# Orientation: from metaphysics to semantics

Readings (optional): Baker [forthcoming], Bennett [1970], Lee [2006], Pooley [2003], van Cleve [1998]

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## 1 Some geometric notions

Ultimately we want to talk about certain spatial properties and relations between material objects, but it will help to start by first considering the purely geometric versions of the notions we are interested in.

### 1.1 Isometry

Two figures are **isometric** iff, roughly, they have the same shape and size. Less roughly:

> Two figures are **isometric** iff one can be transformed into the other by some combination of translations, rotations and reflections (i.e., by some **isometry**).
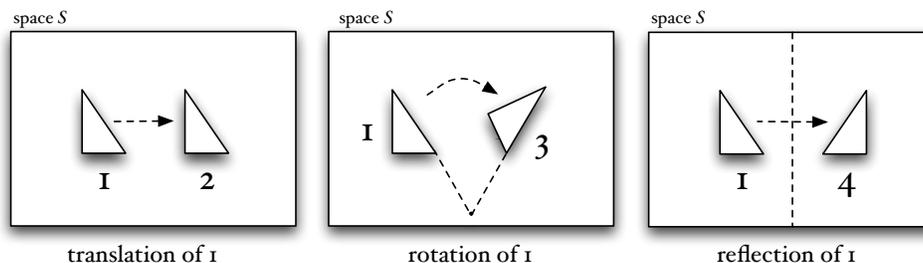


Less roughly:

> Two figures in a space[1] $S$ are are **isometric** iff there is a distance-preserving bijection between the points of one and the points of the other.

It is common to talk as if we can 'move' a geometric figure around in a given space. That's loose. Better to think of it like this: some regions of a given space are translations, rotations, or reflections of other regions of the space.

There is a more general way of thinking about translations, rotations, and reflections. We can think of them as relations between possible ways of imposing a coordinate structure on a given space. This is made precise in linear algebra, but you can get a sense of the idea by thinking about a simple two-dimensional Euclidean plane space. Intuitively,

- **Translating** a coordinization of the plane is like taking every coordinate and mapping it to a new coordinate at a fixed distance and direction;

- **Rotating** it is like turning all the coordinates together around a fixed coordinate in the plane;

- **Reflecting** it is like flipping the coordinization around a fixed line through the plane.

More abstractly, we can think of translation, rotation, and reflection as possible symmetry properties of a space.

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[1]Let's take a **figure** to be a set of points in a metric space. We'll restrict to metric spaces for the purposes of this handout, but little leans on this, and the discussion could be extended to manifolds.

A **metric space** is a pair $\langle S, \mu \rangle$ of a set $S$ of points and a total function $\mu$ (the **metric**) from pairs of points $x, y$ in $S$ to nonnegative real numbers satisfying the following constraints: (1) $\mu(x, y) = 0$ if $x = y$; (2) $\mu(x, y) = \mu(y, x)$ (symmetry); (3) $\mu(x, y) + \mu(y, z) \geq \mu(x, z)$ (triangle inequality).

## 1.2  Rigid motion and chirality

It helps to have a name for the class of isometries that correspond to combinations of translation and rotation alone:

> One figure is a **rigid motion** of another in a space iff of they are related by translation, rotation, or some combination of translation and rotation (i.e., by a **direct isometry**).

Thus triangles 2 and 3 are rigid motions of triangle 1, while 4 is not a rigid motion of 1.

Another useful idea is that of chirality:

> A figure is **chiral** iff it cannot be reflected onto itself. Otherwise it is **symmetric**.

Contrast our (chiral) triangle with the (symmetric) pentagon below:



| translation of 1 | reflection of 1 | translation of A | reflection of A |
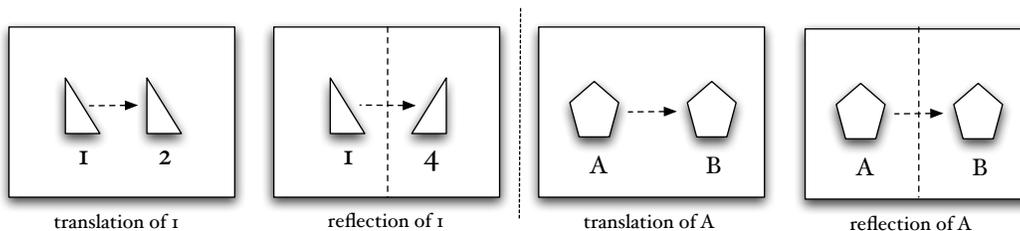
Now we can have a name for pairs of chiral figures which are reflections of each other.

> A pair of isometric figures in a space are **enantiomorphs** (of each other) just in case they are not rigid motions of each other.

For example, triangles 1 and 4 are enantiomorphs.

## 1.3  Orientable and non-orientable spaces

Intuitive spaces, such as the Euclidean plane or Euclidean three-space, are orientable:

> A space $S$ is **orientable** just in case there are isometric figures in the space that are not rigid motions of each other.

The easiest way to get a grip on the idea of orientability is to consider a **non-orientable space**, where it is possible to reflect a figure via translations and rotations alone. Consider the Mobius strip:



In a "local" region of a Mobius strip, a triangle cannot be transformed into its mirror reflection in that region by any rigid motion. But if you rigidly move the triangle on a continuous trip around the strip, it would return as its own reflection.

## 1.4  Oriented spaces

If a space is orientable, then there are exactly two possible ways to enrich it with further structure, and thereby make the space **oriented**. There are several ways to make this precise mathematically, but some rough intuitive pictures on some very simple spaces will suffice to convey the idea.

Consider a simple Euclidean one-dimensional space of points. One can imagine there being more to the structure of the space than just the points and their relations to each other. One can imagine also that the line has a "direction":


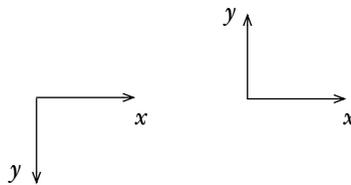
orientable space

oriented space          oriented space
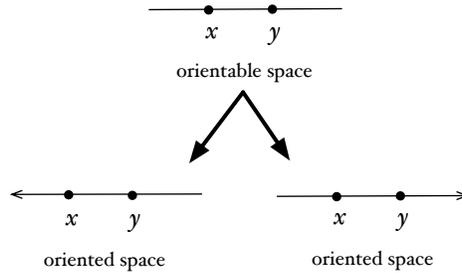
For an intuitive example, think of time as a one-dimensional space of instants. The space has a metric structure. Each instant is at some distance—a duration—from every other. Thus $x$ might be 2 seconds from $y$, etc. The idea that the time dimension is **oriented** is the idea that there is more structure to the space than just the instants and their temporal distances from each other. It is the idea that there is, in addition, a fact of the matter as to whether, for instance, $x$ comes **after** $y$ or **before** $y$. More generally, it is the idea that time is equipped with a direction. On this view, the time dimension is not just orient*able*; it's orient*ed*.

Turning to two dimensions, think of Euclidean two space as coordinatizable by two vectors $x, y$ each pointing off at a right angle to the other on a common point. Now given one of the vectors, say $x$:
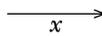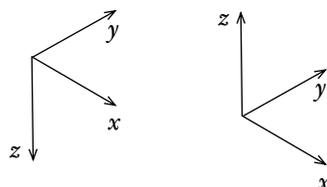


There are exactly **two ways** for $y$ to form a right angle with $x$ (in a single plane):



The fact that there is this binary choice reflects the orientability of the space. Each of these ways of drawing the right angle corresponds to a choice of orientation of the space. Note there is no way to rotate or translate these two pictures on to the other.

Turning to the three-dimensional case, think of Euclidean three space as coordinatizable by thee vectors $x, y, z$ each pointing off at right angles to each other. Now given a pair of the vectors are at right angles to each other, say $x, y$, there are again exactly **two ways** for $z$ to form a right angle with $x$ (in their shared plane) and also with $y$ (in their shared plane):



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The fact that there is this binary choice reflects the orientability of the space. Each of these ways of drawing the right angle corresponds to a choice of orientation of the space. Note there is no way to rotate or translate these two pictures on to the other.

## 2   Incongruent counterparts

Now let's start applying these geometric ideas to physical objects in actual space. To do that, let's assume that space has the structure of some metric space, and that physical objects have shapes which correspond to figures in that space. Then all of our terminology carries over straightforwardly. The relation of **counterparthood** between physical objects corresponds to the geometric relation of **isometry** between figures:

> A pair of objects in a space are **counterparts** just in case their shapes are isometric.

Thus a perfect copy of a left hand is a counterpart of that left hand, and so is a right hand with exactly the same distance relations between its parts.

Next, the idea of two objects being **congruent** corresponds to the idea of one figure being the **rigid motion** of another:

> A pair of objects in a space are **congruent** just in case the shape of one is a rigid motion of the shape of the other. Otherwise they are **incongruent**.

If two objects are congruent, it follows that they are counterparts. But the reverse is not the case. In ordinary Euclidean three-space, a left hand and its mirror-reversed right hand are **incongruent counterparts**.

The idea of incongruent counterparthood corresponds to the idea of **enantiomorphy**, which we may now extend to objects:

> A pair of objects in a space are **enantiomorphs** (of each other) just in case they are incongruent counterparts.

## 3   A Kantian argument from incongruent counterparts to substantivalism

Kant thought, at one point anyway, that the possibility of incongruent counterparts supported what is now called **substantivalism** about space as opposed to **relationism**. Let's give a modern statement of these positions.

> **Relationism:** There are no spacetime points. Spatiotemporal relations are nothing more than relations between physical objects, or between actual and possible physical objects.

> **Substantivalism:** There are spacetime points. Spatiotemporal relations between physical objects obtain in virtue of the relations between the spacetime points that the objects inhabit.

One reason you might think that the possibility of incongruent counterparts supports substantivalism is the simple fact that our definitions of 'congruence' and 'counterpart' above talk about objects *in a space*. But that would be confused: these definitions do not presuppose substantivalism. The relationist is not afraid to talk about space. He does not deny that space exists; he just grounds spatial relations in a different way than the substantivalist. So the relationalist can happily accept our definitions.

Kant's reasoning from incongruent counterparts to substantivalism was different. Basically, Kant saw a tension between two *prima facie* compelling ideas.

First idea: since **incongruent counterparts have exactly the same intrinsic properties**, the fact that one of the hands is a *right* hand is not a matter of that hand's possessing a certain intrinsic property. (These are properties a thing is supposed to have in "metaphysical independence of things outside of it".)

Second idea: the fact that a given hand is a left hand is also not matter of its standing in some extrinsic relation to any material object outside of it. For **it is possible for the universe to contain only a left hand**.

To preserve both ideas, it appears we must assume that a hand's being (e.g.) a left hand is a matter of the hand's standing in an extrinsic relation, but to some non-material entity. That non-material entity, Kant suggested, was space itself.

Kant's solution is problematic. As pointed out by Remnant [1963] and Earman [1971], if there is a puzzle about how a lone hand could be a left hand, there is a equally a puzzle about how a lone hand-shaped region of space could be a left-handed region of space.

Kant might reply that we are supposed to appeal to some special intrinsic feature of hand-shaped regions of space—the region's *handedness*—to settle its orientation. But of course, it is unclear why that should be any more intelligible than saying that hands themselves have intrinsic orientations. If incongruent counterpart hands are intrinsically alike, it is hard to see in what sense the regions of space the hands occupy are not also intrinsically alike.

Even if Kant's particular defense of substantivalism fails, there is a question his discussion raises.

## 4   The question of grounding leftness and rightness *per se*

Here is one question:

How is it possible that two objects which are counterparts can nevertheless be incongruent?

This is not a very interesting question. We have answered it. There is no special problem about grounding, or explaining in virtue of what, two things are incongruent counterparts. Two things are incongruent counterparts thanks to their being isometric in shape, and thanks to there being no rigid motion in the space they inhabit that could bring one exactly into the position of the other. This "explanation", we can add, is neutral on the issue of the metaphysics of space.[2]

But it is tempting to think there is a further problem, one brought out by Kant's intuition that it is possible for the universe to contain only a left hand. This is the question of what grounds leftness and rightness *per se*. We could put it like this:

Suppose we are given a pair of incongruent counterparts hands $A$ and $B$, and suppose $A$ is the left hand. In virtue of what is $A$ the *left* hand, rather than the *right* hand?

The idea behind the question is that there is some further fact of the matter settling, for a pair of incongruent counterparts, which one is the left one and which one is the right one. Such a further fact of the matter appears to be required, if one thinks it is possible for there to be a lone-left-hand universe.

There are two sorts of reaction one might have to this question. The first is to accept it at face value, and then point some additional structure in the world, beyond that required to explain incongruent counterparthood as above, to ground facts of leftness and rightness *per se*. Call this kind of reaction the **orientational realist** response.

The other reaction is deflationary. It claims that the question is based on a mistake, or at any rate has no deep answer. On this view, while it is possible for there to be a lone hand universe, it makes no

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[2]For fuller argument that this is so, see Sklar [1974], Pooley [2003].

sense to talk about the hand having a particular orientation. There is no fact of the matter, concerning such a hand, whether it is left or right. Call this view **orientational antirealism**.

As we'll now go over, orientational realism is not plausible and should be rejected. But as we'll see soon, orientational antirealism raises a surprising puzzle.

## 5 Orientational realism

We can distinguish two versions of orientational realism.

### 5.1 Haecceitistic substantivalism

Suppose you are a **substantivalist**: you believe there are spacetime points over and above physical objects and their parts. And suppose also you think that spacetime points exist across worlds. That is, you think there are facts about which spacetime points in $w$ are identical to which spacetime points in $w'$, for any $w, w'$. (In the terminology of Baker [forthcoming], you are an **unsophisticated substantivalist**.) In fact, let's suppose you think that the spacetime points that actually exist necessarily exist in every possible world, and that in every possible world they have exactly the structure that they actually do.

Then you might offer the following explanation of how a lone left hand is possible:

> A possible lone hand would occupy a region of space that actually exists. And it's a perfectly straightforward fact of the matter whether *that region* is a rigid motion of an actual left hand shape. Thus generally speaking, we can compare hands for congruence across possible worlds.

This view has problems.

- It offers to ground the modal facts about which *possible* hands are left and which are right. It offers to ground them in the facts about *actual* left and right hands. But even if it succeeds in this, it gives no explanation of in virtue of what *actual* left hands are left hands, and *actual* right hands are right hands. So it does not really answer the assigned question. (And given our discussion of Kant's argument above, it is not obvious that it will be able to.)

- The metaphysical assumptions of the view are extravagant. Although the traditional view is that substantivalists are committed to non-qualitative differences between space-time points, most contemporary substantivalists deny that they are required to make such commitments, adopting a "sophisticated substantivalism". Naive substantivalism appears to be committed to myriad empirically indistinguishable possibilities, such as "Leibniz shifted worlds". For example, the naive view, applied to a flat Newtonian space-time, entails that the entire universe might have been 12 feet away from where it actually is, or that it might have been differed only by a rotation.

Let us reject haecceitistic substantivalist orientational realism.

### 5.2 Oriented worlds

It is a widely accepted idea (both in physics and the philosophy of physics) that translation, rotation, and reflection (or their diffeomorphic counterparts, if we are considering the curved spacetime of general relativity) are symmetry properties of the space (or spacetime) we inhabit. If you translate the universe 12 feet in some direction, you don't get a new universe; you get this universe. Likewise for flipping the universe upside down. And likewise, in fact, if you mirror reflect the entire universe: that mirror reflected world is just the world you are now in. The motivation for accepting these symmetry properties is not merely the fact that there is no evidence for the additional structure that would entail

the violation of any of them. It is (as Leibniz stressed) the apparent fact that there *could not be* any such evidence.

If one thinks reflection is a symmetry of our universe, then it follows that one thinks the structure of actual space (spacetime) is **not** that of an **oriented** space. One will think instead that the structure of space has less structure: either that of an **orientable** space, or that of a **non-orientable** space. (The leading view is that our space is orientable.)

Of the three symmetries, reflection is the only one that gets seriously questioned. This usual reason for questioning it comes from the apparent failure of some laws to conserve parity. Another motivation for questioning it might be a conceptual one, the one that is our present topic: if the structure of space were not just orientable but oriented, then it seems space would have the structure to ground the difference between leftness and rightness *per se*.

**Oriented world orientational realism** teaches that our space has the structure of an oriented space, and that this structure is what grounds leftness and rightness *per se*. The orientation of our lone hand in the universe is grounded as left in the oriented nature of space. There is another possible world wherein space is oriented the opposite way. That is a lone right hand world.

(As we wish to understand this view, it is does not take a stand substantivalism/relationism debate as a matter of definition. However it may be that the most viable development of the view does require a stand on the metaphysics of space.)

This view has various problems.

- On the conceptual motivation: the idea that we need to postulate extra space-time structure to ground left-handedness and right-handedness is called into question by the possibility of non-orientable spaces, like the Mobius strip. In a world with this kind of space-time structure, it isnt even possible to ground this distinction, so in such a world, orientational anti-realism must be the correct view. The fact that it is possible for the left/right distinction to go ungrounded seems to call into question the assumption that it needs to be grounded in our world.

- It is unclear how oriented spaces in distinct worlds are to be "aligned", so that the property of being a left hand *per se* determines an extension at any oriented world.

  Granted that there are two distinct possible worlds each containing a hand, where the hands are in all non-orientational respects qualitatively identical, it is unclear in virtue of what one of these oriented worlds corresponds to the left handed world and the other to the right handed world.

- The fact that some laws of nature treat certain handed particles differently arguably does not recommend the rejection of reflection symmetry. There is good reason to think a reflection of this world really would be consistent with the laws of this world. It is plausible that there could not be evidence that the world has a particular orientation.

Let us reject orientational realism.


## 6  Orientational anti-realism

Recall our question was:

> Suppose we are given a pair of incongruent counterparts hands $A$ and $B$, and suppose $A$ is the left hand. In virtue of what is $A$ the *left* hand, rather than the *right* hand?

The **orientational anti-realist** rejects the question. There is no further fact of the matter to be found here. There is nothing that grounds the difference between left and right hands above and beyond their incongruent counterparthood. A lone hand universe is one wherein it is indeterminate whether the hand is left or right.

To be clear, the orientational anti-realist does not deny that there is a difference between **orientable** and **non-orientable worlds**, or that there are properties of space in virtue of which it is orientable or non-orientable. Indeed, the orientational anti-realist is likely to think that it is precisely the distinction between orientable and non-orientable worlds that undermines the very idea of there being any "leftness *per se*". One way to put her view is that she denies that a representation of the universe as orientable *leaves two further possibilities open* for how the representation might be realized.

How then do we explain the fact that the hand on my heart-side is more than just incongruent with my other hand, but is, in addition, my left hand?

At this stage, it is natural to want to start talking about **conventions**. Consider the following remarks from Pooley [2003]:

> ... the *only* facts about a left hand that make it left, is the fact that *we call it "left"*, that it is congruent to every other hand that we in fact call "left" and incongruent to every hand that we call "right".[3] Such an account of the meanings of "left" and "right" is, of course, very close to a causal theory of reference for proper names. And in certain respects the terms "left" and "right" are very much like names. What was it about Immanuel Kant, for example, that made it correct for his contemporaries to call him "Immanuel Kant"? *Nothing*, other than the fact that he was actually known as "Immanuel Kant", that there was a practice of calling him "Immanuel Kant" and so on.
>
> Can this really be all there is to the left-right distinction? I believe that it is. Such a point of view receives indirect support from what Jonathan Bennett calls the *Kantian Hypothesis* [Bennett, 1970, 11]. This is the claim that chiral terms such as "left" and "right" cannot ultimately be explained without ostensively demonstrating, for example, a left hand. Various chiral terms can be explained in terms of each other. For example, one can define "left" in terms of "clockwise" and other, related, notions. But to break out of a rather tight circle, one must ultimately show what one means by "clockwise" or by "left." Non-chiral words will never be enough. (11)

Again, the idea is that there is no further metaphysical account of what makes left *left* over and above a general account of incongruent counterparthood. We have nothing metaphysically to cite about the hand that makes it different from a right hand *per se*. The most we can do is cite differences in the way the hands 'relate' to our linguistic practice. The only question in the vicinity left are **semantic** questions, such as:

> Thanks to what does the hand on my heart side fall into the extension of the predicate 'is a left hand'?

And here (following Bennett [1970]) we observe something interesting: the meaning of 'left' ('right') does not seem explicable in purely qualitative terms. It seems to require something like ostensive demonstration, or reference to a particular chiral object.

One way to take this: a **simple description theory of orientation terms**, such as 'left' and 'right' is incorrect. That is to say, the predicate 'is a left hand' does not have the same intension as any purely qualitative predicate.

On reflection, this is not surprising. We surely do not want to explain 'left' in such a way that the predicate 'is a left hand' is intensionally equivalent to a predicate like 'is the sort of hand found on the heart side of the body'. This would license all the wrong modal conclusions. For instance, it would follow that the claim that the heart *might have been* on the right side is false, an incorrect result.

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[3]Footnote added: "The question "in virtue of what is a left hand left" is thus rather misleading. I should perhaps stress that my favoured relational account of handedness is not part of a general nominalism according to which the instances of any general term "X" have in common only the fact that we call them all "X". It is only the leftright contrast, not handedness *per se*, that is purely nominal."

Moreover this view seems to falsely entail that it is trivially true, as a matter of the meaning of 'left', that the heart is on the left side. (Similarly for other simple descriptions.)

An alternative to this idea is to think of some description as, using Kripke's terminology, "fixing the reference" of 'left hand' rather than "giving the meaning" of the term. This is roughly what Pooley has in mind.

Does this make sense? Kripke, observing the rigidity of proper names, proposed that we take the semantic value of a name to be its bearer. On the hypothesis that the bearer of a name can be taken to exist with respect to various possible worlds, this makes sense. The semantic value of 'Immanuel Kant' is just Immanuel Kant; it is this guy, Kant, regardless of what possible world we consider the semantic value with respect to. It does not refer to the satisfier of a some description at each world.

But it appears we cannot extend this kind story to 'left' and 'right'. For we have nothing to play the role of Kant himself—the being that exists across worlds. It is no good to say that 'left side' rigidly picks out the side of my body that my heart happens to be on. For this presupposes that we can identify 'left sides' across worlds; but that is what the orientational anti-realist precisely denies!

Thus while the orientational realist faces metaphysical challenges, the orientational anti-realist faces a semantic challenge. If orientational anti-realism is true, it appears that orientational terms like 'left hand' and 'right hand' do not have well-defined intensions: their semantic values do not determine a function from possible worlds to the set of left (right) hands in that world. But without such an intension, we cannot compositionally determine the truth-conditions of 'left' and 'right' talk.

Can we leverage experience to solve this problem?

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# Meaning in a disoriented world

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## 1   There is no problem about incongruent counterparthood

Suppose there are three counterpart hands $A, B, C$ on the table. What would it take to make the following sentence true?

(1) Hands $A$ and $B$ are congruent with each other, and are both incongruent with $C$.

In particular: can we explain what the relations of counterparthood and congruence are, such that this kind of situation is possible? Yes. We went through the details last week. We can explain counterparthood in terms of isometry of shape, which in turn is explained in terms of preservation of distances between parts. Incongruence is explained in terms of the shapes of objects not being rigid motions of each other in the space they inhabit.

There are no doubt separate philosophical problems about distance, and about space. But those seem to be separate problems, not having anything to do with incongruent counterparthood *per se*.

So it seems there is no real mystery about incongruent counterparthood *per se*. If there is something surprising about this relation, it is that whether two objects are incongruent counterparts depends on what rigid motions are allowed by the space they are in. (We brought this out last time by talking about non-orientable spaces, like the Mobius strip.) That is to say, incongruent counterparthood is, really, a three-place relation between two objects and the geometry of the space they are in. This isn't immediately intuitive. But nor is it surprising that it isn't immediately intuitive, for non-orientable spaces are not spaces we are used to thinking about.

## 2   The real problem about orientation

Suppose again we have three counterpart hands $A, B, C$ on the table. Consider:

(2) Hands $A$ and $B$ are left hands, and $C$ is a right hand.

(3) Hands $A$ and $B$ are right hands, and $C$ is a left hand.

Intuitively, these correspond to the two (mutually incompatible and jointly exhaustive) possible ways that (1) might be true. Thus if (2) is true, there is more to its being true than that (1) is true; and likewise, if (3) is true, there is more to its being true than that (1) is true. Now we can ask: what more is required to make one of these true, rather than the other?

Merely talking about the congruence relations between the hands clearly gets us nowhere here, for the distribution of congruence relations is the same across (2) and (3)—viz., as in (1). Thus the fact that the congruence relations between the hands are as in (1) cannot ground the difference between (2) and (3), or be what explains what is required to make one rather than the other true.

We could call the challenge of explaining this **the problem of leftness and rightness *per se***, as we did last week; but that is rather wordy, so let's call it instead **the orientation problem**.

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# 3 Responding to the orientation problem

There are various ways of responding to the orientation problem.

**Realism:** The realist grounds the difference between (2) and (3) in some aspect of the structure of space, appealing to structure beyond that required to ground relations of congruence. The development of this view depends on what further structure is assumed. On one version of this view, if (2) is true, then the hands bear certain relations to a haecceitist substantival space, relations they would fail to stand in to that space were (3) true instead. On another version of this view, if (2) is true, then the hands all inhabit a certain oriented space, one different than the one they would inhabit if (3) were true.

**Conventionalism:** The conventionalist holds that if (2) rather than (3) is true, this is so thanks to our linguistic conventions concerning how to use the words 'left' and 'right'. Conventionalism is an anti-realist, deflationary response to the challenge. According to it, there is no substantive property of (e.g.) being a left hand.

**Dispositionalism:** The dispositionalist holds if (2) rather than (3) is true, this is in virtue of the hands' relations, or possible relations, to experiencers. The dispositionalist will hold that the property of being a left hand is something like the property of being disposed to give rise to experiences of a certain distinctive sort—"leftish" experiences. (Right hands, of course, will have a different dispositional property, that of giving rise to "rightish" experiences.) Dispositionalism is a kind of subjectivism, and in that respect can be construed as a kind of anti-realism. But unlike the conventionalist, the dispositionalist *does* think that there is a bonafide property of (e.g.) being a left hand. This is a **response-dependent** property hands may have or fail to have quite independently of our linguistic practice.

All of the above views grant the premise of the problem of orientation, namely that (2) and (3) are the two mutually incompatible and jointly exhaustive possible ways that (1) might be true. A final view we can mention is the view that this premise is false, because although (1) might be true, neither (2) nor (3) could even possibly be true.

**Error theory:** All, or at least the vast body, of ordinary sentences involving 'left' and 'right' are either false or truth-valueless.

All of these views face difficulties. Last week we argued against realism. Let's turn now to the other possible views, beginning with conventionalism.

# 4 Conventionalism

In the face of the physically compelling idea that there really is no difference between a world and its mirror reflection, conventionalism can seem like an attractive view. We should proceed with caution, however, with any claim to the effect that a sentence is true "by convention". For often this sort of claim has little plausibility. Go back, for instance, to our sentence (1), repeated:

(1) Hands $A$ and $B$ are congruent with each other, and are both incongruent with $C$.

We asked of this sentence what it would take to make it true. To answer, we spoke of isometry, rigid motion, and the like. We would not have been satisfied with the alternative answer that when (1) is true, it is true thanks to our conventionally talking a certain way. Insofar as that claim even makes sense, it seems just false. Why then should we be any more comfortable appealing to convention when it comes to (2)/(3)?

[To be clear, it may very well be correct that there is a general respect in which the *truth-conditions* of a sentence are partly a matter of conventions of language. But if so, that would be a fact about *all* sentences, and it would not entail that any sentences are true by convention.]

Pooley [2003] might be an example of a conventionalist; aspects of what he says are in the spirit of that view. Here is how he describes and motivates his position:

> ... the *only* facts about a left hand that make it left, is the fact that *we call it "left"*, that it is congruent to every other hand that we in fact call "left" and incongruent to every hand that we call "right".[1] Such an account of the meanings of "left" and "right" is, of course, very close to a causal theory of reference for proper names. And in certain respects the terms "left" and "right" are very much like names. What was it about Immanuel Kant, for example, that made it correct for his contemporaries to call him "Immanuel Kant"? *Nothing*, other than the fact that he was actually known as "Immanuel Kant", that there was a practice of calling him "Immanuel Kant" and so on. (11)

On its face, this passage is confused. Let's set out the supposed analogy more carefully.

> The only facts about a left hand that make it left is the fact that we call it 'left' (etc).
>
> Likewise: The only facts about Immanuel Kant that made him Immanuel Kant is the fact that he was called 'Immanuel Kant' (etc).

Put this way, there is no analogy, for it simply isn't the case that what made Kant Kant is the fact that he was called 'Kant'. There is debate about what exactly makes a person who they are, but no one thinks that it is a matter trivially determined somehow by the name one has.

Does Pooley have some other analogy in mind? Perhaps:

> The fact about a left hand that makes it correct to call it 'left' is the fact that there is this practice of calling such hands 'left'.
>
> Likewise: The fact about Immanuel Kant that made it correct to call him 'Immanuel Kant' is the fact that there was a practice of calling him 'Immanuel Kant'.

But this is not helpful. It uses the notion we want explained, which is the notion of a left hand. And in any case, insofar as the above claims are true, they seem like the sort of trivialities that would apply equally to all expressions:

> The fact about an F that makes it correct to call it 'F' is the fact that there is this practice of calling Fs 'F'.

Pooley continues:

> Can this really be all there is to the left-right distinction? I believe that it is. Such a point of view receives indirect support from what Jonathan Bennett calls the *Kantian Hypothesis* [Bennett, 1970, 11]. This is the claim that chiral terms such as "left" and "right" cannot ultimately be explained without ostensively demonstrating, for example, a left hand. Various chiral terms can be explained in terms of each other. For example, one can define "left" in terms of "clockwise" and other, related, notions. But to break out of a rather tight circle, one must ultimately show what one means by "clockwise" or by "left." Non-chiral words will never be enough. (11)

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[1] Footnote added: "The question "in virtue of what is a left hand left" is thus rather misleading. I should perhaps stress that my favoured relational account of handedness is not part of a general nominalism according to which the instances of any general term "X" have in common only the fact that we call them all "X". It is only the left-right contrast, not handedness *per se*, that is purely nominal."

The Kantian Hypothesis doesn't seem quite correct as stated.[2] In any case, the interesting overarching idea here seems to be that to get at the meaning of 'left' and 'right', we ultimately need the help of some particular chiral object. There are at least two ways one could imagine this working.

**Tacit reference to a standard chiral object.**
On one way, the least plausible, the handedness of a hand is grounded in the fact that it is (in)congruent to some particular chiral object. To fix ideas, let's call this special particular 'Handy'. The property of being a left hand is the property of being congruent with Handy; right-handedness is the property of being incongruent with Handy.

This would certainly secure a truth-conditional difference between (2) and (3). But it raises more questions than answers. (i) No particular object is crucial to every use of 'left' and 'right'; on the contrary, it appears any chiral object at all might be used to explain the meanings of these terms. (ii) Since, necessarily, Handy is congruent with itself, it would follow that, necessarily, Handy is a left hand. But in light of non-orientable spaces, such a view is hard to believe.

**Reference-fixing with an arbitrary chiral object.**
Second try: perhaps no particular object is involved in the truth-conditions of left-right talk, but that a particular object *is* involved in "fixing the reference" of predicates such as 'is a left hand'.

Let's have an analogy to see how this could work in the abstract. I have a piece of paper, which I dub 'Brian'. I crumple Brian up. Brian now has a very complicated shape. It would take a long time to explain this shape. Since I now want to be able to refer to this shape-property easily, I coin a new predicate: 'krumply', I stipulate, shall express the specific shape property that Brian now actually instantiates.

Thereby I have fixed the reference of the predicate 'krumply', and I have done so by exploiting a contingent property of a particular, namely Brian. Although I used Brian to fix the reference of my predicate, it nevertheless is the case that Brian might not have been krumply. And when I go on to say that some other piece of paper is krumply, the truth of what I say does not turn on how things are with Brian; I am not expressing a relation to Brian. Now we might imagine this predicate gets passed on from speaker to speaker through communicative exchanges. Other speakers succeed in picking out the same shape property by means of this predicate because, roughly, their uses of the name are appropriately causally connected to my dubbing the property with the name.

Can the same reference-fixing trick be pulled off for the property 'is a left hand'? Might we use some arbitrary chiral object, say Handy, not to figure in the truth-conditions of all left-right talk, but rather instead to fix the reference of predicates like 'left-handed'? Or rather, might we say that this is effectively what was actually involved in initiating the practice of left-right talk?

This would only work *if there really were a property that Handy had which constituted its being a left hand*—analogous to the way in there really is a property that Brian has which constitutes his being krumply. But the conventionalist precisely denies that there are any such properties. But this means that Handy doesn't have any special property that we can exploit him to pick out.

The absence of this property means that 'left hand' has no well-defined intension: there is no rule which takes a possible world to the set of left hands in that world. This is just another way of saying there are no meaningful comparisons of handedness across possible worlds.

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[2]Though if it were, it would entail that 'left' and 'right' are importantly different from names, since to acquire competence with a name one does not require any ostensive demonstration.

## 5    Dispositionalism

The key thought behind a dispositionalist account is that the difference between (1) and (2) or (3) is that (2) and (3) tell us something about the relation between the hands and us, namely they tell us something about how the hands are experienced, or would be experienced.

Why might this seem like an attractive thing to say? Certainly, orientational properties seem prima facie to be more like primary qualities like shape and size than like more clear-cut cases of response-dependent properties, like taste or smell. Nonetheless, we think the view can be motivated.

One part of the motivation comes from rejecting an orientational realist view. On an orientational anti-realist view, there's a sense in which there's no difference between the arrangement of hands described by (2), and a mirror-image arrangement of hands. Once we have realized this, there is an obvious contrast between the way the objects look, and the way they have been revealed to be by the correct metaphysics. A left and a right hand look different even if (in some sense) they aren't really different. This idea may drive us towards thinkng of being on the left as the same thing as appearing a certain way to us.

Another motivation comes from a thought experiment concerning what it takes to know the orientational facts about the world. Recall that on an orientational anti-realist view, there's no difference between a possible world and the mirror-image of that possible world. Suppose, bearing this in mind, that you want to know all the facts about this world and your place in it. One might argue that I could give you all this information  a qualitative specification of the world with a center marked on it without telling you which things are on the left, and which on the right. That is, it might be argued that *de se* omniscience is not enough to know the orientational facts.
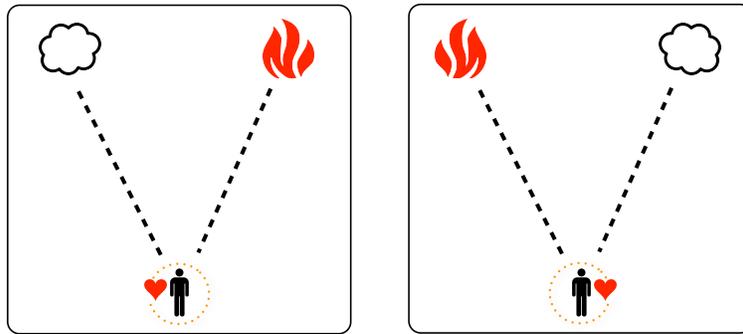


Should he go left, or right?

One response to the problem invokes experiences. If I tell you all the physical facts, and where you are, that might not give you all the orientational information. But what if I tell also about the experiences you are having (or maybe I tell you enough about the connection between experiences and the physical world, that you can figure out what experiences you would have under certain circumstances). Now it seems that you do know enough to determine the orientational facts. For example, you can figure out whether a certain hand is a left or a right hand, by figuring out how it would look to you.

If orientational facts have to do with how things look, then this observation is easily explained.

5

## 5.1  Refining the dispositional view: first steps

Although there are many "orientation involving" properties (like being a left hand, or being a correctly oriented English sentence) it seems that we shouldn't need to give a separate account of the role of experience for each one. Plausibly, if we can explain the properties of being on the left and being on the right in terms of experience, that will be enough: the other orientational properties can the be defined in terms of these.

Being on the left is a property that an object has only relative to a perspective. How should we think about a perspective? It is a triple of a centered world (construed as a spacetime point in a world), an arrow specifying back/front, and an arrow specifying up/down. The point need not be actually occupied by an observer.

Here's one response-dependent view:

> (D1)  X is to the left from perspective P iff X looks to be on the left from P.

Here are some obvious questions about the account:

>    (i)  What is it to "look to be on the left" from P? Can it have this property even if there is no observer there?
>   (ii)  What about objects that aren't visible from P? Can't they be on the left also?
>  (iii)  What about objects that couldn't possibly be seen, like microscopic particles?
>   (iv)  What if there are points in space that no possible observer could view the world from (like the center of a black hole?)

We can deal with (ii) and (iii) by replacing (D1) with (D2):

> (D2)  X is to the left from perspective P iff X looks to be on the left from P or X is on the same side as things that look to be on the left.

The fact that we can easily extend orientational properties to objects that can't even in principle be observed is an important difference with response-dependent properties like smell and taste.

What is it to "look to be on the left"? A natural idea is that it is for the object to be disposed to produce certain experiences in certain observers, were they positioned at P. (Of course, strictly speaking, we mean a counterpart of P.) Who are the "certain observers"? Suppose we start with just using the subject who is entertaining the orientational thought:

> (D3)  **Indexical dispositionalism.**
> X is to the left from perspective P iff X would be disposed to produce this (leftish) kind of experience in me were I located at (a counterpart of) P, or is on the same side as objects that have this property.

What a "leftish experience" is, is an extremely important question, to which we shall return.

Perhaps (iv) can be dealt with by pointing out that once the extensions of "left" and "right" are well-defined from a single perspective, they are derivatively well-defined from every perspective in a world. If a small number of relevant perspectives (e.g. those on the earth's surface) give consistent assignments of left and right (e.g. we have consistent left/right experiences of the world from these different locations), that will be enough to fix their extensions at more exotic locations in the world.

In any case, there are better questions to press about the indexical dispositionalist account.

**Agreement.** Michael has a strange condition. Every once and a while, his experiences temporarily mirror invert. Michael is shy about his problem, however, and doesn't like to call attention to it.

Suppose I know all this. Michael and I are walking together, and he suddenly says:

(4) There's a spotted bluejay to the left of the tree over there!

Now let's stipulate that from my perspective, the bluejay is in fact to the left. The question is, should I believe what Michael says? It seems that I should hesitate. From the point of view of indexical dispositionalism, Michael is partly describing his experiential with the above sentence. Given that Michael may be in a mirror inverted state, and given that he would lie about it if he were, it may very well be that (4) is false. But surely I should assent to (4).

Indeed, we can see a more basic problem.

(5) Michael: There's a spotted bluejay to the right of the tree over there.
    Seth: Fascinating! Let me add that the bluejay to the left of the tree.

(6) Michael: There's a spotted bluejay to the left of the tree over there.
    Seth: I'm sure you're lying. But I'll add that the bluejay to the left of the tree.

Fixes?

A more basic worry afflicting response-dependent treatments: circularity.

## 6   Error theory

One way to be an error theorist is deny that there are properties such as *being a left hand*, and to take it that the use of predicates such as 'is a left hand' presupposes there are such properties. Another way to be an error theorist is to grant that there are such properties, but to deny that they are ever instantiated. A third way is to to grant that there are such properties, but to deny that they are instantiated by the sort of objects we tend to apply these properties to. (Cf. the analogous view about color.)

The obvious burden on the denier is to explain the evident difference between correct and incorrect use of 'left-right talk. Suppose we are at Point A, and you ask me for instructions to Point B. Consider now the following two sets of directions:

(D1) Go straight for two blocks, then turn right, then make your first left and go one block.

(D2) Go straight for two blocks, then turn left, then make your first right and go one block.

Following one of these, it is safe to stipulate, will get you to Point B, and the other definitely will not. But if so, that feature of the directions evidently owes the credit to the correct use of 'left' and 'right', for that is the only difference between the two sets of directions. How does the denier explain this?

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# Meaning in a disoriented world, continued

Reading: Fillmore [1971], the last two handouts

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## 1   The orientation problem

Suppose hands $A$ and $B$ are counterparts.

(1)  Hands $A$ and $B$ are congruent with each other.

(2)  Hands $A$ and $B$ are left hands.

(3)  Hands $A$ and $B$ are right hands.

Intuitively, (2) and (3) each entail (1); and intuitively, (2) and (3) are incompatible.

THE ORIENTATION PROBLEM.
What more besides (1) is required to make one of (2)-(3) true, rather than the other?

Last time we considered various unworkable interpretations of Pooley's answer to this question. Here is another, more plausible idea one might pull from Pooley's remarks.

## 2   Conventionalism redux

The sets of actual hands can be partitioned, by congruence, into two equivalence classes. Can we give these two classes names? Of course. Let us arbitrarily call one of these classes '$L$' and the other '$R$'. Now consider the following sentences:

(1)  Hands $A$ and $B$ are congruent with each other.

(4)  Hands $A$ and $B$ are in $L$.

(5)  Hands $A$ and $B$ are in $R$.

And let's consider a new "problem":

THE L-R PROBLEM.
What more besides (1) is required to make one of (4)-(5) true, rather than the other?

Clearly, there is no explanatory answer here—no answer analogous to the kind of explanatory answer we might give to the question of why (1) is true. The question being posed is instead analogous to asking something like the following:

Consider a set $K$ such that Kant is in the set. Question: thanks to what is Kant in $K$?

Just as it is *given* ('conventional') that Kant is in $K$, likewise it is *given* that $L$ and $R$ have the members that they in fact have. That is, '$L$' ('$R$') was simply defined to correspond to one of the two equivalence classes of congruent hands. The only question in the vicinity here is a linguistic question, namely the question whether $A$ and $B$ are in the set stipulated to be the referent of '$L$' ('$R$').

We might ask: what is involved in stipulating that one class be the referent of '$L$'? This could be achieved in various ways, and the details don't particularly matter for the version of conventionalism we now wish to consider. For instance, we could use a particular: hold up some hand $h$ and say, "Let $L$ be the equivalence class of hands that *this* hand, hand $h$, belongs to." Then we would have:

$$L =_{\text{DEF}} \{x : x \text{ is congruent to } h \text{ in } @ \}$$

Or we could use a description: we could say, "Let $L$ be the equivalence class of hands which contains the hand Ali used to knock out Foreman." Then we would have:

$$L =_{\text{DEF}} \{x : x \text{ is congruent, in } @, \text{ to the hand Ali used to knock out Foreman in } @ \}$$

Either way we will have fixed a reference for '$L$' and by parity, '$R$'.

This is an adequate reply to THE L-R PROBLEM. Can just the same response be given to the THE ORIENTATION PROBLEM? Yes, if we treated 'left' and 'right' as exactly analogous to 'being a member of $L$' and 'being a member of $R$'. If the conventionalist did that, he would have a clear and coherent answer to the question what more besides (1) is required to make one of (2)-(3) true, rather than the other.

So a version of conventionalism can, strictly speaking, solve THE ORIENTATION PROBLEM. If there is a problem with conventionalism, it is not that the conventionalist can't answer this question.

## 3 Extensional versus intensional equivalence

It is clear what the property *being a member of* $L$ is. The conventionalist says that we should, in effect, identify the property a being a left hand with this property. If two properties are equivalent, they have the same intension; and if they have the same intension, they have the same extension.

Now it is clear that the two properties have the same extension. Or, semantically ascending: it is clear that the semantic values of the predicates 'being a member of $L$' and 'being a left hand' are such that, when we evaluate them with respect to the actual world, we get the same set of objects:

$$[\![ \textbf{ being a member of } \boldsymbol{L} ]\!]^{@} = [\![ \textbf{ being a left hand } ]\!]^{@} = \{x : x \in L\}$$

This equivalence was achieved by fiat: we simply made sure to pick out $L$ in such a way that it corresponded to the equivalence class of actual left hands. This is why the conventionalist can get the correct result for purely extensional sentences such as (2) and (3).

But do these properties have the same **intension**? Or, semantically ascending: do the predicates 'being a member of $L$' and 'being a left hand' have the same extension with respect to **any** possible world? This question is crucial for the conventionalist.

Last week we pressed the worry that these predicates are **not** intensionally equivalent, and that as a result, the conventionalist has the wrong account of 'left' and 'right'. The failure of intensional equivalence is revealed most clearly in connection with modal sentences, and not with purely extensional sentences such as (2)/(3). Let's now go over this worry more carefully.

## 4 'Left hand' and 'right hand' as rigid predicates?

Ultimately, we want to examine what the conventionalist's view predicts, not just about extensional sentences such as (2) and (3) (repeated):

(2) Hands $A$ and $B$ are left hands.

(3) Hands $A$ and $B$ are right hands.

But also about intensional (modal) sentences, such as:

(6) Hand $A$ is a left hand, but it might have been a right hand.

(7) If I were to raise my left hand, it would be in the air.

(8) There might have been more left hands than there actually are.

Etc. In order to bring conventionalism to bear on intensional sentences in a clear way, it will help to state the semantic assumptions of the view a bit more clearly. Let's do that.

## 4.1 Warm-up

We'll approach matters indirectly. To fix ideas, we'll start by giving a semantics for a boring, non-orientational sentence. Then we can turn back to sentences containing 'left hand' and 'right hand'. So consider the sentence:

(9) John is hungry.

Ignoring various subtleties, in an ordinary possible worlds semantics the semantic values of the parts of this sentence would be:

$[\![\textbf{John}]\!]^w = $ John
$[\![\textbf{is hungry}]\!]^w = \{x : \text{is hungry in } w\}$

Let's assume the following schematic composition rule for sentences of the form $Fx$:

**Compositional rule.** $[\![Fx]\!]^w = 1$ iff $[\![x]\!]^w \in [\![F]\!]^w$

Then the semantic value of the sentence may be determined compositionally as follows:

$[\![\textbf{John is hungry}]\!]^w = 1$  iff
$[\![\textbf{John}]\!]^w \in [\![\textbf{is hungry}]\!]^w$  iff
John $\in \{x : \text{is hungry in } w\}$ iff
John is hungry in $w$

Thus the truth-conditions, or set of possible worlds, with respect to which the sentence is true is:

$\{w : \text{John is hungry in } w\}$

The sentence is true just in case the the actual world @ is in this set.

So far so good. Now, what if we embed the sentence (9) under a modal operator?

(10) John might have been hungry.
(I.e., 'It might have been that' + 'John is hungry')

To give truth-conditions for (10), we first need to know the compositional semantic contribution of the possibility operator. Abbreviating this operator with the diamond, assume the following:

$[\![\Diamond \phi]\!]^w = 1$  iff  $\exists w' : wRw'$ and $[\![\phi]\!]^{w'} = 1$[1]

Then the semantics of (10) can be unpacked as follows:

$[\![\Diamond(\textbf{John is hungry})]\!]^w = 1$  iff
$\exists w' : wRw'$ and $[\![\textbf{John is hungry}]\!]^{w'} = 1$
$\exists w' : wRw'$ and $[\![\textbf{John}]\!]^{w'} \in [\![\textbf{is hungry}]\!]^{w'}$  iff
$\exists w' : wRw'$ and John $\in \{x : \text{is hungry in } w'\}$ iff
$\exists w' : wRw'$ and John is hungry in $w'$

---

[1]This is the semantics for the possibility operator given in a Kripke semantics for modal logic. The $R$ corresponds to an *accessibility relation*, which specifies which worlds are 'possible' with respect to which. We needn't worry now about what restrictions this relation is subject to.

Thus the truth-conditions, or set of possible worlds, with respect to which the sentence is true is:

$$\{w : wRw' \text{ and John is hungry in } w'\}$$

That wraps up our example; let's turn back to 'left' and 'right'.

## 4.2   Conventionalist semantics for 'left hand' and 'right hand'

Consider the sentence:

(11)   Handy is a left hand.

What are its truth-conditions, according to the conventionalist? We can work it out from assumptions about the parts of the sentence. The conventionalist makes no particular assumption about names, so let's just continue to adopt the standard, Kripkean view of names:

$\llbracket \textbf{Handy} \rrbracket^w = $ Handy (i.e., some particular hand; a left one, let's stipulate)

The conventionalist's view embraces the following semantics for handedness predicates:

$\llbracket \textbf{is a left hand} \rrbracket^w = L$
$\llbracket \textbf{is a right hand} \rrbracket^w = R$

—where again, the set $L$ ($R$) is stipulatively defined, in some manner or another, to correspond to the equivalence class by congruence of the actual left (right) hands. Notice that, in contrast with ordinary predicates (e.g., **is hungry**), the extensions of these predicates do not vary with the choice of evaluation world. These predicates are **rigid**, in exactly the way that names are on the Kripkean view of names.

From these two semantic values together, the truth-conditions of (11) are straightforward:

$\llbracket \textbf{Handy is a left hand} \rrbracket^w = 1$  iff
$\llbracket \textbf{Handy} \rrbracket^w \in \llbracket \textbf{is a left hand} \rrbracket^w$  iff
Handy $\in L$

Thus the truth-conditions, or set of possible worlds, with respect to which (11) is true is:

$$\{w : \text{Handy is in } L\}$$

Since Handy is a member $L$, and $L$ does not vary with (is not relative to) possible world, it follows that every world is such that Handy is in $L$; the quantification over worlds here is vacuous. So (11) is true with respect to every world, hence necessarily true. Correspondingly, we know the sentence:

(12)   Handy might have been a right hand.

is false according to the conventionalist. Its truth-conditions are as follows:

$\llbracket \Diamond(\textbf{Handy is a right hand}) \rrbracket^w = 1$  iff
$\exists w' : wRw'$ and $\llbracket \textbf{Handy is a right hand} \rrbracket^{w'} = 1$  iff
$\exists w' : wRw'$ and $\llbracket \textbf{Handy} \rrbracket^{w'} \in \llbracket \textbf{is a right hand} \rrbracket^{w'}$  iff
$\exists w' : wRw'$ and $\llbracket \textbf{Handy} \rrbracket^{w'} \in \llbracket \textbf{is a right hand} \rrbracket^{w'}$  iff
$\exists w' : wRw'$ and Handy $\in R$

But Handy $\notin R$, and since $R$ does not vary with the possible world we consider, there is no world such that Handy $\in R$.

These predictions of conventionalism are incorrect. Sentences like

(13) Handy is a left hand, but it might have been a right hand.

can be true. The handedness of something is generally not necessary to it. We should like to say things like:

(14) If Handy were embedded in space differently, it might have been a right hand.

(15) If we were to put Handy in the mirror reversal machine, it would emerge a right hand.

Related, and more mundanely:

(16) This glove is reverseable. It is a left glove now, but if you were to turn it inside out, it would be a right glove.

All of these claims are false, on the conventionalist semantics we have described; for they all call for some object to be possibly left-oriented and possibly right-oriented, and conventionalism does not allow for this. A related difficulty arises with:

(17) There might have been more, or fewer, left hands than there actually are.

This is true; but it could only be true if the number of left/right hands could vary across worlds, something our conventionist cannot make sense of.

Summing up, the objection is that conventionalism fails to respect:

> CONTINGENCY OF HANDEDNESS.
> The particular orientation of some (if not all) chiral objects is a contingent matter, as is the particular cardinality of their congruence classes.

The burden on the conventionalist is to revise his semantics so that it will respect the contingency of handedness—and to do so in a manner compatible with the anti-realist spirit of conventionalism.

## 5  The Kantian hypothesis and some related themes

As we have described conventionalism, it is quite arbitrary how the sets $L$ and $R$ are picked out: we could do it by ostension, or we could do it using a purely qualitative description. This arbitrariness is in tension with some of Kant's latter remarks on the left/right distinction; for example, the remark in the *Prolegomena* that:

> The difference between similar and equal things which are not congruent (for instance, two symmetrical helices) cannot be made intelligible by any concept, but only by the relation to the right and left hands which immediately refers to [sensuous] intuition. (1.3)

Bennett's distills from these and related remarks what he calls the *Kantian Hypothesis*:

> KANTIAN HYPOTHESIS.
> The meaning of 'left' and 'right' can be explained "only by a kind of showing—one could not do it by telling" ([Bennett, 1970, 175]).

Fillmore makes a similar point when he says:

> There is a basic sense of the terms 'left' and 'right' by which human beings are taught to find left and right on their own bodies, and it is likely that this can be learned only be demonstration. There are no simpler concepts in terms of which the notions of 'left' and 'right' can be explicated. [Fillmore, 1971, 34]

Here are some related ideas:

THE EXPERIENTIAL CAPACITY PREREQUISITE.

A prerequisite to knowing the meaning of 'left' and 'right' is that one be able to have an experience as of the chirality of an object or scene.

THE VERIDICAL EXPERIENTIAL CAPACITY PREREQUISITE.

A prerequisite to knowing the meaning of 'left' and 'right' is that one be able to have an experience of the chirality of an object or scene.

THE EXPERIENCE PREREQUISITE.

A prerequisite to knowing the meaning of 'left' and 'right' is that one have had an experience as of the chirality of an object or scene.

THE VERIDICAL EXPERIENCE PREREQUISITE.

A prerequisite to knowing the meaning of 'left' and 'right' is that one have had an experience of the chirality of an object or scene.

Are any of these plausible?

We can also state two versions of a thesis which links one's knowledge of the meanings of these terms to one's capacity to apply them on the basis of experience:

ORIENTATIONAL LANGUAGE/CONCEPTS AS RECOGNITIONAL.

It is constitutive of knowing the meaning of 'left' and 'right', or possessing the concepts LEFT and RIGHT, that one be disposed to apply these terms on the basis of certain kinds of experience.

ORIENTATIONAL LANGUAGE/CONCEPTS AS RELIABLY RECOGNITIONAL.

It is constitutive of knowing the meaning of 'left' and 'right', or possessing the concepts LEFT and RIGHT, that one be disposed to apply these terms in a stable way to the sides of chiral objects or scenes.

One way to fail to have reliably veridical orientational experiences is simply to reliably hallucinate. Another way might be to be like Flippy:

Each time Flippy goes to sleep, he awakes to find that his experiences are mirror-inverted. Thus the room he wakes to seems to him to be the equivalent of a mirror reflection of the room he fell asleep in; the sides of his body appear to have been flipped; and so on.

On the one hand, Flippy might be able to reliably use 'left' and 'right' talk; but on the other, it seems correct to say that for Flippy, the sides of things appear to continually mirror-reverse.

## 6 Dispositionalism

The key thought behind a dispositionalist account is that the difference between (1) and (2) or (3) is that (2) and (3) tell us something about the relation between the hands and us, namely they tell us something about how the hands are experienced, or would be experienced.

Motivations:

- The alternatives are worse: orientational realism is metaphysically extravagant; conventionalism gets the wrong truth-conditions.
- The Kantian hypothesis.
- The intuition that omniscience about the physical and (non-experiential) indexical facts is not enough to know the orientational facts.

## 6.1 Refining the dispositional view: first steps

Although there are many "orientation involving" properties (like being a left hand, or being a correctly oriented English sentence) it seems that we shouldn't need to give a separate account of the role of experience for each one. Plausibly, if we can explain the properties of being on the left and being on the right in terms of experience, that will be enough: the other orientational properties can the be defined in terms of these.

Being on the left is a property that an object has only relative to a perspective. How should we think about a perspective? It is a triple of a centered world (construed as a spacetime point in a world), an arrow specifying back/front, and an arrow specifying up/down. The point need not be actually occupied by an observer.

Here's one response-dependent view:

> (D1)  X is to the left from perspective P iff X looks to be on the left from P.

Here are some obvious questions about the account:

> (i)   What is it to "look to be on the left" from P? Can it have this property even if there is no observer there?
>
> (ii)  What about objects that aren't visible from P? Can't they be on the left also?
>
> (iii) What about objects that couldn't possibly be seen, like microscopic particles?
>
> (iv)  What if there are points in space that no possible observer could view the world from (like the center of a black hole?)

We can deal with (ii) and (iii) by replacing (D1) with (D2):

> (D2)  X is to the left from perspective P iff X looks to be on the left from P or X is on the same side as things that look to be on the left.

The fact that we can easily extend orientational properties to objects that can't even in principle be observed is an important difference with response-dependent properties like smell and taste.

What is it to "look to be on the left"? A natural idea is that it is for the object to be disposed to produce certain experiences in certain observers, were they positioned at P. (Of course, strictly speaking, we mean a counterpart of P.) Who are the "certain observers"? Suppose we start with just using the subject who is entertaining the orientational thought:

> (D3)  **Indexical dispositionalism.**
> X is to the left from perspective P iff X would be disposed to produce this (leftish) kind of experience in me were I located at (a counterpart of) P, or is on the same side as objects that have this property.

What a "leftish experience" is, is an extremely important question, to which we shall return.

Perhaps (iv) can be dealt with by pointing out that once the extensions of "left" and "right" are well-defined from a single perspective, they are derivatively well-defined from every perspective in a world. If a small number of relevant perspectives (e.g. those on the earth's surface) give consistent assignments of left and right (e.g. we have consistent left/right experiences of the world from these different locations), that will be enough to fix their extensions at more exotic locations in the world.

In any case, there are better questions to press about the indexical dispositionalist account.

**Agreement.** Suppose I am on a walk with Flippy, and he suddenly says:

(18) There's a spotted bluejay to the left of the tree over there!

Externally described, Flippy and I occupy the same vantage point. Now let's stipulate that from my perspective, the bluejay appears as on the left. The question is, should I believe what Flippy says? It seems that I should hesitate. From the point of view of indexical dispositionalism, Flippy is partly describing his experience, or disposition to experience, with the above sentence. Given that Flippy may be in a mirror inverted state, and given that he would lie about it if he were, it may very well be that (4) is false. But surely I should assent to (4).

Indeed, we can see a more basic problem.

(19) Flippy: There's a spotted bluejay to the right of the tree over there.
Geoff: Fascinating! Let me add that the bluejay to the left of the tree.

(20) Flippy: There's a spotted bluejay to the left of the tree over there.
Geoff: I'm sure you're lying. But I'll add that the bluejay to the left of the tree.

Fixes?

A more basic worry afflicting response-dependent treatments: circularity.

## References

J. Bennett. The difference between right and left. *American Philosophical Quarterly*, 7(3):175–191, 1970.

Charles J. Fillmore. Space. In *Lectures on Deixis*. CSLI Publications, 1971.

# Orienting a disoriented world

Berkeley, Phil 290-5, 10-14-2010
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## 1  Orientation and modality

Last time we talked about the conventionalist view that (e.g.) 'is a left hand' is **rigid predicate**, a predicate with the same extension at every world—namely, the set of actual left hands. We saw that this view founders on the following:

(1)  There might have been more, or fewer, left hands than there actually are.

(2)  Some, if not all, handed objects are only contingently handed in the way they in fact are.

So the conventionalist still owes us some story about what 'is a left hand' means. The story should compatible with the spirit of orientational anti-realism. We have associated orientational anti-realism with the following claims:

### Some orientational anti-realist theses

(i)  Like translation and rotation, reflection is a symmetry property of (actual) space. ('Leibniz equivalence.')

(ii)  The possibility of laws sensitive to chirality does not undermine (i).

(iii)  There could not be evidence that the universe has a particular orientation.

(iv)  There are no intrinsic handedness properties possessed by material objects. (Whatever you mean by 'intrinsic'.)

(v)  There are no intrinsic handedness properties possessed by regions of space. (If there are regions of space.)

(vi)  There is no global property of space in virtue of which objects occupying regions of space possess their handedness.

(vii)  One can completely specify a possible world without using any notion of left and right.

(viii)  Consider a possible world $w$ containing only a hand. Suppose that the universe of this world has a space as qualitatively similar to actual space as can be. Claim: the hand in $w$ is chiral, but it is of indeterminate handedness in the following sense: a complete inventory of what is true with respect to $w$, sufficient to pick $w$ out, need not include anything entailing the proposition that the hand is left, or that it is right. A complete inventory of what is true with respect to $w$ is compatible with either claim.

This set of claims constitutes a natural package view. But one may fight it out over particular theses. As the conventionalist attempts to deal with her modality problem, she may wish to reconsider, or get more nuanced about, one or more of the above theses.

Let us look more closely at the last two claims.

## 1.1 On stipulation

In *Naming and Necessity*, Kripke is sharply critical of the idea that there is a need to formulate a criterion of transworld identity for material objects:

> Nor should any school pupil receive high marks for the question "How do we know, in the state where die A is 5 and die B is 6, whether it is die A or die B that is 6? Dont we need a 'criterion of trans-state identity' to identify the die which is 6 with die A?"

Kripke goes on to say that talk of substantive criteria of transworld identity is confused, because we can just **stipulate** that we are talking about a situation in which it is, say, die A that is in question. Now one might ask:

> Why can't we just **stipulate** of a hand in some arbitrary possible world that is under discussion that it is a left hand? Furthermore, isn't it the case that if we were to instead make the different stipulation that it is a right hand, would we automatically be talking about a different possible world?

The answer to the first question is: "Yes". The answer to the second question is "no". One can, of course, stipulate the possibility or distinction one is talking about—but only if the possibility or distinction is out there to be talked about. The problem is that there is fundamentally no left/right distinction out there to be talked about (while there is a distinction between the possibility of die A's landing 6 and its landing 5).

If orientational anti-realism is true at a world, then all of the orientational facts at that world can be given by specifying the distances between objects and their parts, facts which determine which objects are congruent with others, but don't determine whether a given hand is a left hand or a right hand.

In describing a possible world, we may if we like add that a certain hand is a left hand or a right hand. But if we had decided to describe the world a different way, say by describing a hand as a right hand instead, we would not—not automatically—be describing a different situation. That would only follow if anti-realism were false.

Perhaps we should walk through an example.

## 1.2 More lonely hands

Consider a hand-shaped agglomeration of matter in the actual world, Handy. Handy is shaped like the hands we call 'left'. Consider the following two requests:

> Consider a possible world $w$ containing Handy as the only material object, with Handy's parts stand in exactly the distance relations they actually do. Assume that Handy is, as he is in the actual world, left-hand-shaped in $w$.

> Consider a possible world $w'$ containing a right-hand-shaped agglomeration of matter, call it Handy*, composed exactly of the parts of Handy, where these parts stand in exactly the same distance relations they do in the actual world.

We claim that to comply fully with these requests, you may consider exactly the same world.

We suspect the moral is that extensions of predicates such as 'right-hand-shaped' are relative to more than possible worlds. What more?

## 2 Orientation functions

A **vantage point** $v$ is defined as triple $\langle p, v_1, v_2 \rangle$ of a point in space $p$, an up/down vector $v_1$ and a perpendicular front/back vector $v_2$.

As Fillmore observed, we think of many objects as equipped with a front/back and up/down orientation, fixed by factors such as the following:

> It is important to realize that for a thing to have an up/down orientation, it must be conceived of as permanently or typically or symbolically oriented in a fixed way with respect to the direction of the pull of gravity. (32)

> For animate beings having a certain degree of complexity, the front is that portion of it which contains its main organs of perception and which arrives first whenever it moves in its most characteristic manner of movement. (32-33)

> If [an inanimate object] has some surface similarity to a front/back oriented animal, the portion of the object designated as its front is so designated on analogy with the model. ... Otherwise, the portion of an object is designated its front if it is that part to which its users are oriented when they are using the object in the principal way which it was intended to be used, or that part of an object is designated as its front if it is the part of the object to which its users typically or importantly or symbolically have access. (33)

Let us assume that there is a function $V$, which associates objects we intuitively think of as having a front/back and up/down with a vantage point. So, e.g., $V^w(\text{Fillmore}) = $ the triple of the point Fillmore occupies in $w$, an arrow pointing in the direction he is facing in $w$, and an arrow pointing up out of his head in $w$.

Now we want to be able to associate vantage point with a further, left/right axis; and we want to do this in a consistent way within a given world.

An **assignment of normal vectors** in a given world is a function from each vantage point to a vector that is normal to (i.e. perpendicular to) the other two vectors in the vantage point (you can think of this as "choosing a left side"). For a flat 3D space, a **consistent** assignment of normal vectors to vantage points is an assignment such that every way of mapping one vantage point onto another through a rigid motion, also maps the corresponding normal vectors onto each other.[1] Informally, this constraint ensures that you can't map two objects onto each other through a rigid motion so that their up/down and back/front directions coincide, but their "left side" is not on the same side.[2]

Call a consistent assignment of normal vectors to vantage points across all worlds with orientable space-times an **orientation function** $O$. What this function does, informally, is consistently label the sides of objects in every orientable possible world, relative to a decision about what their front/back up/down orientation is, with a "left side" and a "right side".

Then let's relativize the extensions of our expressions to worlds and orientation functions.

> **Fillmore's heart is on his left side**$^{w,O} = 1$ iff Fillmore's heart is on the side of his body which is the $O^w(V(\text{Fillmore}))$-side.

There will be two possible values for $O$ for every orientable world.

_____

[1] For a flat space, we can define a "rigid motion" function for vantage points as we did for regions of space: it is a combination of rotations and linear translations.

[2] A consistent assignment is only possible in an orientable world. In a non-orientable world, a consistent assignment is only possible in a local region of the space.

## 3   The Kantian hypothesis and some related themes

Bennett's distills what he calls the *Kantian Hypothesis*:

> KANTIAN HYPOTHESIS.
>
> The meaning of 'left' and 'right' can be explained "only by a kind of showing—one could not do it by telling" ([Bennett, 1970, 175]).

Here are some related ideas:

> THE EXPERIENTIAL CAPACITY PREREQUISITE.
>
> A prerequisite to knowing the meaning of 'left' and 'right' is that one be able to have an experience as of the chirality of an object or scene.

> THE VERIDICAL EXPERIENTIAL CAPACITY PREREQUISITE.
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> Each time Flippy goes to sleep, he awakes to find that his experiences are mirror-inverted. Thus the room he wakes to seems to him to be the equivalent of a mirror reflection of the room he fell asleep in; the sides of his body appear to have been flipped; and so on.

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Fixes?

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