

LEIBNIZ'S PHYSICS

ARGUMENTS AGAINST THE ATOMISTS

1. The Argument Against the Inflexibility of Atoms:

P1) If two perfectly hard inflexible atoms were to collide, at the moment of collision either they come to a rest immediately after collision or the direction of motion instantaneously reverses.

P2) In both cases a change through a leap from one state to another has occurred.

P3) An immediate change from one state to another is impossible.

Note: This premise assumes a *Principle of Continuity*. It will appear in several other arguments Leibniz employs against his opponents, and it is expressed in the Monadology #13, where he says, “All natural change being gradual, something always changes and something always remains.” It is a reasonable principle, but it isn't clear what his reasons were for holding it, and it doesn't seem especially fair to use it against others without at least arguing for it.

C) Atoms (as hard inflexible substances) are impossible.

2. Arguments Against the Void:

P1) Suppose there is a void.

P2) “God could have placed some matter in it without derogating, in any respect, from all other things.”

P3) But this violates the Principle of the Best.

C) There is no void.

Or:

P2’) If there is a void then there are parts of space that are indistinguishable from one another.

P3’) If there are parts of space that are indistinguishable from one another, there are things that exist but differ in number only, and this is absurd (**because of the Identity of Indiscernibles**).

C) There is no void.

3. An Argument Against the Simplicity and Homogeneity of Atoms:

P1) No matter how small atoms are, the world would contain still more variety, richness, and being if they were more finely divided.

Note here that he is arguing against the view of atoms as extended things. His monads are not extended, so they have no size and are not divisible.

P2) But the Principle of the Best entails that this world contains the greatest variety and richness of any compossible world.

C) Atoms can't be simple and homogeneous.

ARGUMENTS AGAINST DESCARTES

Arguments Against the View that Extension is the Essence of Body:

A. The Aggregative Argument:

P1) Because the bodies of the Cartesians are infinitely divisible, they can only be aggregates.

P2) Aggregates are not genuine individuals. (Rainbows, as aggregates of raindrops, are not genuine individuals.)

C) Cartesian bodies have, properly speaking, no reality.

This is an odd argument because it applies also to Leibniz's material world. But remember that Descartes held that material bodies are just as real as minds, and for Leibniz, if I understand him correctly, only monads are truly real.

B. The Argument from the Uniformity of Matter:

P1) All qualitative variety in the Cartesian system depends on motion.

P2) There is no motion at an instant.

C1) In the Cartesian world there can be no qualitative variety in an instant.

P3) If the world is qualitatively homogeneous at each instant, then every instant will be qualitatively identical.

C2) The world as a whole will not undergo any qualitative change as it passes from one instant to another.

“... under the assumption of perfect uniformity of matter, one cannot in any way distinguish one place from another, or one bit of matter from another bit of matter in the same place.”

C. The Argument from the Conservation of mv^2 .

P1) Descartes' view of force depends on the Cartesian Conservation Principle that conservation depends only on size times speed.

P2) But the conservation of mv^2 requires that we introduce something into body over and above extension.

C) So there must be something over and above size and speed (viz. force) that goes beyond its geometrical properties.

A Critique of Descartes' Laws of Motion and Impact Laws:

1. Descartes had claimed that force = quantity of motion = speed times size. To refute this Leibniz makes the following assumptions:

- a. The amount of force a body acquires in virtue of falling from a certain altitude is equal to the amount of force required to raise it to that level.
- b. The amount of force a one pound body acquires by falling 4 meters is equal to the amount of force a 4 pound body acquires by falling 1 meter.
- c. Galileo's Law: The distance traveled by a falling body is directly proportional to the square of the time it falls, i.e., $d=at^2$.
- d. The total amount of force in the world is conserved both locally and globally.

The Argument:

P1) Suppose a 4 pound brick falls from a height of 1 meter. Descartes quantity of motion will then be $1 \times 4 = 4$.

P2) Suppose a 1 pound brick falls from a height of 4 meters. By Galileo's Law it will fall the 4 meters in 2 seconds.

C1) According to Descartes, the quantity of motion will be $1 \times 2 = 2$.

P3) In fact, however, its force will be 4.

This can be seen by dropping the 1 pound brick from 4 feet on one end of a teeter-totter, the other end of which contains a 4 pound brick. The brick will rise 1 meter.

C2) So force is not identical with Descartes' quantity of motion.

2. Descartes had maintained that if two bodies moving toward one another in opposite directions at the same speed collide, then if they were the same size they would reverse directions, but if one was smaller than the other, the larger one would continue in the same direction while the smaller one reversed directions. But Leibniz notes that on this view the difference in size doesn't matter. Even if the smaller body is only a tiny bit smaller, this will happen. And he notes that this "is an enormous leap from one extreme to another" in violation of his Principle of Continuity.

3. Leibniz objected to Descartes' physics on the grounds that if it was correct it would be a simple matter to build a perpetual motion machine.

The argument here seems to proceed as follows:

Imagine two balls of exactly the same size and traveling at exactly the same speed colliding with one another, then reversing directions and each, in turn, then colliding with a larger object equidistant from the center of the initial collision. On Descartes' view, after the initial collision each ball will rebound at exactly the same speed it had before the collision. But when the two balls then collide with the two larger stationary objects, each ball will reverse direction, once again with the same speed, since, according to Descartes, when a smaller object collides with a larger one the smaller one will reverse directions while the larger one remains stationary.



AN ARGUMENT AGAINST OCCASIONALISM

Earlier I suggested that Leibniz shared with the occasionalists the view that mind and body don't interact. But most of the occasionalists held that it was also true that material bodies don't interact. Thus, Malebranche says that "God is the only true cause, and only he truly has the power to move bodies."

You can imagine how Leibniz felt about this! One of the reasons God viewed this as the best possible world is because of the simplicity and efficacy of its laws.

In fact, he complains that occasionalism involves a perpetual miracle.

"But I believe that corporeal substance has the ability [force] to continue its changes in accordance with the laws God put into nature and conserves there."

I have no idea what he said about the miracles recounted in the Bible, but I think he ought to have denied that they happened, since by definition they violate the laws of physics!

EXAM 1 STUDY GUIDE

- **Discuss Descartes' Meditations. Explain how each Meditation advances the project, and identify the problems they lead to.**
- **Discuss Descartes' physics and explain the objections Leibniz raised against it.**
- **Discuss Leibniz's proofs for the existence of God. In what respects were Leibniz's proofs improvements on the proofs of his predecessors? What objections can be raised against Leibniz's proofs?**
- **Discuss Leibniz's theory of monads and their relation to the corporeal world. What arguments does he give for thinking that there must be monads?**
- **Review the issues that arose between Leibniz and Clarke/Newton in their debates. In your opinion, who won the debate and why?**