What is Space?

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Goals for this Module

This is a very introductory look at debates about the nature of space. The module serves to introduce you to the way metaphysicians inquire into their domain of interest. Our goals:

1. Introduce and clarify the distinction between two theories of space, Absolutism and Relationalism, as well as briefly discuss how this debate is important for settling questions about the existence of vacua and absolute motion.
2. Introduce Kant's argument for Absolutism.
3. Consider how the existence of higher spatial dimensions affects Kant's argument (next week).

Introduction

We don't see space. We see objects that stand in spatial relations to one another. One object is 10 feet from me. Another is 20 feet from me. Being inaccessible to direct observation is unimportant. Neutrinos are not directly observable either, but they still exist. Our question is whether space has an independent existence from the objects that exist in space and the relations they stand in to one another.

Absolutism (also called substantivalism): Space exists as an independent object in its own right over and above the material content of the universe. Space is a continuous and pervasive media that extends everywhere.

Relationalism: Space does not exist as an independent object. There is only the material content of the universe and the relations objects stand in to one another. Space is merely defined through spatial relations among the material objects in the universe.

Some Terminology

Properties are what objects exemplify (or instantiate) individually or one by one, e.g., blue, red, angular, alive, etc.

Object: o is an object just if (i) there is some property P such that Po and (ii) there is no x such that o is a property of x.[1]

We can subsequently define different types of objects.

Physical Object: x is a physical object if (i) x is an object and (ii) x occupies some region of space.

Abstract Object: x is an abstract object if (i) x is an object and (ii) x does not occupy a region of space.

Relations are exemplified by several individuals in relation to each other, e.g., being a mile apart is something that is exemplified by a pair of objects—one thing is a mile away from another. Similarly, being next to is a spatial relation between objects: one object is next to another.

Relations have different features:

1. A relation R is **symmetrical** if, given any pair of objects a and b,

$$aRb \leftrightarrow bRa$$

2. A relation R is **asymmetrical** if, given any pair of objects a and b,

$$aRb \ \& \ \neg bRa$$

3. A relation R is **transitive** if, given some objects a, b, and c,

$$(aRb \ \& \ bRc) \rightarrow aRc$$

4. A relation R is **non-transitive** if, give some objects a, b, and c,

$$(aRb \ \& \ bRc) \ \& \neg aRc$$

5. A relation R is **reflexive** if for some object a,

$$aRa$$

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[1]Some metaphysicians will prefer to use the word 'particular' or 'individual' in place of 'object'. The terminological differences mask an important similarity; they all agree that there are beings which possess properties, but are not themselves properties of anything else.

6. A relation R is **non-reflexive** if some some object a,

$$\neg aRa$$

Absolutism is the view that objects can stand in spatial relations to space itself, i.e., the view that there are absolute spatial relations like *located at.* Suppose that x and y are 10 feet part. X is located in the region R1 of space that contains it. Y is located in the region R2 of space that contains it. In between R1 and R2 there exists another thing, a 10 foot region of space.

Relationalism is the view that spatial relations exist, but space itself does not. If x and y are 10 feet apart and there is nothing in between them, there does not also exist the regions of space that x and y occupy as well as the region of space 10 feet long that is occupied by nothing. Leibniz uses the following analogy to explain Relationalism:

> [T]he Mind can fancy to itself an Order made up of Genealogical Lines, whose Bigness would consist only in the Number of Generations, wherein every Person would have his Place. (The Leibniz-Clarke Correspondence, (ed.) Alexander 1956, 70)

> and if to this one should add the Fiction of a Metempsychosis, and bring in the same Human Souls again; the Persons in those Lines might change place; he who was a Father, or a Grandfather, might become a Son, or a Grand-son etc. (Ibid. 70-1)

> And yet those Genealogical Places, Lines, and Spaces, though they should express real Truths, would only be Ideal Things. (Ibid. 71)

A family is simply a group of people standing in certain relations to each other: daughter, uncle, cousin, etc. The relations are something additional to the collection of individual people. Is the family something in addition to these individuals and relations? Is it an object in its own right that contains people, grows over time, etc? Leibniz says no.

Consider the sentence 'my family has lived in the United States for two centuries'. The expression 'the family' does not pick out some person who has been alive for 200 years. We use the phrase to refer to a group of people who stand in familial relations. Similarly, Leibniz thinks that space is not a real object above and beyond the objects that it supposedly contains. There are just the various spatial relations that objects stand in to one another.

What's at stake?

The debate between the Relationalist and Absolutist has been taken as important for settling two issues:

1. Do vacua exist?

2. Does absolute motion exist? Or is all motion relative?

Historical Precursors

- Democritus (460–370 BC) vs. Aristotle (384–322 BC) *Physics, De Caelo*

- Sir. Isaac Newton (1643–1727), *Philosophia Naturalis Principia Mathematica* (1687) vs. Gottfried Wilhelm Leibniz (1646–1716), *The Leibniz-Clarke Correspondence* (1715–1716)

Incongruent Counterparts

Immanuel Kant (1724–1804), argued for Absolutism in *Concerning the Ultimate Foundation of the Differentiation of Regions of Space* (1768).

Claim: Absolute space is necessary to explain the existence of incongruent counterparts.

> [An incongruent counterpart is]...an object which is completely like and similar to another, although it cannot be included exactly within the same limits.

There are two types of mirror objects. Let X be an object and let Y be its mirror image.

1. X is a **congruent counterpart** of Y if X can be made to coincide with Y by rigid motions (without changing its shape or size).[2]

2. X is an **incongruent counterpart** of Y if X cannot be made to coincide with Y by rigid motions.

An object is said to possess handedness just when it and its mirror image are incongruent counterparts.

An object is said to lack handedness just when it and its mirror image are congruent counterparts.

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[2]If you know what a Mobius strip is, ignore the complication.

Master Argument

The argument strategy: There are spatial differences between right and left hands. We want to know what gives a hand one of these spatial features as opposed to another. The reason why a giraffe is taller than a mouse is that the height of the former is greater than the height of the latter. Similarly, what is it about my left hand that makes it a left hand as opposed to a right hand? We'll identify the only viable options for explaining handedness and exclude all but one, Absolutism.

1. A hand is left or right either (a) solely in virtue of the *internal* relations among the parts of the hand, or (b) at least partly in virtue of the *external* relations of the hand to other material objects, or (c) in virtue of the *external* relations of the hand to space itself.

2. Since the internal relations are the same for right and left, a hand is not left or right solely in virtue of its internal relations,

3. A hand is neither right nor left even partly in virtue of its relations to other material objects.

4. Therefore, a hand is left or right at least party in virtue of its relation to absolute space.[3]

1–3 state the premises of the argument. 4 states the conclusion. The argument is valid. If it is sound, then 4 must be true. Here are the arguments for the premises.

P2. Internalism

Internalists accept 1 and 3, but they rejects 2. They accept that a hand that was all alone in the Universe would still be a right or left hand, but they think that it's being left or right can be explained without looking outside the hand itself. The features of the hand alone, they claim, will make it a right or left one. Hence, one needs no other material objects or space itself to explain these features.

Objection:

a. The internal relations of both the left and right hand are distances between points and angles between lines, e.g., the length of the index finger.
b. The internal relations of both the left and right hand are identical.
c. If the internal relations of a right hand make it a right hand, then they cannot be identical to the internal relations of a left hand.

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[3]'Incongruent Counterparts and Higher Dimensions', by James Van Cleve

    d. The internal relations of a right hand do not make it a right hand (similarly for the left hand)…(from a–c)

Our conclusion says that internal relations cannot distinguish right from left handedness.

P3. Externalism

Externalists accept 1 and 2, but reject 3. They claim that being a left or right hand depends on a relationship to other material objects. Kant raises the following objection:

    a. Suppose that there is a world in which only a hand, H, exists.
    b. Suppose that a body possessing no hands pops into existence.
    c. H can fit only the left or the right wrist.
    d. If H fits the right wrist, H was a right hand before the body popped into existence.
    e. If H fits the left wrist, H was a left hand before the body popped into existence.
    f. H was a right or left hand before the body popped into existence…(from c–e)
    g. H was a right or left hand when no other material object exists…(from f)
    h. H's being a right or left hand is not explained by its relationship to any other material object…(from g)

Absolutism

There were three candidates for explaining handedness. Internalism and Externalism is false. The remaining candidate, Kant claims, Absolutism must be true.