

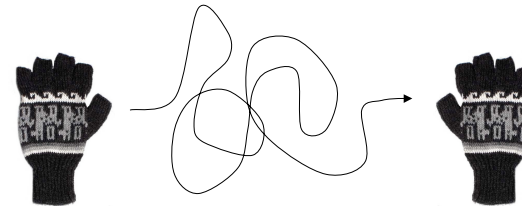
Philosophers' Rally
RuG 2007

**Mirror Images:
Philosophical reflection on space**

Jan-Willem Romeijn
Faculty of Philosophy
University of Groningen

A weird show

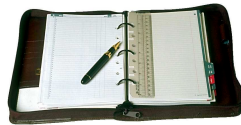
Imagine that, by an incomprehensible move, a magician manages to turn a left-handed glove into a right-handed one.



- 2 -

Enantiomorfy

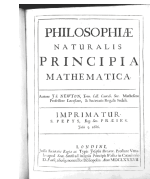
Such a transformation of, supposedly intrinsic, orientation is impossible. We call spatial objects that possess this character enantiomorphic.



- 3 -

Newton's absolute space

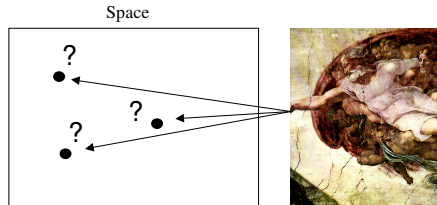
The natural philosopher Newton maintained that space exists in itself, as substance. This was illustrated by the famed bucket experiment.



- 4 -

Leibniz's relationism

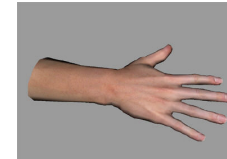
The philosopher and lawyer Leibniz criticised Newton's views. He argued that space cannot be more than a convenient scheme to organise experience. Space is not a substance.



- 5 -

The hand of Kant

In 1768 Immanuel Kant imagined a right hand in an otherwise empty space, and noticed that Leibniz cannot make the orientation of this right hand precise.

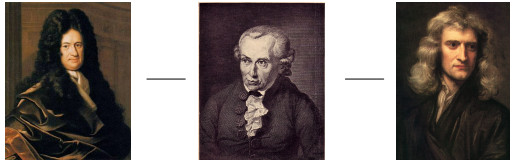


Kant argued that the fact that a lone hand has orientation proves that there is such a thing as absolute space.

- 6 -

Fifteen years later

Kant revised his views several times, to end up in the position that space exists only on the interface of a knowing subject and an external world.

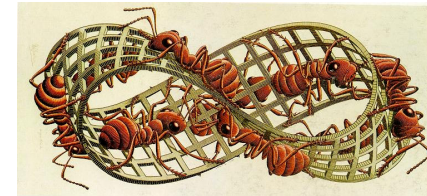


This position anticipates some modern discussions, which show that both Newton and Leibniz leave something to be explained.

- 7 -

Is orientation real?

Following this idea of Kant, should we say that the orientation of a hand is determinate and real, or rather not?

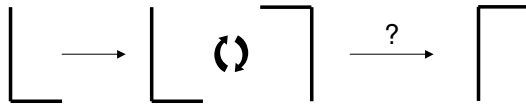


This question is put in perspective by developments in geometry in the nineteenth century.

- 8 -

Two-dimensional

We can also consider enantiomorphic objects in the two-dimensional space of the projection screen.



The letter L then turns out to be an enantiomorphic object. Note that the mirror-image transformation is possible if we are allowed to lift the L from the screen, twist it, and put it back on.

- 9 -

Constructing a Möbius band

- 10 -

Orientation is space-relative

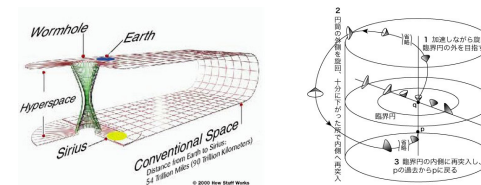
The folding exercise with the Möbius twist shows that whether or not an object is enantiomorphic depends on the space in which the object is located.



What is the structure of the space we are living in? And can we investigate this structure at all?

Space and physics

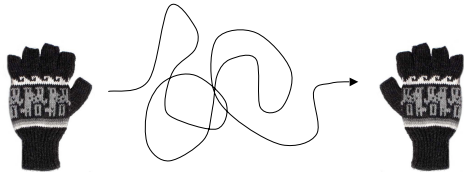
The french mathematician Poincaré showed that the structure of space is tied up with conventions, and with the natural laws that govern the objects in it. This idea stood at the cradle of Einstein's theories of relativity.



In our space, structures like the Möbius twist may very well exist!

Conclusions

It is an empirical question whether left and right hands are genuinely different from each other, and thus whether the magic show can exist.



But the fact that space itself has become the subject of a physical theory suggests that it is a substance, and that it exists independently of a knowing subject.

- 13 -