

1 The Identity of Indiscernibles

The uncontroversial *Indiscernibility of Identicals*: If a is identical to b , then for every property of P , a has P if and only if b has P .

- Superman and Clark Kent?
- Water and H₂O?

The controversial *Identity of Indiscernibles* (II): If for every property P , a has P if and only if b has P , then a is identical to b .

- Note its logically equivalent contrapositive: if a is not identical to b , then for some property Q , a has Q and b lacks it.
- Qualitative identity involves having all and only the same qualitative properties and relations to other things. Let's call this qualitative similarity (or exact similarity).
- Numerical identity involves being one and the same thing.

It's not too crazy to think that this is at least contingently true. But Leibniz believes that it's necessarily true based on PSR.

Consider a world with two qualitatively indiscernible spheres... How can we tell these two spheres apart?

- Name one 'a'
- One will stand in the relation of being zero distance from itself
- One will be in a different place from the other

Other purported counterexamples:

- Mirror universe worlds
- Radial symmetry worlds
- Eternal recurrence worlds

2 Leibniz and Newton

The Calculus Controversy

Newton's work: *Philosophiae Naturalis Principia Mathematica*, or simply the "Principia"

The Leibniz-Clarke Correspondence

Newton says that space is God's sensorium, or organ of sensation.

3 Substantivalism versus relationism

Substantivalism: Space is something distinct from body and exists independently of body.

"...in a ship under sail, the relative place of a body is that part of the ship the body possesses, or that the part of the cavity the body fills, and which therefore moves together with the ship; and relative rest is the continuance of the body in the same part of the ship or of its cavity. But real, absolute rest is the continuance of the body in the same part of that immovable space, in which the ship itself its cavity, and all that it contains, is moved." (Newton, Scholium, p.285)

Relationism: Space consists in nothing but relations between bodies.

"...I hold space to be something merely relative, as time is, that I hold it to be an order of coexistences, as time is an order of successions. For space denotes, in terms of possibility, an order of things which exist at the same time, considered as existing together, without entering into their particular manners of existing." (p.297)

Leibniz's arguments against substantivalism:

- Space cannot be a substance, as it lacks the properties of a substance.
- Space cannot be the property of a substance – which substance?
 - "Sir Isaac Newton says that space is an organ which God makes use of to perceive things by. But if God stands in need of an organ to perceive things by, it will follow that they do not depend altogether on him, nor were produced by him." (p.294)
- Argument p.297
- "To suppose two things indiscernible is to suppose the same thing under two names. And therefore, the hypothesis that the universe could have had at first another position of time and place than that which it actually had, and yet that all the parts of the universe should have had the same situation among themselves as that which they actually had – such a supposition, I say, is an impossible fiction." (p.299-300)

Newton's spinning bucket argument against relationism:

- Leibniz denies that there is absolute motion.
- Stages of the bucket and water:
 - 1: At rest, flat
 - 2: Spinning, flat and still
 - 3: Spinning, flat and spinning
 - 4: Spinning, concave and spinning
 - 5: At rest, concave and spinning
- Question: Why does the surface of the water become concave?
 - It can't be because it's spinning relative to the bucket.
 - This is because it's spinning relative to the bucket at stage 2, but it's flat.
 - On the other hand, it's not spinning relative to the bucket at stages 1 and 4, but it's respectively flat and concave.
- There must be something relative to which the water is spinning: absolute space.

2 Vacuums

"...for the more matter there is, the more God has occasion to exercise his wisdom and power. This is one reason, among others, why I maintain that there is no void at all." (p.295)

"The same reason which shows that extramundane space is imaginary proves that all empty space is an imaginary thing, for they differ only as greater and less." (p.300)

"To omit many other arguments against the void and atoms, I shall here mention those which I ground upon God's perfection and upon the necessity of a sufficient reason. I lay it down as a principle that every perfection which God could impart to things, without derogating from their

other perfections, has actually been imparted to them. Now let us fancy a space wholly empty. God could have placed some matter in it without derogating, in any respect, from all other things; therefore, he has actually placed some matter in that space; therefore, there is no space wholly empty; therefore, all is full." (p.302-3)