," and our use of the word "being" in such an expression as "a human being"). The translation here chosen is motivated (a) by what seems to make sense in the context of this sentence itself (where "an affection of being *qua* being" would be, at best, obscure), and (b) by the confirming evidence of what immediately follows, in which the same word, *ens*, is clearly used in its concrete, particular sense, and not for "being" in the abstract.

somewhere, and a body in the space that it fills; and whatever is neither everywhere nor anywhere is not. And hence it follows that space is an emanative effect of the first-existing being, for if I posit any being whatever I posit space. And the like may be affirmed of Duration: namely both are affections or attributes of a being [*entis affectiones sive attributas*] in accordance with which the quantity of the existence of any individual is denominated, as to amplitude of presence and perseverance in its being [*perseverationem in suo esse*]. So the quantity of the existence of God, according to duration has been eternal, and according to the space in which he is present, infinite; and the quantity of the existence of a created thing, according to duration has been just so much as the duration since its first existence, and according to the amplitude of its presence, as much as the space in which it is.

Moreover lest anyone imagine from this that God is extended and made of divisible parts like a body: it should be known that spaces themselves are not actually divisible, and furthermore that each being has its own proper mode of presence in spaces. Thus, the relation to space of duration is far different from that of body. For we do not ascribe different durations to the different parts of space, but say that they all endure together. A moment of the duration of Rome and of London is the same, as is one of the Earth and of [any] star in the entire heavens. And just as we understand any one moment of duration to be thus diffused through all spaces, in its own way, without any conception of its parts: so it is no more contradictory that a Mind can likewise, in its own way, be diffused through space without any conception of parts.

5. The positions, distances, and local motions of bodies are to be referred to the parts of space. And this appears from the first and fourth properties of space enumerated above, and will be still more manifest if you conceive vacuities to be disseminated between the corpuscles, or if you consider what I have previously said about motion. To this it may be added further that there is no force present in space that would impede or promote or in any way change the motions of bodies. And hence projectiles describe straight lines by uniform motion If they do not meet impediments from elsewhere. But of this more later.

6. Lastly, space is of eternal duration and immutable nature, and this because it is the emanative effect of an eternal and immutable being. If ever space had not been, God would then have been nowhere, and therefore he either created space later where he himself was not, or else, what is no less discordant with reason, created his own ubiquity. . . .

Extension having been described, for the other part the nature of bodies remains to be explained. Of this, however, since it exists not necessarily but by the divine will, the explanation will be more uncertain, because it is not at all given to us to know the limits of the divine power--namely, whether matter could have been created in one way only, or whether there are several ways by which other beings similar to bodies might have been produced. And although it hardly seems credible that God could create beings like bodies, that should perform all their actions and exhibit all their phenomena, and yet in essential and metaphysical constitution should not be bodies: since nevertheless I do not have a clear and distinct perception of this matter, I should

not dare to affirm the contrary, and accordingly I will not say positively what the nature of bodies is, but rather shall describe a certain kind of beings, in every way similar to bodies, whose creation we cannot fail to acknowledge to be within the power of God--and which thus we cannot certainly declare not to be bodies.

Since each man is conscious that he can move his body at will, and believes further that all men enjoy the same power of similarly moving their bodies by thought alone: the power of moving any bodies whatever by will is in nowise to be denied to God, whose faculty of thought is infinitely more powerful and swift. And by a like argument it must be conceded that God, by the sole action of thinking or willing, can prevent any body from entering any given space defined by certain limits [or boundaries].

If he should exercise this power, and make some space over the earth (in the shape of a mountain or of a body terminated in any way) to become impervious to bodies, and thus to stop or to reflect light and any impinging thing, it seems impossible that by our senses (which alone are constituted judges in this matter) we should discover this space not to be truly a body; for it will be tangible on account of its impenetrability, and visible opaque and colored on account of its reflection of light, and when struck it will resound because the neighboring air will be moved by the blow.

Let us then feign empty spaces scattered through the world, some one of which, defined by certain limits, by the divine power becomes impervious to bodies, and it is manifest *ex hypothesi* that this will oppose the motions of bodies and perhaps reflect them, and will assume all the properties of a corporeal particle, except that it will be immobile. But if we further feign that impenetrability not conserved always in the same part of space, but able to be transferred hither and thither according to certain laws, yet so that the quantity and shape of that impenetrable space are not changed, there will be no property of bodies that does not belong to this. It will be figurate, tangible, and mobile, able to reflect and be reflected, and in any combination of things will no less constitute a part than any other corpuscle; and I do not see why it would not be equally able to act upon our minds and be acted upon in turn, as it is nothing but an effect of the divine mind called forth within a definite quantity of space. For it is certain that God can move our perceptions by his will, and hence can annex such power to the effects of his will.

In the same way if several spaces of this kind should be impervious to bodies and to each other, they would all sustain the vicissitudes of corpuscles and exhibit the same phenomena. And so if all this world were constituted of this kind of beings, it would hardly seem to be any different in character. And hence these beings will be either bodies or like bodies. If they are bodies, then bodies can be defined to be *determinate quantities of Extension which the omnipresent God affects with certain conditions* :⁴ these are (1) that they be mobile (and therefore I have not declared them to be numerical parts of space, which are strictly immobile, but only definite quantities which may be transferred from space to space). (2) That two such be unable in any part to

⁴(Emphasis in the original.)

coincide, or that they be impenetrable and so when by their motions they meet they obstruct one another and are reflected in accordance with certain laws. (3) That they be able to excite various perceptions of the senses and the fancy in created minds, and in turn to be moved by the latter (nor should there be wonder hereat, since the description of their origin is founded in this).⁵

Moreover, it will help to note the following concerning what has now been explained. (1) That for the existence of these beings it is unnecessary to feign some unintelligible substance to be given in which as in a subject a substantial form should inhere: extension and an act of the divine will suffice. Extension takes the place of the substantial subject in which the form of the body is conserved by the divine will; and that effect of the divine will is the form or formal reason of the body, denominating as a body every region of space in which it is produced.⁶

(2) These beings will be no less real than bodies, nor less apt to be called substances. For whatever reality we believe to be in bodies, we are made to believe by reason of their Phænomena and sensible qualities. And hence we should judge these Beings, since they are capable of all these sorts of qualities, and can exhibit similarly all these phænomena, to be no less real--if only they were to exist. Nor will they be any the less substances, since they alike,⁷ through God alone, will subsist and will support accidents.

(3) Between extension and the form imposed upon it there is almost the same Analogy that the Aristotelians posit between the *materia prima* and substantial forms, namely when they say that the same matter is capable of assuming all forms, and borrows the denomination of numerical body from its form. For thus I suppose that any form may be transferred through any space, and everywhere denominate the same body.

(4) They differ, however, in that extension . . . has more reality than *materia prima*, and also in that it is intelligible, as likewise is the form that I have assigned to bodies. For if there is any difficulty in this conception, it is not in the form that God

⁵That is, the origin and nature of these bodies is founded in the power of a mind--that of God--to give the requisite properties to *changing* regions of space, and so to impart motions to the bodies.

⁶In scholastic terminology, the *form* or *formal reason* (*ratio formalis*)--or the *substantial form*--expresses the essential character of a substance (here, the body in question). That this form "denominates" the corresponding regions of space "as a body" means that they have ("derivatively") the *name* 'body' in virtue of the form (that "effect of the divine will"): the regions of space characterized by those forms are not in themselves the body--as Newton has said, the body and the spatial extent are not "numerically identical": indeed, as time passes, "numerically distinct" spatial regions may be successively "denominated" as *the same body* (this, precisely, on Newton's analysis, constitutes "local motion"--motion of a body from one *place* to another).

⁷That is, like the bodies we know.

imparts to space, but in the way in which he imparts it. But that is not to be taken for a difficulty, since the same [point] occurs with respect to the way we move our limbs, and nevertheless we do believe that we can move them. If that way were known to us, by parity of reason we should also know how God can move bodies, and expel them from a certain space terminated in a given figure, and prevent the expelled bodies or any others from entering into it again--that is, cause that space to be impenetrable and to assume the form of a body.

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Lastly, the usefulness of the described Idea of bodies shines forth most in that it clearly involves and best confirms and explicates the chief truths of Metaphysics. [There follows here a somewhat lengthy passage dealing with the nature of God, the defense against atheism, and the defects--according to Newton--of Descartes's philosophy on these points. Newton concludes that there is "almost no other reason for there to be Atheists than the notion of bodies having, as it were, a complete absolute and independent reality in themselves." After a little further discussion of how this notion arises, he goes on:] Thus the prejudice just mentioned ought to be laid aside, and substantial reality rather ascribed to Attributes of that kind, which are real and intelligible in themselves and do not require a subject in which they inhere And this we can manage without difficulty if (besides the Idea of body expounded above) we reflect that we can conceive of space existing without any subject, when we think of a vacuum. . . . In the same way, if we should have an Idea of that Attribute or power by which God, through the sole action of his will, can create beings: we should perhaps conceive that Attribute as it were subsisting of itself, without any substantial subject, and involving his other attributes.⁸ But so long as we cannot form an Idea of this Attribute, nor even of our own power by which we move our bodies, it would be rash to say what is the substantial foundation of minds.⁹

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Moreover, that I may reply more concisely to Descartes's argument: let us strip from a body (as he bids) weight, hardness, and all sensible qualities, so that nothing remains except what pertains to its essence. Will extension alone then remain? By no

⁸In other words: if we could have an idea of God's *attributes*, these taken together might make up the entire nature of God--again, as in the case of Newton's (hypothetical) bodies, with no need of any "unintelligible substance" as the "support" of these attributes.

⁹Care should be taken, in this discussion, to distinguish between Newton's use of the word "substance" (and its derivative "substantial") to refer to the "unintelligible support of properties," and his use to refer to the notion of "substantial reality" he is concerned to *advocate* as an *adequate and intelligible* one.

means. For we may further cast off that faculty or power by which they move the perceptions of thinking things. For . . . that faculty of bodies [namely, of stimulating perceptions in minds] can be cast off with extension still preserved, but it cannot be cast off with the corporeal nature still preserved [i.e., the faculty in question is essential to body]. . . . But should anyone object that bodies not united to minds cannot directly arouse perceptions in minds, and that hence . . . this power is not essential to them: it should be noted that there is no question here of an actual union, but only of a faculty in bodies by which they are capable of a union through the forces of nature. From the fact that the parts of the brain, especially the finer ones to which the mind is united, are in a continual flux, new ones succeeding to those which fly away, it is manifest that that faculty is in all bodies. And, whether you consider divine action or corporeal nature, to remove this is no less [a violation of the nature with which God has endowed bodies] than to remove that other faculty by which bodies are enabled to transfer mutual actions amongst one another--that is, to reduce body to empty space.