Philosophy 593S: Philosophy of Space and Time, Fall 2005
Handout 3: Newton

1. Substantivalism and Absolutism

Absolute time 'flows uniformly' 'without reference to anything external.' What does this mean?

Absolute space 'without reference to anything external, always remains homogenous and immovable.'

'Absolute motion is the change of position of a body from one absolute place to another.'

2. The Nature of Space

Claim: Extension is neither substance nor accident (21).

(1) All substances are 'absolute in themselves.'
Extension 'is not absolute in itself, but is as it were an emanative effect of God.'

(2) All substances can 'act upon things.'
Extension cannot act upon things.

(3) All accidents 'inhere in some subject.'
'We can clearly conceive extension existing without any subject.'
Should God annihiliate a body, the body's extension would not perish.

The properties of space:

(1) space can be distinguished into parts; (2) space extends infinitely in all directions; (3) the parts of space are motionless; (4) no being exists or can exist which is not related to space in some way; (5) 'The positions, distances, and local motions of bodies are to be referred to the parts of space'; (6) 'space is eternal in duration and immutable in nature.'

The argument for (3) in the Scholium (§6):

(1) Suppose region x moves (for reductio).

(2) x moves iff x first occupies region R and later occupies a distinct region R' (definition).

(3) If x is a region of space then x occupies R iff $x = R$.

(4) Therefore, for distinct regions R and R', $x = R$ and $x = R'$.

The argument for (3) in 'De Grav' (p.25 §3):

(1) Suppose region x moves (for reductio).

(2) If x moves then either x separates 'from the vicinity of other contiguous parts' (Descartes' definition) or x first occupies region R and later occupies a distinct region R' (Newton's definition).

(3) 'It has been sufficiently demonstrated that this [ie Descartes' definition] is absurd.'

(4) (See above for the argument that x does not move according to Netwon's defintion.)

Consider the following scenario: let R be a spherical region of space right above my desk. Let R' be a spherical region of space (with the same radius) somewhere inside the Sydney Opera House. At some time R and R' 'switch places': now R' is above my desk and R is inside the Sydney Opera House.

Newton seems to think that this is impossible. Why, exactly?

'the parts of space are individuated by their positions, so that if any two could change their positions, they would change their individuality at the same time and each would be converted numerically into the other. The parts of...space are understood to be the same as they really are only because of their mutual order and position; nor do they have any principle of individuation apart from that order and position, which consequently cannot be altered' (25).

Is there an argument here, or is this just a confusing *assertion* that the scenario is impossible?

3. Newton's arguments in favor of his definition of 'absolute, true, and mathematical motion'

'absolute and relative rest and motion are distinguished from each other by their properties, causes, and effects' (Scholium §8).

Newton contra Descartes: Descartes' definition of 'true motion' is incompatible with the following.

- Necessarily, if x is in true motion then it is moving with some definite speed in a definite direction (19).
- Necessarily, if x is at true rest and y is at true rest then the distance between x and y is not changing (Scholium §8).
- Necessarily, if x is part of y and keeps a given position in relation to y and y truly moves then x truly moves (§9; the argument in §10 is similar).

Newton against relationalism about motion generally: every definition of 'true motion' in terms of changing relative distances is incompatible with the following.

- Necessarily, x changes its state of true motion iff a force is exerted on x (Newton's 2nd law).

Why reject relationalism, rather than think that these alleged necessary truths are not, after all, necessary?

4. The Bucket Argument, §11

Necessarily, if x is rotating about some center then x endeavors to receed from that center.

Is the argument based on this effect of rotation an argument against Descartes' definition of 'true motion,' or against any possible relationalist definition of 'true motion'?

Controversy about the form of the argument.

Ernst Mach's objection: 'Newton's experiment with the rotating vessel of water simply informs us, that the relative rotation of the water with respect to the sides of the vessel produces *no* noticeable centrifugal forces, but that such forces *are* produced by its relative rotation with respect to the mass of the earth and the other celestial bodies.'

Question: suppose Newton's arguments show that there is no adequate definition of 'true motion' in terms of changing relative distances. Could relationalists respond in either of the following ways?

(1) 'I refuse to define "true motion." You can't define *everything,* after all.'

(2) 'I refuse to recognize any such state as true motion.'

5. Corollary V

Can an argument for relationalism be based on Corollary V? (Mach thought that Corollary V showed that 'the reduction to absolute space was by no means necessary.')

6. The Globes Experiment

7. Newton on the nature of material bodies

Claim: Material bodies are 'determined quantities of extension which omnipresent God endows with certain conditions' (28).

The argument:

Objection: If each material body is (identical with) some region of space, and regions of space cannot move, then material bodies cannot move.

'I did not say that they are numerical parts of space which are absolutely immobile, but only definite quantities which may be transferred from space to space' (28).

Objection: the Leibnizian problem of explaining qualitative variety again?