Advanced Topics in Metaphysics

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Part I How Could Things Have Been Different?

Texts:

- Lewis, D. (1998). Possible worlds. In Laurence, S. and Macdonald, C. (eds.), Contemporary Readings in the Foundations of Metaphysics. Oxford: Blackwell, pp. 96-102.
- Sider, T. (2003). Reductive Theories of Modality. In Loux, M. J. and Zimmerman, D. W. (eds.), The Oxford Handbook of Metaphysics. Oxford: Oxford University Press, pp 180-208.

1 An Introduction To Modality

Modal sentences concern what is necessary or possible; i.e., what must or can be the case. We can regiment such sentences using the following symbols:

- Necessarily, p:
 □p, or ¬◊¬p
- Possibly, *p*:
 ◊*p*, or ¬ □ ¬*p*

Despite this simple symbolization, there is a huge variety among modal sentences. Examples:

- I cannot make the Faculty meeting later today. (I have to pick up my wife from work.)
- You can leave the room. (The door is unlocked.)
- You must wash the dirty dishes. (Those are the house rules.)
- I must not overtake on the right. (It's against the laws of the State of Israel.)
- Ethical modality: You must not murder innocent babies. (It's wrong.)
- *Epistemic modality*: The butler must have killed Mr. Mustard in the nursery with the candlesticks. (That's what the evidence shows.)
- Nomic modality: Nothing can travel faster than light. (It's a law of nature.)
- *Logical modality*: Nothing can be both yellow and not-yellow. (That's a contradiction.)
- *Metaphysical modality*: Nothing can be both over 2 meters long and under 1 meter long. (That is just a part of the nature of having length.)

It will later become important to divide modal sentences into two groups:

[De re] A *de re* modal sentence is one that contains, within the scope of a modal expression, a pronoun/free variable that is anaphoric on or bound by a singular term or quantifier outside the scope of the modal expression.

A heuristic semantic mark of de re modal sentences is that they permit substitution of co-designating terms salva veritate.¹

[De dicto] A de dicto modal sentence is one that is not de re.

A semantic mark of de dicto modal sentences is that they do not permit substitution of co-designating terms salva veritate.

¹"Salva veritate" is Latin for "with (or by) unharmed truth". To permit substitution of co-designating terms *salva veritate* is to be such that any term can be substituted with a co-designating one without risk that the resulting sentence will have a different truth value than the original sentence.

To illustrate this distinction, consider a few examples:

Necessarily, the number of planets is even.

 \Box (The number of planets, *x*, is such that *x* is even).

This sentence is de dicto. As a mark of this, note that the sentence does not permit the substitution of the expression "the number of planets" with a co-designating one *salva veritate* (assume for now that definite descriptions are designating expressions). Proof: This sentence is false, because the solar system could have had one more or one fewer planets (i.e., either 7 or 9 planets). However, if "the number of planets" is replaced with the co-designating expression "8" we get the true sentence, "necessarily, 8 is even".

• The number of planets is such that, necessarily, it is even. The number of plants, *x*, is such that □(*x* is even).

This sentence is de re. As a mark of this, note that the sentence does permit the substitution of the expression "the number of planets" with a co-designating one *salva veritate*. In particular, note that both "the number of planets is such that, necessarily, it is even" and "8 is such that, necessarily, it is even" are true.

• Alice's next door neighbor is such that, necessarily, he or she is Alice's neighbor. Alice's next door neighbor, x, is such that $\Box(x \text{ is Alice's neighbor})$.

This sentence is de re. As a mark of this, note that the sentence does permit the substitution of the expression "Alice's next door neighbor" with a co-designating one *salva veritate*. In particular, note that both "Alice's next door neighbor is such that, necessarily, he or she is Alice's neighbor" and "Bob is such that, necessarily, he or she is Alice's neighbor" are false.

Necessarily, Alice's next door neighbor is Alice's neighbor.
 □(Alice's next door neighbor, x, is such that x is Alice's neighbor).

This sentence is de dicto. As a mark of this, note that the sentence does not permit the substitution of the expression "Alice's next door neighbor" with a co-designating one *salva veritate*. Proof: This sentence is true, because a next door neighbor cannot fail to be a neighbor. However, if "Alice's next door neighbor" is replaced with the co-designating expression "Bob" we get the false sentence, "necessarily, Bob is Alice's neighbor" (Bob, could, after all, move to a different building).

While this way of distinguishing between de re and de dicto sentences is very common, for present purposes it will be useful to revise the definition of a *de re* sentence thus:

[De re (revised)] A *de re* modal sentence is one that contains, within the scope of a modal expression, either a directly referential term (i.e., a term whose propositional contribution is simply its referent, for example a proper name or indexical) or a pronoun/free variable that is anaphoric on or bound by a singular term or quantifier outside the scope of the modal expression.

Today we will focus on metaphysical modality and try to understand what facts correspond to sentences that concern metaphysical modalities. In other words, we'll ask: what makes things possible or necessary?

2 Possible World Reductionism

We'll consider several answers to this question. The first answer is this:

- **[Possible World Reductionism]** All the facts are non-modal. They only concern what *is* and *exists*, not what could have been but is not or does not exist. True metaphysically modal sentences correspond to facts involving possible worlds. In particular:
 - 1. "Necessarily, p" is true iff in all possible worlds it is the case that p.
 - 2. "Possibly, *p*" is true iff in some possible worlds it is the case that *p*.

The idea is that a possible world is a complete possible history. One possible world is the actual world, our world. The other worlds are merely possible - they exist, but are non-actual ways things could have been. According to [Reductionism], modal expressions quantify over these existing possible worlds. This raises the question what possible worlds might be. Just to say that they are "complete possible histories" obviously won't do for a reductionist, since she wants there not to be modal facts which excludes it being a fact that complete possible histories exist. So more has to be said about what possible worlds amount to.

2.1 Linguistic Ersatzism

One might try to identify possible worlds with linguistic entities. For instance:

[Linguistic ersatzism*] Possible worlds are maximal sets of sentences; where a set of sentences is maximal iff for any sentence, the set includes either that sentence or its negation as a member. Then,

- 1. "Necessarily, *p*" is true iff "*p*" is a member of all maximal sets of sentences.
- 2. "Possibly, p" is true iff "p" is a member of some maximal sets of sentences.

The problem with linguistic ersatzism^{*} is that "1+1=7" is going to be a member of lots of maximal sets of sentences, and so the theory entails that possibly, 1+1=7. To remedy this problem, we must somehow restrict the range of maximal sets of sentences. This would suggest that we should accept:

- [Linguistic ersatzism] Possible worlds are maximal and consistent sets of sentences; where a set of sentences is maximal and consistent iff for any sentence, the set includes either that sentence or its negation as a member, and, all the sentences in the set can be true together. Then,
 - 1. "Necessarily, p" is true iff "p" is a member of all maximal and consistent sets of sentences.
 - 2. "Possibly, p" is true iff "p" is a member of some maximal and consistent sets of sentences.

The trouble with linguistic ersatzism is that the modal word "can" occurs inside its definition of possible world. Therefore, even if linguistic ersatzism were true, it would not follow that all the facts are non-modal. There would still be modal facts about what sentences can be true together.

A potential reply is to replace the modal expression "all the sentences in the set can be true together" with the non-modal expression "there exists a model that assigns the truth value 'T' to all the sentences in the set". This, however, won't work. There exists a model that assigns the truth value 'T' to the set of sentences {"all paint chips are red", "all paint chips are green"}, but it is not the case that all the sentences in this set can be true together.

2.2 Combinatorialism

One might try to identify possible worlds with certain mathematical structures. For instance:

[Combinatorialism] Possible worlds are sets of space-time points; where each set represents the possibility that all and only the points in the set are occupied by matter. Then,

- 1. "Necessarily, *p*" is true iff in all possible worlds it is the case that *p*.
- 2. "Possibly, *p*" is true iff in some possible worlds it is the case that *p*.

The problem with Combinatorialism is that it is entirely unclear what it means to say that "it is the case that p in a set of space-time points". The combinatorialist would presumably answer that it is the case that p in the set of space-time points w iff it is impossible for all and only the points in w to be occupied by matter, and for p to be untrue. This answer, however, is troublesome: The modal word "impossible" occurs inside its definition of truth at a possible world. Therefore, even if Combinatorialism were true, it would not follow that all the facts are non-modal. There would still be modal facts about what sentences at true at given possible worlds.

2.3 Concretism/Modal Realism (Lewis)

The previous theories tried to identify possible worlds with certain abstract entities, specifically, sets. But Lewis had a different idea. He *roughly* suggested that

- **[Concretism*]** Possible worlds are concrete entities. Specifically, they are maximal composites of spatio-temporaly related things. This means that if *x* is a possible world then any two parts of *x* are spatio-temporaly related, and anything spatio-temporaly related to a part of *x* is itself a part of *x*. Then,
 - 1. "p" is true in a possible world w iff "p" is true when all its quantifiers are restricted to parts of w.
 - 2. "Necessarily, p" is true iff "p" is true in all possible worlds.
 - 3. "Possibly, p" is true iff "p" is true in some possible worlds.

You might think that it follows from Lewis's definition of "possible world" that there is only one possible world - ours - and so that "p", "necessarily, p" and "possibly, p" always have the same truth value. But that is precisely what Lewis denies. According to him, there is a huge range of possible worlds, and reality is in fact a densely populated multiverse.

A problem for Concretism is that, according to Lewis, possible worlds do not overlap - nothing exists (wholly) in more than one possible world. In particular, Lady Gaga only exists in the actual world. As a result, the above theory suggests that "possibly, Lady Gaga performs with a pink elephant" is false, since in the only world in which Lady Gaga exists she dose not perform with a pink elephant. However, anyone who knows *anything* about Lady Gaga knows that "possibly, Lady Gaga performs with a pink elephant" is true. So the theory needs to be adjusted. Lewis *roughly* suggested this:

- **[Concretism]** Possible worlds are concrete entities. Specifically, they are maximal composites of spatio-temporaly related things. This roughly means that if *x* is a possible world then any two parts of *x* are spatio-temporaly related, and anything spatio-temporaly related to a part of *x* is itself a part of *x*. Then,
 - 1. "p" is true in a possible world w iff "p" is true when all its quantifiers are restricted to parts of w, and its pronouns/free variables and directly referential terms take as semantic values the counterparts in w of their original semantic values. Here, y is x's counterpart in w iff y is similar enough to x and is at least as similar to x as are other things existing in w.
 - 2. "Necessarily, p" is true iff "p" is true in all possible worlds.
 - 3. "Possibly, p" is true iff "p" is true in some possible worlds.

This ensures that "possibly, Lady Gaga performs with a pink elephant" is true, because there is a possible world in which Lady Gaga's counterpart performs with a pink elephant.

- *Incredulous Stare Objection.* "According to Lewis, there exist golden mountains, unicorns, talking donkeys, and fire-breathing dragons. You've got to be kidding me!"
- *Reply*: If your best overall theory says that something exists, it is reasonable to think that it does exist. The the best systematic account of modal and other phenomena is given by Concretism. Therefore, it is reasonable to think that there exist golden mountains, unicorns, talking donkeys, and fire-breathing dragons, etc.
- *Objection from Actualism*. Lewis denies that everything is actual. But the claim that everything is actual is true in virtue of the meaning of "actual" alone. So Lewis' view is incoherent.
- *Reply*: Lewis denies that the claim that everything is actual is true in virtue of the meaning of "actual" alone.
- *Objection from Island Worlds*. Lewis defines possible worlds as a spatio-temporaly interrelated wholes. It follows from the definition that there is no possible world containing two disconnected space-times. So it is impossible that there is a space-time disconnected from ours. But that seems possible!

 The Humphrey Objection (Kripke). Suppose that, after losing the 1972 presidential election to Richard Nixon, Hubert Humphrey said to himself "I might have won the election if only I had done such and such." According to counterpart theory, what Humphrey is saying to himself is true because a counterpart of his in another possible world wins the election by doing such and such. Kripke argues, however, that while Humphrey cares very much that he might have won, he surely "could not care less whether someone else, no matter how much resembling him, would have been victorious in another possible world".

3 Possible-World-Agnostic Reductionism

So far we have considered views that are reductionist, since they hold that there are no modal facts; and possible worlds focused, since they hold that there are possible worlds. Now we'll consider a few views which are reductionist, but not possible worlds focused.

3.1 Fictionalism (Rosen)

- **[Fictionalism (about possible worlds)]** All the facts are non-modal. They only concern what *is* and *exists*, not what could have been but is not or does not exist. True metaphysically modal sentences correspond to facts involving the *fiction* that there are possible worlds. In particular:
 - 1. "Necessarily, *p*" is true iff according to the fiction of possible worlds, in all possible worlds it is the case that *p*.
 - 2. "Possibly, *p*" is true iff according to the fiction of possible worlds, in some possible worlds it is the case that *p*.

A concern for Fictionalism is that if it is not the case that, according to the fiction of possible worlds, there is a possible world containing pink elephants, then "possibly, there are pink elephants" is false. But the "fiction of possible worlds" (as it is laid out, say, in Lewis's *On the Plurality of Worlds*) does not explicitly mention any world with pink elephants. So either the theory has false consequences, or there is more to the theory that has not yet been specified. In this latter case, the theory falls short of a reduction of modal talk.

3.2 Quasi-Conventionalism (Sider)

- **[Quasi-Conventionalism]** All the facts are non-modal. They only concern what *is* and *exists*, not what could have been but is not or does not exist. True metaphysically modal propositions correspond to facts involving other propositions. In particular, if the proposition that *p* is any purely qualitative proposition (i.e., one which does not directly attribute a property to an object), then
 - The proposition that *necessarily*, *p* is identical to the proposition that *the proposition that p is a logical consequence of the class of true propositions of the mathematical kind* (e.g., 2+2=4), *the analytic kind* (e.g., a thing is a yard long iff it is three feet long), *the philosophical kind* (e.g., for every *x* and *y*, there exists a *z* that is composed of *x* and *y*), *and the kind kind* (i.e., the kind of proposition expressed by a sentence of the form "All Fs are Gs", where F is a natural kind term and G expresses, in fact, the deep explanatory feature of the property expressed by F).
 - 2. The proposition that *possibly*, *p* is identical to the proposition that *not necessarily*, *not p*.

4 Primitivism

We might close with primitivist views, i.e., views on which there are modal facts. These views may or may not hold that there are possible worlds. What they agree on is this:

[Primitivism] There are some modal facts. They are facts about what could have been or about what must have been. True metaphysically modal sentences correspond to modal facts. In particular:

- 1. "Necessarily, *p*" is true iff necessarily, *p*.
- 2. "Possibly, *p*" is true iff possibly, p.
- *Objection*: What is possible must be grounded in what is actual!

Part II How Do Objects Change?

Texts:

- Haslanger, S. (2003). Persistence through time. In Loux, M. J. and Zimmerman, D. W. (eds.), The Oxford Handbook of Metaphysics. Oxford: Oxford University Press, pp 315-354.
- Wasserman, R. (2006). The problem of change. Philosophy Compass, 1(1), pp. 48-57.

5 A Puzzle

Let's say that an object *persists* iff it exists over a period of time. Let's say that an object undergoes an *alteration* when is persists through change. Philosophers have found the fact that objects undergo alterations puzzling. To see why, consider a banana that changes from green to yellow as it ripens. Each of the following claims seems true:

- **1. [Difference]** The unripe banana is green and the ripe banana is yellow.
- 2. [Identity] The unripe banana is identical to the ripe banana.
- 3. [Incompatibility] Everything that is yellow is not green.
- 4. [Non-contradiction] Nothing can have incompatible properties, i.e., nothing can be both F and not-F.

Although each of these claims seems true, together they lead to a contradiction. Here's how: By (1) the unripe banana is green and the ripe banana is yellow. But by (2), the unripe banana is identical to the ripe banana. Therefore, a single banana is both green and yellow. But by (3), if a banana is yellow, it is not green. So, a single banana is both green and not green. But by (4), it is not the case that a single banana is both green and not green. Although the case that a single banana is both green and not green.

6 Tense, With Its Own Puzzle

The contradiction is due to the fact that we forgot about tense. More specifically, we thought that (1) the unripe banana *is* green and the ripe banana *is* yellow. But this thought is false. In fact, it is false at all points in time. To think something true, we should have thought something else. Specifically, if we were thinking when the banana is still unripe, we would have thought something true had we thought that the banana *is* green and *will be* yellow. Alternatively, if we were thinking when the banana is already ripe, we would have thought something true had we thought that the banana *was* green and *is* yellow. Neither of these thoughts, however, entails a contradiction when combined with the other thoughts above.

While this solution to our puzzle is very nice, we should notice that it appealed to a particular kind of proposition. A *proposition* is a bearer of truth values, and a thing that we can think and assert to be the case. The kind of proposition we used in solving the puzzle is the *tensed proposition*:

• A proposition is *tensed* when it specifies how things were, are, or will be simpliciter, rather than how things are at a time. Some tensed propositions have different truth values at different times.

For example:

- The banana was yellow. (This is false when the banana is still unripe, but true when the banana has already turned black with rot. So the proposition has different truth values at different times.)
- The banana is yellow now.
- The banana will be green.
- I visited Delhi last March.

– I will get a haircut in 5 days.

The time-related concepts that occur in tensed propositions - e.g., now, was, will, last March, in 5 days - are called *A*-concepts. The mark of an A-concept is that it specifies a perspective on time. When you use it, you say something that is relative to the time at which your use occurs.

- A proposition is *tenseless* when it specifies how things are at a time, rather than how things were, are, or will be simpliciter. If a tenseless proposition has some truth value, it always has the same one.) For example:
 - The banana is yellow at 8:21am, October 2nd 2020. (This is true when the banana is ripe. It is
 also true when the banana is unripe. So if the proposition has some truth value, it always has the
 same one.)
 - The banana was green during World War II.
 - The banana will be yellow some time between October 2087 and November 2088.
 - World war 1 occurred after the American Civil War.
 - Dinosaurs existed before computers did.

The time-related concepts that occur in tenseless propositions - e.g., at 8:21am, October 2nd 2020, during World War II, between October 2087 and November 2088, after the American Civil War, before computers existed - are called *B-concepts*. The mark of a B-concept is that it does not specify a perspective on time. When you use it, you do not say something that is relative to the time at which your use occurs.

The fact that we could solve our original puzzle by using tensed propositions leads to a further puzzle: what facts do true tensed propositions correspond to?

7 What Facts Do True Tensed Propositions Correspond To?

We'll consider two answers to this question. The first answer is this:

- **[Reductionism (about tense)/De-tensing/Not taking tense seriously]** All the facts are tenseless. True tensed proposition correspond *at a time t* to tenseless facts. In particular:
 - 1. The tensed proposition that *it was the case that p* is true at a time *t* iff there is a time *t** such that (i) *t** is earlier than *t*, and (ii) *p* at *t**.
 - 2. The tensed proposition that *it is the case that p* is true at a time *t* iff *p* at *t*.
 - 3. The tensed proposition that *it will be the case that p* is true at a time *t* iff there is a time *t** such that (i) *t** is later than *t*, and (ii) *p* at *t**.

[Note that the right hand sides of conditions 1, 2 and 3 are themselves tenseless propositions, and involve no A-concepts. The only time-related concepts occurring on the right are B-concept.]

According to [Reductionism], A-concepts like "now", "was" and "will" are like location-relative concepts like "here", "to the north", and "to the south". Consider, for example, that the proposition that *it is cold here* is true in the North Pole and false at the Equator. Although the proposition *it is cold here* has location-relative truth conditions, the common view is that there are no fundamentally location-relative facts. There is, in particular, no fundamental fact regarding what place is really here. There is just some relation between the proposition that it is cold here and the location at which you evaluate whether it is true. The reductionist believes the same kind of thing is going on with time. Consider, for example, that the proposition that *it is cold now* is true at 1am and false at 1pm. Although the proposition *it is cold now* has time-relative truth conditions, the reductionist view is that there are no fundamentally time-relative facts. There is, in particular, no fundamental fact regarding what place is really here. For example, that the proposition that *it is cold now* is true at 1am and false at 1pm. Although the proposition *it is cold now* has time-relative truth conditions, the reductionist view is that there are no fundamentally time-relative facts. There is, in particular, no fundamental fact regarding what time is really now. There is just some relation between the proposition that it is cold now and the time at which you evaluate whether it is true.

The second answer we'll consider is:

[Taking tense seriously/Non-reductionism] There are some tensed facts. True tensed proposition correspond *simpliciter* to tensed facts. In particular:

- 1. The tensed proposition that *it was the case that p* is true iff WAS(it is the case that *p*).
- 2. The tensed proposition that *it is the case that p* is true iff it is the case that *p*.
- 3. The tensed proposition that *it will be the case that p* is true iff *WILL*(it is the case that *p*).

[Note that the right hand sides of conditions 1, 2 and 3 are themselves tensed propositions, and involve no B-concepts. The only time-related concepts occurring on the right are A-concept.]

According to [Non-Reductionism], A-concepts like "is", "was", and "will" are special, and track some fundamental feature of reality. Usually, this fundamental feature is a perspective from the present. Consider, for example, the propositions that *it was cold*, that *it is cold now*, and that *it will be cold*. According to the non-reductionist, these propositions have different truth values at different times because at different times different fundamental time relative facts obtain. Specifically, at 1pm, there obtains the fundamentally time relative fact that *WAS*(it is cold), but the the fundamentally time relative fact that it is cold does not obtain. 12 hours earlier, at 1am, the fundamentally time relative fact that it is cold does obtain, but the fundamentally time relative fact that *WILL*(it is cold) does not obtain (assuming that the weather constantly keeps getting warmer and warmer forever).

Some (but not all!) serious tensers/non-reductionists go further. They suggest that the *tenseless* proposition that p at time t is true iff either WAS(it is the case that p and t is present) or (it is the case that p and t is present) or WILL(it is the case that p and t is present). More generally, these serious tensers/non-reductionists suggest that tensed facts are the only fundamental facts, and that tenseless propositions are made true simpliciter by these tensed facts. But, to stress again, this is an optional extra commitment.

In this lesson we will set [Non-reductionism] aside, and instead assume that [Reductionism] is true. We will explore whether and how we can account for change given Reductionism. To do this, we will have to spell out exactly what we mean when we say that a single banana can be eternally and tenselessly yellow "at" one point in time but fail to be eternally and tenselessly "at" another point in time.

8 Eternalism and Persistence

Here is where we are: We are trying to explain how alterations are possible—specifically, how a single banana can change from green to yellow as it ripens—by using tenseless propositions. This, note, requires us to assume that

- · Different points in time exist, and
- Different things can be true "at" different time points.

What remains for us to do is to explain what we mean by saying that different things can be true "at" different time points.

Since [Reductionism] entails that different points in time exist, it is usually combined with

[Eternalism/Four-dimensionalism] Past, present, and future times all exist, and it is possible that there exist objects that do not presently exist.

[Reductionism] is inconsistent with [Eternalism]'s major rival:

[Presentism/Three-dimensionalism] The present exists, but neither the past nor the future do. Consequently, only present objects exist.

From this point on, we will be assuming that [Eternalism] is true and that [Presentism] is false. So we will be asking what it means to say that different things can be true "at" different time points, on the assumption of [Eternalism]. We will consider six answers to this question.

9 Putting Time into Objects

9.1 Perdurantism

Perdurantism says that

[Perdurantism] Ordinary objects persist by perduring, i.e., by having different parts (called "stages") at different times. In other words, ordinary objects persist in much the same way as they extend in space: Ordinary objects extend through space by having different parts at different places. Similarly, according to [Perdurantism], ordinary objects persists by having different parts at different times. The ordinary objects themselves, however, are space-time worms - composites of all their spatio-temporaly located parts/stages.

Perdurantists explain how different things can be true "at" different time points thus: To say that a banana is yellow "at" the time it is ripe is to say that the *part of the banana (the banana-stage) located when the banana is ripe* has the property of being yellow. To say that a banana is green "at" the time it is unripe is to say that the *part of the banana (the banana (the banana-stage) located when the banana is unripe* has the property of being green.

This view says that there is no one thing that yellow at one time and also green at another time. Furthermore, this view says that the banana itself is neither yellow or green. Strictly speaking, it is different parts of the banana that are yellow or green. This has led some people to object to the view. They say that, intuitively, the thing that is either yellow or green is the banana, not a part of it. There are also two further, related, objections:

- *No-Change Objection*: We are assuming [Reductionism]. This view is open to the *no-change objection* the objection that since all the fundamental facts are tenseless and so obtain eternally with no change, nothing ever gains or loses a property, and worse nothing even comes into or goes out of existence. Everything just is. This is counterintuitive.
- *Reply 1*: Alteration merely involves an object's stages' having incompatible properties. This is all that is needed to solve the puzzle we started with. This account of change may not fully capture how change appears to us, but it may all the same be true.
- Reply 2 (tu quoque): Since this is an objection to [Reductionism], it applies equally to all reductionist
 accounts of change, including combinations of [Endurantism] and [Eternalism] with [Reductionism] (see
 below). The objection is not particular problem for [Perdurantism]. No less importantly, [Perdurantism]
 (as well as [Endurantism] and [Eternalism]) need not assume [Reductionism] at all. So the objection is
 not an objection [Perdurantism] in itself.

9.2 Exdurantism

Exdurantism says that

[Exdurantism/Stage theory] Ordinary objects persist by exduring, i.e., by themselves being momentarily existing ordinary objects (called "stages") which are counterparts of—i.e., which are related by a counterpart relation to—momentarily existing ordinary objects (i.e., to other stages) at different times.² There are also space-time worms, which are composites of all the spatio-temporaly located stages related to a given ordinary object by the counterpart relation. These space-time worm persist by perduring, but they are not ordinary objects. Instead, they have ordinary objects as spatio-temporaly located parts.

Exdurantists explain how different things can be true "at" different time points thus: To say that a banana is yellow "at" the time it is ripe is to say that *the banana (the banana-stage) located when the banana is ripe* has the property of being yellow. To say that a banana is green "at" the time it is unripe is to say that *the banana (the banana stage) located when the banana is unripe* has the property of being green.

²Here, a stage x (existing at t) is a counterpart of a stage y (existing at t*) iff y is similar enough to x and is at least as similar to x as are other objects existing at t*.

Unlike [Perdurantism], [Exdurantism] accommodates the intuition that the banana itself is either yellow or green. Still, [Exdurantism] is similar to [Perdurantism] in saying that there is no one thing that yellow at one time and also green at another time. Strictly speaking, it is different (counterpart) bananas that are yellow or green. Also, unlike [Perdurantism], [Exdurantism] says that each banana exists only at a single instant. If a grab something that ripens, I am actually grabbing not one banana but a multitude of bananas.

- *Historical Intrinsicness Objection*: Intuitively, objects have historical intrinsic properties properties that an object has just by virtue of how it (and nothing else) is and was. (E.g., being a horse, being a chair, ...) But the exdurantist account of persistence gives this up. It makes all historical intrinsic properties into properties that an object has not by virtue of how it (and nothing else) is and was, but by virtue of how it and some of its counterparts are and were.
- *Reply*: The objection involves an inference from the claim that historical properties are properties that an object has by virtue of how it and some of its counterparts are and were to the claim that historical properties are not intrinsic. This inference might be resisted.

10 Putting Time into Predicates

10.1 Relationalist Endurantism

Relationalist Endurantism is the combination of two views:

- **[Endurantism]** Ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times.
- [Relationalism (about temporal qualification)] What appear to be temporary monadic properties (or nplace relations) are actually temporary 2-place (or, n+1-place) relations to times.

Relationalist Endurantism explains how different things can be true "at" different time points thus: To say that a banana is yellow "at" the time it is ripe is to say that the banana bears the relation *being yellow at* to the time at which it is ripe. To say that a banana is green "at" the time it is unripe is to say that the banana bears the relation *being green at* to the time at which it is unripe.

Note:

- Bearing the relation *being yellow at* to time *t* entails *not* bearing the relation *being green at* to time of *t*.
- However, bearing the relation *being yellow at* to time *t* does *not* entails *not* bearing the relation *being green at* to times that are *distinct* from *t*.
- Since an object can consistently bear the relation of *being yellow at* to *t*, and not bear the same relation to the distinct time *t**, no inconsistency is involved when a banana ripens.

This view says that the properties involved in alterations are *compatible relational* properties. In the case of the ripening banana, the properties involved in its alteration are the compatible properties *being yellow at t* and *being green at t*^{*} (where t and t^{*} are distinct).

A common objection to relationalist Endurantism, and to relationalism in general is this:

- Intrinsicness Objection: Intuitively, objects have temporary intrinsic properties properties that can
 alter, but that an object has just by virtue of how it (and nothing else) is. (E.g., having mass, being
 red, being bent...) But [Relationalism] gives this intuition up. It makes all temporary properties into
 properties that an object has not by virtue of how it (and nothing else) is, but by virtue of how it is
 related to a time.
- *Reply*: The objection involves an inference from the claim that temporary properties are relations to times to the claim that temporary properties are not intrinsic [i.e., not had just by virtue of how their possessors (and nothing else) are]. This inference might be resisted.

11 Putting Time into Predication

11.1 Tensed Copula Endurantism

Tensed-copula Endurantism is the combination of two views:

- **[Endurantism]** Ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times.
- **[Tensed Copula]** To have a monadic property at a time is to stand in the having-at-a-time relation to the monadic property and to the time. To stand in an n-place relation at a time is to stand in the standing-at-a-time relation to the n-place relation and to the time.

Copula tensers explain how different things can be true "at" different time points thus: To say that a banana is yellow "at" the time it is ripe is to say that the banana stands in the *having-at-a-time* relation to the monadic property of being yellow and to the time at which it is ripe. To say that a banana is green "at" the time it is unripe is to say that the banana stands in the *having-at-a-time* relation to the monadic property of being green and to the time at which it is unripe.

- Bradley's Regress Objection: Suppose [Tensed Copula] is true. Then,
 - if o has the monadic property F, then
 - *o* stands in the *Having* relation to *F* and to *t*; or equivalently, *o* has the (relational) monadic property *Having-F-at-t*. But then,
 - o stands in the Having relation to Having-F-at-t and to t; or equivalently, o has the (relational) monadic property Having-Having-F-at-t-at-t. But then

- ...

Since we are trying to explain how different things can be true "at" different time points by appealing to [Tensed Copula], this infinite regression is malignant - it shows that our explanation can never end. So its better if we don't try to explain how different things can be true "at" different time points by appealing to [Tensed Copula].

11.2 Adverbialist Endurantism

Adverbialist Endurantism is the combination of two views:

- **[Endurantism]** Ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times.
- [Adverbialism (about the Copula)] To have a monadic property at a time is to have a monadic property in a timely-way. To stand in an n-place relation at a time is to stand in the n-place relation in a timely-way.

For example, to say that a banana is yellow "at" the time it is ripe is to say that the banana is *in-the-time-of-ripenessly* yellow. To say that a banana is green "at" the time it is unripe is to say that the banana is *in-the-time-of-unripenessly* green.

On this solution, the banana is both yellow and green, but in different timely ways. The idea is that this is consistent. What is impossible is for a banana to be both yellow and green in the same timely way.

12 Putting Time into Quasi-Predication: State-of-Affairs-ist Endurantism

State-of-Affairs-ist Endurantism is the combination of two views:

[Endurantism] Ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times.

[State-of-Affairs-ism] For an object to have a property at a time (= for a *token* state of affairs to obtain) is for the *type* of state of affairs that consists in the that object's having that property (simpliciter) to be *instantiated at* that time. For objects to stand in a relation at a time (= for a *token* state of affairs to obtain) is for the *type* of state of affairs that consists in the those objects' standing in that relation (simpliciter) to be *instantiated at* that time.

For example, to say that a banana is yellow "at" the time it is ripe is to say that the banana's being yellow (a state of affairs type) is instantiated at the time in which it is ripe; or in other words, it is to say that a token of the banana's being yellow obtains at the time in which the banana is ripe. Similarly, to say that a banana is green "at" the time it is unripe is to say that the banana's being green (a state of affairs type) is instantiated at the time words, it is to say that a banana is a the time in which it is unripe; or in other words, it is to say that the banana's being green (a state of affairs type) is instantiated at the time in which it is unripe; or in other words, it is to say that a token of the banana's being green obtains at the time in which the banana is unripe.

Note that this view relies on two different "predication-like" metaphysical notions: First, there is the "having"/"standing" connection between objects one the one hand and properties and relations on the other hand. This connection is responsible for state of affairs types, and has nothing to do with time. Second, there is the "instantiating at" connection between state of affairs types and state of affairs tokens. This connection is relative to time.

• *Objection from Types*: State-of-Affairs-ism says that there are types of states of affairs, and that those types can consist in *object's having properties*. So, in particular, there is the state of affairs type that is the banana's being yellow, and there is also the state of affairs type that is the same banana's being green. But a single banana cannot be both yellow and green. Contradiction.

Part III Does Time Flow?

13 Recap

Let's retrace our steps. Last week we started out by noticing that we can solve the original puzzle by using tensed propositions. Then we asked ourselves what makes tensed propositions true, and explored the idea that they are made true by tenseless facts (= [Reductionism]). This idea lead us to [Eternalism] and to a long discussion of what tenseless facts are in an eternalist framework. But suppose there are fundamentally tensed facts, and that [Taking sense seriously] is true. What then?

Recall what [Taking sense seriously] says:

Taking tense seriously/Non-reductionism] There are some tensed facts. True tensed proposition correspond *simpliciter* to tensed facts. In particular:

- 1. The tensed proposition that *it was the case that p* is true iff WAS(it is the case that *p*).
- 2. The tensed proposition that *it is the case that p* is true iff it is the case that *p*.
- 3. The tensed proposition that *it will be the case that p* is true iff *WILL*(it is the case that *p*).

[Note that the right hand sides of conditions 1, 2 and 3 are themselves tensed propositions, and involve no B-concepts. The only time-related concepts occurring on the right are A-concept.]

According to [Non-Reductionism], A-concepts like "is", "was", and "will" are special, and track some fundamental feature of reality. Usually, this fundamental feature is a perspective from the present. Consider, for example, the propositions that *it was cold*, that *it is cold now*, and that *it will be cold*. According to the reductionist, these propositions have different truth values at different times because at different times different fundamental facts obtain. Specifically, at 1pm, there obtains the fundamental fact that *WAS*(it is cold), but the fundamental fact that it is cold does not obtain. 12 hours earlier, at 1am, the fundamental fact that it is cold does obtain, but the fundamental fact that *WILL*(it is cold) does not obtain (assuming that the weather constantly keeps getting warmer and warmer forever).

If [Non-Reductionism] is true than there is a clear sense in which time flows. Time flows in the sense that there are fundamentally time-relative facts - fundamental facts that can obtain at one time but fail to obtain at another time. The fact that these facts can "move" or "change" from obtaining to not obtaining, or from not obtaining to obtaining, provides a clearer sense for the claim that time flows. On the other hand, if [Reductionism] is true and there are no fundamentally time-relative facts, then it is difficult to make sense of the claim that time flows. For this reason, our discussion of whether time flows will focus on the disagreement between reductionists and serious tensers/non-reductionists.

14 The Range of Positions

We need to distinguish between two questions:

- 1. Are there fundamentally tensed facts?
 - Answer 1: "No" = [Reductionism]
 - Answer 2: "Yes" = [Non-reductionism]
- 2. What times exist?
 - Answer 1: "Only the present" = [Presentism]
 - Answer 2: "The present, the entire past and the entire future" = [Eternalism]
 - Answer 3: "The present, the entire past but not any of the future" This view is called the "growing block model". We won't discuss it.

• Answer 4: ...

Now consider the combinations of all the views we will discuss:

- **1. [Reductionism] + [Presentism].** This view is usually not taken seriously. Here is why: World War II occurred entirely in the past. According to [Reductionism], this is because World War II (eternally) occurs at some entirely past time *t*. But according to [Presentism], there are no past times. So World War II does not (eternally) occur at some entirely past time *t*. Contradiction.
- 2. [Reductionism] + [Eternalism] = [B-theory]. This is the view multiple versions of which we discussed last week.
- **3.** [Non-reductionism] + [Presentism]. This view is usually just called "Presentism", since [Presentism], along with the assumption that World War II occurred entirely in the past, entails [Non-reductionism].
- **4. [Non-reductionism] + [Eternalism] = [Moving spotlight theory].** According to this view, the present, the entire past and the entire future exists, but time nevertheless flows because there are some fundamentally time-relative facts which can "move" or "change" from obtaining to not obtaining, or from not obtaining to obtaining. The most common version of this view says that some fundamental time relative facts concern which time has the special property of *being now*, or of *being present*. At *t*, the tensed facts are that *t* is present, and that WILL(t + 5 minutes is present). At t + 5 minutes, the tensed facts are that t + 5 minutes is present and that WAS(t is present).



Table 1: Range of Positions

In the rest of this discussion, we will replace the question "does time flow" with the question of whether [Reductionism], [Presentism] or [Moving spotlight theory] are true. If [Reductionism] is true then it is difficult to make sense of the idea that time flows. But if either [Presentism] or [Moving spotlight theory] are true, then time certainly flows.

15 Reductionism

We discussed [Reductionism] at length last week. During that discussion we encountered the following objection to the view:

- *No-Change Objection*: We are assuming [Reductionism]. This view is open to the *no-change objection* the objection that since all the fundamental facts are tenseless and so obtain eternally with no change, nothing ever gains or loses a property, and worse nothing even comes into or goes out of existence. Everything just is. This is counterintuitive.
- *Reply*: Alteration merely involves an object's stages' having incompatible properties. This is all that is needed to solve the puzzle we started with. This account of change may not fully capture how change appears to us, but it may all the same be true.

A closely related objection comes from our *experiences*:

- Objection from experience:
 - 1. Events in the present seem to us like they are occurring now, whereas events in the past and future do not seem to us that way. In other words, events in the present seems to us to have the property of *being now*, or of *being present*.
 - 2. Furthermore, some events in the present seem to us like they are passing and changing. In other words, some events in the present seems to us to have the property of *passing*, and of *changing*.
 - 3. The only reasonable explanation of why we have the aforementioned experiences is that there are tensed facts to the effect that some events have the tensed properties of *being now* (*being present*), *passing* and *changing*.
 - 4. Therefore, the best explanation of why we have the aforementioned experiences is that there are tensed facts to the effect that some events have the tensed properties of *being now* (*being present*), *passing* and *changing*.
 - 5. Therefore, there are tensed facts to the effect that some events have the tensed properties of *being now (being present), passing* and *changing*.
 - 6. Therefore, Reductionism is false.
- *Reply* (L. A. Paul): Claim 3 of the last argument is false.
 - Here is a reductionist-friendly explanation of why events in the present seem to us to have the property of *being now*: There is no such property as the property of being now, and there are no tensed facts either. Events in the present seem to us to have the property of being now because that is a part of their seeming to us to be any way at all. For example, to seem to be red is to seem to be red now, to seem to occur 5 meters away is to seem to occur 5 meters away now, etc. What explains why events seem to us to be any way at all are our brain states, or some other physical or mental facts. There is no need to think a temporal fact explains why events seem to us to be any way at all. So there is no need to think a temporal fact explains why events seem to us to have the property of *being now*.
 - Here is a reductionist-friendly explanation of why events in the present seem to us to have the properties of *passing* and *changing*: There are no such properties as the properties of changing and passing, and there are no tensed facts either. Events in the present seem to us to have these properties because our minds (i.e., our brains, or something else physical or mental about us) make them seem to be that way to us. As anyone who has ever watched a video or a film knows, it is an empirical fact that observing two static and instantaneous stimuli that are sufficiently close to each other in space and time makes it seem to us as though a single external thing is changing and passing (i.e., getting older). It is also an empirical fact that certain brain lesions can cause akinetopsia an inability to have things seem to be changing. This suggests that there is no need to think a temporal fact explains why events seem to us to be changing or passing. The explanation can be entirely due to an instantaneous feature of our mind. features any way at all.
 - These explanations suggest that whenever events seem to us to have the tensed properties of being now (being present), passing and changing - we are suffering an illusion!

The final objection we will consider concerns headaches:

• The "Thank Goodness It's Over" Objection (Prior): Suppose after a painful headache I remark "thank goodness that's over!" If tenseless facts exhausted reality, then the facts after the headache would be the same as the facts before the headache. So it would not be clear what I was thanking goodness for. I am clearly not thanking goodness for the fact that the headache is over on 20 October 2020, at 5:23pm, for I might know beforehand the exact date and time when the pain will cease, and I will not then thank goodness for anything.

• *Reply* (Sider): Before getting to the real answer, consider a parody on Prior's objection. Suppose there is a fire in the Carmel Mountain, and I remark "thank goodness the fire is far away". If location-non-relative facts exhausted reality, then the facts at the Carmel Mountain would be the same as the facts away from the Carmel Mountain. So it would not be clear what I was thanking goodness for. I am clearly not thanking goodness for the fact that the fire is in the Carmel Mountain, for I might know beforehand the exact location of the fire, and I will not therefore thank goodness for anything.

The reply to this parody-argument is this: I am thanking goodness for the truth (at my location) of the *location-relative* proposition that the fire is far away. If I were in the Carmel Mountain I could not thank goodness for the truth of this proposition, since it would not then be true at all. Still, what makes this proposition true at my actual location is just the location-non-relative fact that the fire is in the Carmel Mountain and that I am far away from the Carmel Mountain.

The exact same thing happens in Prior's original objection: On 20 October 2020, at 5:24pm, I am thanking goodness for the truth at that time of the *tensed* proposition that my headache is over. At the time of 20 October 2020, at 5:22pm I cannot thank goodness for the truth of this proposition, since it is not then true at all. Still, what makes the proposition that my headache is over true at the time at which I actually think it (20 October 2020, at 5:24pm) is just the tenseless fact that the headache is over on 20 October 2020, at 5:23pm and that 20 October 2020, at 5:24pm is after 20 October 2020, at 5:23pm.

16 The Moving Spotlight

The most common version of the moving spotlight theory combines [Non-reductionism] and [Eternalism] with [Endurantism]. This combination of views says that the past, present, and future times all exist, and that ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times.

The combination of these three views leads to the following account of change: Recall the banana that ripens and turns from green to yellow. The banana endures and is wholly present throughout the ripening. When the process starts, the banana *has* the property of being green and *will have* the property of being yellow. When the process ends, the banana *has had* the property of being green and *has* the property of being yellow. Still, time does not determine what objects exist. It is just that tensed propositions have different truth values at different times. There is nothing more to it.

Objection (Zimmerman): Even if consistent, the combination of [Eternalism] and [Non-reductionism] is not appealing. Consider my past headache. Suppose, with standard eternalists, that it exists but does not presently exist. Given Non-reductionism, we cannot say that it is painful, merely that it was painful. So there exists a non-painful headache. This is counterintuitive. And the problem generalizes: Standard eternalist say that all wholly past entities exist, but only presently have properties that reflect their past - they are not in space but were in space, they are not shaped but were shaped, they are not colored but were colored etc. This is very counterintuitive.

Whatever one makes of this objection, it is a fact that most of those who accept [Non-reductionism] reject [Eternalism] and therefore the moving spotlight theory too.

17 Presentism

[Presentism] is usually combined with [Endurantism], leading to the view that (i) the present exists, but that neither the past nor the future do, and that (ii) ordinary objects persist by enduring, i.e., by being wholly present (and present in all their parts) at different times. This leads to the following account of change: Recall the banana that ripens and turns from green to yellow. The banana endures and is wholly present throughout the ripening. When the process starts, the facts are that the banana *is* green and that *WILL*(the banana is yellow). When the process ends, the facts are that *WAS*(the banana is green) and that the banana *is* yellow. Nevertheless, at each point in time no non-present state of the banana exists. So, when the banana

is unripe, there is no such thing as the fact that the banana *is* yellow in the future. Similarly, when the banana *is* ripe, there is no such thing as the fact that the banana *is* green in the past.

- Objection from Special Relativity. There is a serious and long debate about whether Presentism is consistent with the theory of Special Relativity. The discussion is fairly technical and falls outside the scope of this class. I set it aside.
- Objection from Cross-temporal relations: Consider the true claim that
 - Some American philosophers admire some ancient Greek philosophers.

This claim is hard to capture in tensed language. Consider:

There presently exists an x and there presently exists a y such that (x is an American philosopher, and y is an ancient Greek philosopher, and x admires y).

This is false because there this no presently existing ancient Greek philosopher.

- WAS(There presently exists an x and there presently exists a y such that (x is an American philosopher, and y is an ancient Greek philosopher, and x admires y)).

This is false because there was no time at which both an American and an ancient Greek philosopher existed.

- (There presently exists an x such that x is an American philosopher, and WAS(there presently exists a y such that y is an ancient Greek philosopher, and x admires y)).

This is false because there is not a single past time at which an ancient Greek philosopher both existed and was admired by an American philosopher.

The general lesson from this example is this: We seem to be able to say things that are true in virtue of relations that obtain between relata from different times. But it seems that the presentist can only recognize relations that obtain between relata that exist at a single time.

- *Grounds of Truth Objection*: If a proposition is true, its truth must be grounded in something. We can make this idea more precise in two ways:
 - Truth Maker principle: For every true proposition there exists an entity—a 'truth-maker'—whose existence suffices for the truth of the proposition.
 - Truth Supervenience principle: Which propositions are true supervenes on what objects exist, what
 properties those objects have, and what relations they stand in—or equivalently—it is impossible
 for the same objects to exist and to have the same properties and to stand in the same relations
 as they do, and still for different propositions to be true.

Presentism violates both these principles. For the proposition that *dinosaurs existed* is true now, but there is nothing now to make it true (dinosaurs do not now exist), and the proposition could be false in a duplicate of this world in which only the present objects, with their present properties and relations, exist.

The presentist might try to reply by saying that true tensed propositions are made true by tensed facts, which exist and that obtain presently. For example, the proposition that dinosaurs existed is true now because there exists now the primitively tensed fact that *WAS*(dinosaurs exist). But that requires a fact to obtain now even though the subject matter of that fact—in this case, dinosaurs—do not exist. This makes no sense.

• *Reply*: The objection is question-begging. First, the truth maker principle is not violated. Just as there can be a fact that dinosaurs do *not* exist even though the subject matter of that fact—dinosaurs—do not exist, so there can be a fact that *WAS*(dinosaurs exist) even though the subject matter of that fact—dinosaurs—do not exist. Second, the supervenience principle is ill-put. The correct version says that it is impossible for the same objects to exist, to have existed, and to will have existed such that they respectively have, have had, and will have had the same properties and stand, have stood and will have stood in the same relations as they do, did or will do, and still for different propositions to be true.

• *Rejoinder*: You are saying that the world itself now has the *property* of *being such that WAS(dinosaurs exist)*. That's cheating!

Part IV What Do Mathematicians Talk About?

Texts:

- Putnam, H. (1975). Philosophy of Logic. In his Mathematics, Matter and Method: Philosophical Papers, vol. 1. Cambridge: Cambridge University Press, pp. 323-357.
- Benacerraf, P. (1988). What numbers could not be. In Laurence, S. and Macdonald, C. (eds.), Contemporary Readings in the Foundations of Metaphysics. Oxford: Blackwell, pp. 435-454.
- Field, H. (1998). Mathematical objectivity and mathematical objects. In Laurence, S. and Macdonald, C. (eds.), Contemporary Readings in the Foundations of Metaphysics. Oxford: Blackwell, pp. 387-403.

18 A Tension

Mathematics is a curious subject:

- On the one hand, it appears to provide us with knowledge that is certain, secure, and immutable.
- On the other hand, it appears to be a study of numbers, functions, sets, groups, etc., which appear to be abstract, causally inefficacious, entities. It is unclear whether such entities exist, and even if they do, whether we can know anything about them.

Because of this, mathematics pulls us in two opposite directions: On the one hand, it seems that "2+2=4" is a true statement about the properties of the numbers 2 and 4, and on the other hand, doubts over whether there are such things as the numbers 2 and 4 might lead you to think that "2+2=4" cannot be true. Today, we will explore this tension.

19 Mathematical Realism

Mathematical realists hold that some mathematical entities *exist* and that some mathematical statements are *true*. Here are two arguments for this view:

19.1 Argument from mathematics

Consider the following mathematical argument:

Theorem 1. There are infinitely many primes.

Proof. Suppose that $p_1, p_2, p_3, ..., p_n$ are *all* of the primes. Then, let $P = p_1 \cdot p_2 \cdot p_3 \cdot ... \cdot p_n + 1$. Observe that P is not divisible by any of $p_1, p_2, p_3, ..., p_n$, since each of them leaves a remainder of 1 when one attempts to divide P by it. But any natural number greater than 1 is divisible by some prime number. So, since P is a natural number greater than 1, it is divisible by some prime number distinct from $p_1, p_2, p_3, ..., p_n$. So there is some prime number distinct from $p_1, p_2, p_3, ..., p_n$. Contradiction.

This argument proves that there are infinitely many primes. And now we get to the real point: *if there are infinitely many primes, there must be infinitely many numbers. And if there are infinitely many numbers, there must be numbers.* So mathematical realism is true.

19.2 The Quine-Putnam Indispensability Argument

- 1. We should be committed to (a) the truth of, and (b) the existence of the entities posited by, our best theories from the natural sciences.
- 2. Our best theories from the natural sciences presuppose (a) the truth of, and (b) the existence of the entities posited by some mathematical statements.

Consider a simple example:

Newton's law of gravitation which says that (i) any body a exerts a force f on any body b, (ii) f's direction is towards a, and (iii) f's magnitude F is given by the equation

 $F = \frac{gM_aM_b}{d^2}$

where g is a universal constant, M_a is the mass of a, M_b is the mass of b, and d is the distance between a and b.

Newton's law presupposes that force magnitudes, distances and masses can be measured by real numbers, i.e., that some mathematical sentences of the forms " $F = r_1$ ", " $M_a = r_2$ " and " $d = r_3$ " (where r_1 , r_2 and r_3 are arbitrary real numbers) are true, and therefore that mathematical entities such as real numbers exist.

Furthermore, since Newton's law presupposes that some mathematical sentences of the above forms are true, it also presupposes that there are force magnitude, distance and mass measurement functions. Specifically, the truth of sentences of the above form " $d = r_3$ " presupposes that there is a distance measurement function, which is defined as *the unique function* $f(\cdot, \cdot)$ from pairs of spatial points v, w to the non-negative real numbers, such that

(i) f(w,v) = 0 iff w = v, (ii) f(w,v) = f(w',v') iff the interval \overline{vw} is congruent with the interval $\overline{v'w'}$, (iii) f(w,v) = f(w,u) + f(u,v) if w, u, v are co-linear points and u is between w and v, and (iv) the metric defining points a_{v} as are such that $f(a_{v}, a_{v}) = 1$

(iv) the metric defining points a_1, a_2 are such that $f(a_1, a_2) = 1$.

This reveals that Newton's law of gravitation presupposes that some sentences about functions such as (i)-(iv) are true, and therefore that functions from points to real numbers exist.

3. *Therefore*, we should be committed to (a) the truth of, and (b) the existence of the entities posited by some mathematical statements.

In our example, this means being committed to the truth of certain claims about functions and real numbers, as well as to the existence of certain functions and real numbers.

20 Benacerraf's Identification Problem, and Structuralism

One kind of concern for Mathematical Realism is that even if mathematical entities exist, it is unclear how we can know anything about them. Another kind of concern for Mathematical Realism is that even if mathematical entities exist, it is unclear which entities they happen to be. It is this second concern, often called "Benacerraf's Identification Problem", that we will discuss now. We will focus on how the problem arises in the example of the natural numbers, $\mathbb{N} = \{0, 1, 2, 3, 4, ...\}$:

- The mathematical theory that describes these numbers and their properties is Dedekind-Peano Arithmetic whose axioms (concerning succession addition, multiplication, arithmetic induction, etc.) are easy to find. Now consider two views about what the natural numbers discussed by Peano-Dedkind Arithmetic are:
 - **[von Neumann reduction]** $0 = \emptyset, 1 = \{\emptyset\}, 2 = \{\emptyset, \{\emptyset\}\}, 3 = \{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}, ..., i.e., the successor of any natural number$ *n*is the set containing*n*and all of*n*'s members (i.e., all natural numbers smaller than*n*).

Both of these views about the natural numbers are are as good as any view might be: Both views allow you to prove, given standard set theory and some extra definitions, the truth of all the axioms of Peano-Dedkind Arithmetic. So both views allow us to prove everything Peano-Dedkind Arithmetic tells us about the natural numbers.

- The problem is that at least one of these views has to be false. This is because the first view entails that 3 is a member of 17, and the second view entails that 3 is not a member of 17. So the two views contradict each other.
- From this situation (along with further, related considerations, that can be set aside here) Benacerraf draws the following conclusion:

"There is no way connected with the reference of number words that will allow us to choose among them, for the accounts differ at places where there is not connection whatever between features of the accounts and our uses of the words in questions. ...[Therefore] there is little conclude except that any feature of an account that identifies 3 with a set is a superfluous one - and that therefore 3, and its fellow numbers, could not be sets at all."

In short, the natural numbers are not sets of any kind. But if they are not sets, what are they?

• Benacerraf proposes the answer is a view that is often called "Structuralism" (emphasis added):

"numbers are not objects at all, because in giving the properties (that is, necessary and sufficient) of numbers you merely characterize an abstract structure - and the distinction lies in the fact that the "elements" of the structure have no properties other than those relating them to other "elements" of the same structure. If we identify an abstract structure with a system of relations ..., we get arithmetic elaborating the properties of the "less-than" relation, or of all systems of objects (that is, concrete structures) exhibiting that abstract structure. That a system of objects exhibits the structure of the integers implies that the elements of that system have some properties not dependent on structure. It must be possible to individuate those objects independently of the role they play in that structure. But this is precisely what cannot be done with the numbers. To be the number 3 is no more and no less than to be preceded by 2, 1, and possibly 0, and to be followed by 4, 5, and so forth. And to be the number 4 is no more and no less than to be preceded by 3, 2, 1, and possibly 0, and to be followed by.... Any object can play the role of 3; that is, any object can be the third element in some progression. What is peculiar to 3 is that it defines that role - not by being a paradigm of any object which plays it, but by representing the relation that any third member of a progression bears to the rest of the progression. Arithmetic is therefore the science that elaborates the abstract structure that all progressions have in common merely in virtue of being progressions. It is not a science concerned with particular objects - the numbers. The search for which independently identifiable particular objects the numbers really are (sets? Julius Caesars?) is a misguided one."

In short, according to Structuralism, (i) mathematics does not characterize anything that has properties other than those relating it to other things in a common mathematical structure, and therefore (ii) statements identifying mathematical objects with things described in a non-mathematical language are not true (i.e., they are either false or meaningless), but (iii) some statements in pure mathematical language are straightforwardly true.

Structuralism can be developed in multiple ways. I will mention just two:

 Some structuralists, focusing on the sentence "[t]o be the number 3 is no more and no less than to be preceded by 2, 1, and possibly 0, and to be followed by 4, 5, and so forth", have suggested that numbers exist, and are elements of abstract structures. So their answer to the question "what are numbers?" is that numbers are elements is a certain abstract structure. This version of structuralism is a kind of Mathematical Realism. 2. Other structuralists, focusing on the sentence "Arithmetic... is not a science concerned with particular objects", have broken with Mathematical Realism by denying that numbers exist. On their view, the answer to the question "what are numbers?" is that there are no numbers. Nevertheless, they hold that some mathematical sentences are true.

It is not all all straightforward, however, to hold *both* that there are *no* mathematical objects, and that *some* mathematical statements are true. To see this, consider the following argument:

1. [Face value] Mathematical sentences should be taken at face value, and therefore as making straightforward claims about the nature of mathematical objects.

[E.g., "2 + 2 = 4" should be taken as being of the form "f(a, b) = c", and therefore as making the claim that the object 4 is identical to the object 2 + 2.]

- **2. [Standard Semantics]** If mathematical sentences should be taken as making straightforward claims about the nature of mathematical objects, then if there are no mathematical objects, mathematical sentences should be taken as not true.
- **Conclusion 1.** Therefore, if there are no mathematical objects, mathematical sentences should be taken as not true.
- 3. [No objects] There are no mathematical objects.

Conclusion 2. Therefore, mathematical sentences should be taken as not true.

This argument shows that, at least as long as we are committed to standard semantics, we have to make a choice:

- **Either** we can accept that mathematical sentences should be taken at face value. In that case, our views on the existence of mathematical objects and mathematical truth go together: We must either accept or reject *both* that some mathematical statements are true *and* that there are mathematical objects.
- **Or** we can deny that mathematical sentences should be taken at face value. In that case, we might still hope to deny that there are mathematical objects, while insisting that some mathematical statements are true.

As a result of this, structuralists who deny that there are mathematical objects but insist that some mathematical statements are true have to reinterpret mathematical sentences in various ways. One option found in the literature is to reinterpret mathematical statements as making abstract modal claims (i.e., claims about what is mathematically possible or necessary).

21 Field's Fictionalism

Suppose you think, however, that mathematical sentences should be taken at face value, and (perhaps because of Benacerraf's problem) that there are no mathematical objects. In that case, you must hold that *no* mathematical statements are true (i.e., they are either false or meaningless). How can this view - often called "Fictionalism" - be sensible? Field offers the following answer:

- 1. There are no mathematical objects, and no mathematical statements (including statement of mathematical axioms) are true.
- 2. Mathematical statements are *objective* only in the sense that there clear standards of correctness that determine whether a mathematical sentence is a *logical consequence* of the mathematical axioms, in a logic that extends first-order logic with the logic of the quantifier "there are only finitely many".
- 3. We choose mathematical axioms for considerations of "interestingness, utility, beauty, and concordance with" our concepts.

Part V What Parts Do I Have?

Texts:

- Carmichael, C. (2020). How to Solve the Puzzle of Dion and Theon Without Losing Your Head. Mind, 129(513), pp. 205-224.
- Olson, E. T. (1995). Why I have no hands. Theoria, 61(2), pp. 182-197.
- Baker, L. R. (1997). Why constitution is not identity. The Journal of Philosophy, 94(12), pp. 599-621.

22 The Puzzle of Dion and Theon

Philo of Alexandria attributes the following puzzle to Chrysippus:

Suppose that Dion is a regular man whose left foot is annihilated at time t. Prior to t, Dion is exactly located in a region that is shaped like a fully intact man. After losing his foot, Dion is exactly located in a region (call it R) that is shaped like a man who is missing his left foot. If there was an object inhabiting R prior to t—call this object either "Dion's left-foot complement" or "Theon"—then you might ask what is the relationship is between Dion and this object *after* t.

23 Answer #1 (van Inwagen, Olson): No arbitrary parts

Neither Theon nor Dion's left foot ever existed. But Dion exists and survives the annihilation of his foot.

- van Inwagen's argument:
 - Dion still exists after the annihilation of his left foot; and if Theon ever existed, then Theon also continues to exist after the annihilation of Dion's left foot.
 - Therefore, if Theon ever existed, then Theon and Dion end up in the same place, having all their material parts in common.
 - But two material objects cannot be co-located.
 - Therefore, Theon never existed.
 - Theon does not differ from Dion's left foot in any metaphysically non-arbitrary way.
 - Therefore, neither Theon nor Dion's left foot ever existed.
- Olson's argument:
 - If Theon exists, then Dion and Theon share a single brain and so all their mental states.
 - But only one thing has those mental states, namely Dion.
 - Therefore, Theon never existed.
 - Theon does not differ from Dion's left foot in any metaphysically non-arbitrary way.
 - Therefore, neither Theon nor Dion's left foot ever existed.

But why is Dion existence more metaphysically significant or non-arbitrary than the existence of his parts?

- According to van Inwagen, Dion is an organism and so metaphysically privileged since the activities of the particles which compose it constitute a life.
- According to Olson, Dion is an organism and so metaphysically privileged since it is a thinker.

Criticisms:

- People often have feet.
 - *Reply*: That intuition can be explained as the intuition that some of peoples' *non-arbitrary* parts (e.g., the particles that make me up) have the property of *being arranged foot-wise*. This does not commit us to the existence of feet.
- Olson argued that Dion has no arbitrary parts by assuming that only Dion has his mental states. But
 this assumption is doubtful. Instead, we could say that Dion's mental states are had not just by Dion
 but by all the (arbitrary) parts of Dion that have his brain. It is just that when we say "Dion is the only
 thinking thing in this room" we strictly-speaking mean something like "Dion is the only thinking thing
 in this room that is not a part of another thinking thing".
 - *Reply*: The alternative view seems to suggest that there is some arbitrary object in every subregion of Dion's location and definitely suggests that there is a multitude of objects that have Dion's mental states. So when the word "I" is uttered by Dion, which of this multitude of objects does it refer to?
 - * If it refers to all of them, then Dion is not a single object.
 - * If it refers to the largest object that has Dion's brain as part, then such an object has to exist. But Dion's boundaries are not sufficiently determinate for such a unique largest object to exist.
 - * Worse, on any view on which the word "I" as uttered by Dion refers to a unique object: (i) All the objects that have Dion's brain as part would not be able to know what object "I" refers to, or even if it refers to the same object at different times. This is because there is no nonarbitrary reason to prefer one of them as referent over the others. (ii) All the objects that have Dion's brain as part but to whom "I" does not refer would be prevented from thinking about themselves in the first person.
- Olson argued that Dion has no arbitrary parts by assuming that parts of Dion that share Dion's brain would have Dion's mental states. This is false. The brain and proper parts of Dion that share this brain (e.g., Theon) are material objects that survive biological death. Dion does not survive biological death. Therefore, the mere existence of those parts does not entail the existence of distinct thinkers sharing a single brain.
- Carmichael: Theon differs from Dion's left foot in a metaphysically significant, non-arbitrary, way.
 - van Inwagen has to say this for the following reason: Theon's existence after t entails the existence of two material objects sharing all their material parts and being exactly co-located. Dion's left foot's existence after t does not entail this. This is a metaphysically significant, non-arbitrary, difference between Theon and Dion's left foot.
 - Olson has to say this for the following reason: Theon's existence entails the existence of distinct thinkers sharing a single brain. Dion's left-foot's existence does not entail this. This is a metaphysically significant, non-arbitrary, difference between Theon and Dion's left foot.
 - Carmichael says this for the following reason: Theon's existence entails the existence of objects that cannot gain or lose parts. [Reason: Theon is an arbitrarily chosen object, and so Theon's existence entails the existence of arbitrary objects in every sub-region of Dion's location. So, if Theon can furthermore gain or lose parts, Theon can come to be co-located with these other arbitrary objects. But two material objects cannot be co-located. So Theon cannot gain or lose parts.] Dion's left foot's existence does not entail that [Reason: Dion is not an arbitrarily chosen object.] This is a metaphysically significant, non-arbitrary, difference between Theon and Dion's left foot.

24 Answer #2 (Carmichael): Ordinary parts only

Dion's ordinary parts—his head, his feet, and so on—exist. However, the complements of those ordinary parts—e.g., Theon—never exist.

- *Objection*: Dion is an existing material object that does not survive biological death. Dion's body is an ordinary existing material object that does survive biological death. So Dion and Dion's body are two *distinct* co-located material objects. That cannot be. So either Dion or Dion's body does not exist. This solves the original problem just as well as the present view.
- *Reply*: Either Dion's body is a proper part of Dion (since Dion also has blood and electrical signals as parts), or, "Dion's body" is a *phase sortal* that refers to Dion when he exists and is shaped (roughly) like an intact man, and otherwise refers to nothing or to something other than Dion.

25 Answer #3 (Baker, Zimmerman): Dion consists of Theon

After t, Dion and Theon are distinct co-located objects that have exactly the same material parts.

• Baker's argument that multiple material objects can be co-located:

In 450 BCE, the Greek sculptor Myron cast a statue of a bronze discus thrower. The statue, called "Discobolus", has not survived and is known to us only by Roman marble copies. Suppose that Myron created Discobolus by first casting two pieces of bronze and then welding them together. That is, suppose that Discobolus and the piece of bronze that constituted it came into existence at the same instant when the two smaller pieces were welded. Suppose also that Discobolus and the bronze piece that constituted it were destroyed together, at the same instant, a century later. Finally, suppose that while Myron was welding the statue together, he declared: "I hereby dub the piece of bronze that will result from my welding 'Bronze Piece', or 'BP' for short." Now:

- Discobolus is essentially a statue (i.e., anything that exists and is not a statue at some point in time is not Discobolus; i.e., "statue" is a *substance sortal*).
- BP is not essentially a statue (i.e., BP can exist without being a statue).
- Therefore, Discobolus is distinct from BP (i.e., Discobolus is distinct from the material object that constitutes Discobolus).
- Objection 1 to Baker:
 - If y is a paradigm F and x is intrinsically exactly like y, then x is an F.
 - Discobolus is a paradigm statue and BP is exactly like Discobolus.
 - Therefore, BP is a statue.
 - Discobolus and BP are co-located statues.
 - At most one statue occurs at any given place.
 - Therefore, Discobolus is identical to BP.

Reply: The first premise is false. What makes something a statue (or a planet, or a bank note, etc.) are its extrinsic properties - properties it has by virtue of its relations with things other than it or its parts. So intrinsic identity to a paradigm statue is not enough to ensure that something is a statue.

- Objection 2 to Baker:
 - Discobolus and BP consist of the very same atoms.
 - If Discobolus and BP consist of the very same atoms, then either they are identical or they differ in kind.
 - If Discobolus and BP differ in kind there must be something true of exactly one of them in virtue of which they differ in kind.
 - There is nothing true of exactly one of them in virtue of which they differ in kind.
 - Therefore, Discobolus is identical to BP.

Reply: Discobolus and BP differ in kind because exactly one of them is essentially a statue. Furthermore, what makes something a statue are its extrinsic properties; whereas what makes something a piece of bronze are its intrinsic properties.

- Objection 3 to Baker (Gibbard):
 - Modal expressions do not apply to concrete things independently of the way that they are designated.
 - A property, if it is to be a property, must apply or not apply to a thing independently of the way that it is designated.
 - Therefore, expressions constructed with modal operators do not give properties of concrete things.
 - Therefore concrete things have no modal properties.
 - If concrete things have no modal properties, then Discobolus does not have the property of being essentially a statue.
 - Therefore, Discobolus is not essentially a statue.

Reply: The first premise is false. That Alice can swim the English channel, the bullets can kill you, that cyanide is lethal - these can be true independently of how Alice, bullets or cyanide are designated. Worse, truths like "the electron could have passed through either one of the slits" had better be true independently of how the electron is designated, or the truth of science are description relative.

• Objection 4 to Baker: Isn't it better to say that identity can be contingent, e.g., that Discobolus and BP are identical, because they have exactly the same categorical (i.e., non-dispositional, or non-power) properties; but that they could have been distinct because Discobolus is essentially a statue and Discobolus is not?

Reply: It is not better.

- First, suppose Discobolus were melted down, so that BP existed and Discobolus did not. Everyone
 agrees that in such a case Discobolus and BP would be distinct. Therefore, if we say that Discobolus and BP are actually identical, it emerges that the relation between Discobolus and BP depends
 on what happens to them earlier and later in life (whether they start and end at the same time).
 This is an unattractive theoretical complication.
- Second, if the relation between Discobolus and BP depends on what happens to them later in life, there will be cases in which we could not know whether Discobolus and BP are identical until one of them ceases to exist. Worse, I will not know whether I am identical to my body (it would depend on whether I leave a corpse or not). This is an unattractive theoretical complication.
- Zimmerman's argument that material objects can be co-located:
 - There are masses of matter (e.g., the water in my glass, the gold in my ring, the matter in my body) which cannot gain or lose parts.
 - My body can gain and lose parts.
 - Therefore, my body is distinct from the matter in my body.
 - Therefore, two material objects can be co-located.
- Objection to Zimmerman (Carmichael):
 - That my body is distinct from its matter does not entail that two material objects can be co-located.
 - This is because masses of matter are not objects.
 - Instead, "the mass of matter in X" introduces a way of using a singular expression in order to make claims about the totality of X's parts (each of which is an object). Since the totality of X's parts can exist without jointly composing (i.e., making up) a further object, masses of matter are not objects themselves.

- * *Objection*: Suppose that some matter was an atom-less gunk, i.e., an infinitely divisible matter every part of which has further parts. Also suppose that some mass of this matter had a part that was rearranged so as to become a living organism. Then, if the part still existed after the reorganization, there would be both a part of matter (i.e., a material object) and an organism (i.e., a material object) co-located after all. And if the part no longer existed after the reorganization, then mere reorganization can destroy parts of masses of matter.
- * *Reply*: Indeed, the part no longer exists after the reorganization, and mere reorganization can destroy parts of masses of matter. This is because organisms must have freely moving parts, and parts of masses of matter can fail to have freely moving parts.

Part VI Are There Objective Answers to Existence Questions?

Texts:

- Chalmers, D. (2009). Ontological Anti-Realism. In Chalmers, D., Manley, D. and Wasserman, R. (eds.), Metametaphysics. Oxford: Oxford University Press, pp. 77-129.
- Thomasson, A. (2009). Answerable and Unanswerable Questions. In Chalmers, D., Manley, D. and Wasserman, R. (eds.), Metametaphysics. Oxford: Oxford University Press, pp. 444-471.
- Sider, T. (2009). Ontological Realism. In Chalmers, D., Manley, D. and Wasserman, R. (eds.), Metameta-physics. Oxford: Oxford University Press, pp. 384-423.

26 Metaontology

- The basic questions of ontology have the form "Do Xs exist?"
- The basic questions of *metaontology* have the form "Does the question of whether Xs exist have <u>objectively</u> true or false answers, i.e., does it have answers that are true or false <u>independently of</u> the context in which those answers are assessed?"

Possible answers to the basic questions of metaontology:

- [Heavyweight Ontological Realism about Xs] There are objectively true or false answers to the question of whether Xs exist. Furthermore, there answers are *not* trivial, i.e., *not* knowable by *a priori reasoning* that requires no philosophical sophistication.
- [Lightweight Ontological Realism (Realist Deflationism) about Xs] There are objectively true or false answers to the question of whether Xs exist. But there answers are trivial, i.e., knowable by a priori reasoning that requires no philosophical sophistication.
- [Ontological Anti-Realism (Anti Realist Deflationism) about Xs] There are no objectively true or false answers to the question of whether Xs exist.

26.1 A leading example

Throughout the semester we found ourselves suggesting that various things (individuals, persisting individuals, numbers, etc.) are composites of certain parts. But how do you get to things to come together so as to create a composite of which they are parts? This is one of the questions studied by *mereology* (the theory of parts and wholes; from "meros" - part in Greek). Here are a few possible answers to the question:

[Universal mereological composition] For every plurality there is a sum its members, i.e., $\forall x \forall y \exists z (z = sum(x, y))$.

This view implies that there exists a sum of my nose and the Eiffel Tower.

[Fastening] There is a sum of a plurality of objects only if its members are fastened together.

It has been argued that this is false, since no new objects come into existence when two people are glued, sewn, fused or otherwise fastened together.

[Mereological nihilism] There are no sums of the members of any plurality.

This view entails that there are no tables or chairs, or people or any composites at all. Only simples i.e., entities that have no parts—exist. These simples can be arranged table-wise, or chair-wise, or person-wise. All these view attempt to provide an objectively true answer to the ontological question "are there composites"? Furthermore, most of the people engaged in the debate about these answers believe that the various answers that are being discussed are not only objectively true or false, but require sophisticated philosophical and maybe even empirical reasoning to be known. Therefore, most of the people engaged in the debate about whether composites exist are committed to *heavyweight ontological realism about composites*.

Still, the debate between these ontological realists about composites has led some people to ask an important question: How could we seriously be disagreeing about whether there are tables and chairs? Hasn't this debate gone wrong somewhere?

Those who think that the debate has gone wrong somewhere fall into two camps. *Lightweight ontological realists about composites* think, for example, that it is a trivial matter that composites exist. According to them, (i) there are obviously simples arranged table-wise, and (ii) *a priori* reasoning that requires no philosophical sophistication establishes that if there are simples arranged table-wise, then there are also composites, and in particular, tables. Since (i) and (ii) together entail that there are composites, there is an objectively true and trivial answer to the question of whether there are composites.

Ontological anti-realists about composites have a different view. They think that there are no objectively true or false answers to the question of whether composites exist. This view can take several forms. For example:

- Ontological *relativists* about composites think that whether statements of the form "composites exist" are true or false depends on the context in which those statements are assessed.
- Ontological *indeterminists* about composites think that statements of the form "composites exist" are neither true nor false. Instead, they might lack a truth value altogether, or they might have some truth values other than true or false.
- Ontological *noncognitivists* about composites think that statements of the form "composites exist" are neither true nor false, and furthermore, they do not even purport to be true or false. Instead, these statements might function to express the speaker's desires, emotions, preferences, or other mental states cannot be evaluated for accuracy.

Let's look at each of these options.

27 Heavyweight Ontological Realism About Composites

Heavyweight Ontological Realists believe that

• Reality has a structure which includes a certain fundamental totality of everything that exists.

The idea that reality has a structure can be elucidated in many ways. It has been proposed, e.g., that Reality has structure in virtue of the fact that

- Some collections (e.g., the collection of all electrons) are *mind-independently similar*, while other collections (e.g., the collection of all electron-or-building-or-jacket-or-dogs) are not mind-independently similar.
- Some properties (e.g., the property of being an electron) are *natural*, while other collections (e.g., the property of being an electron-or-building-or-jacket-or-dog) are unnatural.
- Some properties (e.g., the property of being an electron) are a part of *what ideal inquirers aim to discover*, while other collections (e.g., the property of being an electron-or-building-or-jacket-or-dog) are not a part of what ideal inquirers aim to discover.
- Some properties (e.g., the property of being an electron) are not merely projected onto things by our minds, while other collections (e.g., the property of being an electron-or-building-or-jacketor-dog) are merely projected onto things by our minds.

The idea that there is a *fundamental totality of everything that exists* can also be elucidated in many ways. It has been proposed, e.g., that there is a fundamental totality of everything that exists in virtue of the fact that

- Some facts (e.g., the fact that something is human, and the fact that something is located in North America) are *mind-independently similar*, while other facts (e.g., the fact that some simples are arranged human-wise, and the fact that some simples are arranged located-in-North-Americawise) are not mind-independently similar.
- It is *natural* to be a property P such that something is P, while it is not natural to be a property P such that some simples are arranged P-wise.
- What is in the fundamental totality of everything that exists is a part *what ideal inquirers aim to discover*, while what is in the totality of ways that some simples are arranged in is not a part of what ideal inquirers aim to discover.
- What is in the fundamental totality of everything that exists is *not merely projected onto things by our minds*, while what is in the totality of ways that some simples are arranged in is merely projected onto things by our minds.
- We can make true or false assertions about what items are included in this totality by using the verb "to exist" (or, at least, by using the verb "to exist" in certain ways or in certain contexts).
- Which items are included in the fundamental totality of everything that exists is determined by Reality, and not by the context in which we assess any assertions. Therefore, when we make assertions about what items are and are not included in the fundamental totality of everything that exists, those assertions are true or false independently of the context in which those answers are assessed, i.e., objectively.
- For example, utterances of "composites exist" are objectively true (at least when the verb "to exist" in certain ways or in certain contexts) iff composites are included in the fundamental totality of everything that exists, and otherwise objectively false. (Note that this last claim is circular. According to heavyweight ontological realists, however, the circularity cannot be avoided since "exists" is a primitive concept.)
- Knowledge of which items are included in the fundamental totality of everything that exists is not something that can be gained merely by *a priori reasoning* that requires no philosophical sophistication. For example, *a priori* reasoning that requires no philosophical sophistication cannot establish that if there are simples arranged table-wise, then there are also composites, and in particular, tables.

The knowledge argument against heavyweight ontological realism (Chalmers):

- Intuitively, given full knowledge of the properties of two objects (including knowledge of the relations they bear to each other, but not including properties concerning their relations to their sums), one is in a position to know—merely by *a priori reasoning* that requires no philosophical sophistication everything about those two objects. There is no further nontrivial truth to know about whether there exists a sum of the two objects.
- 2. But if heavyweight ontological realism were true, there would be a further nontrivial truth to know about whether there exists a sum of the two objects.
- 3. Therefore, heavyweight ontological realism is false.

The scrutability argument against heavyweight ontological realism (Chalmers):

- 1. All truths are a priori entailed by the fundamental truths.
- 2. But claims about what is in the fundamental totality of everything that exists are not a priori entailed by the fundamental truths.
- 3. Therefore, there are no truths about what is in the fundamental totality of everything that exists.
- 4. Therefore, heavyweight ontological realism is false.

28 Lightweight Ontological Realism About Composites

We'll focus on one lightweight ontological realist - Amie Thomasson. She believes that

- An utterance of the form "Xs exist" is
 - objectively true iff (i) the term "X" is associated with application conditions (i.e., conditions that specify under which circumstances the term "X" refers) which competent users of "X" are able to follow and enforce on others (and in this sense, have a priori access to), and (ii) these application conditions are satisfied.
 - objectively false iff (i) the term "X" is associated with application conditions (i.e., conditions that specify under which circumstances the term "X" refers) which competent users of "X" are able to follow and enforce on others (and in this sense, have a priori access to), and (ii) these application conditions are not satisfied.
 - indeterminate iff the utterance is neither objectively true nor objectively false.
- The work of the ontologist is to make explicit the application conditions associated with various terms. Since we have a priori access to the application conditions, we can know whether Xs exist by *a priori reasoning* that requires no philosophical sophistication.
- The word "table"'s a priori accessible application conditions determine that "table" refers when there are particles arranged table-wise. Therefore, *a priori* reasoning that requires no philosophical sophistication establishes that if there are particles arranged table-wise, then there are tables. Furthermore, it is a matter of empirical fact that there are particles arranged table wise. So, it is a trivial objective truth that there are tables.
 - Objection (from the heavyweight ontological realist about composites): But it is *false* that if there are particles arranged table-wise, then there are tables. What is true instead is that if there is an object composed by particles arranged table-wise, then there are tables.
 - Reply: Perhaps so. But then we need to ask whether there are objects composed by particles arranged table-wise. To answer that question, we have to determine whether the application conditions for the term "object composed by particles arranged table-wise" are satisfied. If they are satisfied, then it is again a trivial objective truth that there are tables. If they are not satisfied, then it is a trivial objective truth that there are no tables. And if the term "object composed by particles arranged table-wise" (or, the term "object" itself) lacks application conditions altogether then it is indeterminate whether there are tables (or, objects).
 - Rejoinder (from the heavyweight ontological realist about composites): The last reply show that Thomasson's case rests on the idea that existence questions can only have objectively true or false answers when a priori accessible application conditions are attached to them. Without further argument, this is question-begging against the heavyweight ontological realist.

29 Ontological Anti-realism About Composites

We'll focus on one ontological anti-realist - David Chalmers. He believes that

- There is no fundamental totality of everything that exists. Reality's structure does not include such a totality. (This raises a question about how some utterances of the form "Xs exist" are true.)
- What exists is partially dependent of our concepts, in the following sense: We can legitimately conceptualize Reality in multiple ways, using multiple conceptual frameworks. No single framework is the correct or objectively the best one. And *according to different legitimate frameworks, different things exist.* More explicitly:
 - Different legitimate frameworks are associated with different *admissible furnishing functions*.

- An admissible furnishing function is a function from possible worlds to domains of discourse that satisfies certain other constraints.
- Suppose a given legitimate framework is associated with the admissible furnishing function f. Then, what exists is a world w according to that framework is whatever is in f(w), i.e., whatever is in the domain of discourse assigned to w by f.
- Ordinary utterances—i.e., utterances made within the context of ordinary discourse—express the conceptual framework of the utterer. Therefore,
 - for any ordinary utterance, the context of the utterance determines
 - * a possible world of utterance, w. World w is the world at which the utterance occurs,
 - * a *furnishing function, f*. Function *f* is a function from possible worlds to domains of discourse.
 - * a domain of discourse, f(w). As the notation suggests, the domain is determined by the world of the utterance and the furnishing function.
 - An ordinary utterance of the form "Xs exist" is
 - * objectively true iff the subset of f(w) which is identical to "X"'s extension in w is nonempty.
 - * objectively false iff the subset of f(w) which is identical to "X"'s extension in w is empty.
- Ontological utterances—i.e., utterances made within the context of a philosophical discussion in which ontological considerations are paramount—are not bound to the conceptual framework of the utterer. Instead,
 - an *ontological* utterance of the form "Xs exist" is
 - * objectively true iff for all admissible furnishing function f, the subset of f(w) which is identical to "X"'s extension in w is nonempty.
 - * objectively false iff for *no* admissible furnishing function f, the subset of f(w) which is identical to "X"'s extension in w is empty.
 - * indeterminate iff for *some* admissible furnishing function f, the subset of f(w) which is identical to "X"'s extension in w is nonempty, and for *some* admissible furnishing function f, the subset of f(w) which is identical to "X"'s extension in w is empty.
- Ontological utterances of "composites exist" are indeterminate, since they are true on the admissible furnishing function associated with the conceptual framework of the believer in universal mereological composition; but false on the admissible furnishing function associated with the conceptual framework of the believer in mereological nihilism.

Argument for ontological realism from science (Quine, Sider):

...in trying to decide how much structure there is in the world, I can think of no better strategy than this extension of Quine's criterion: believe in as much structure as your best theory of the world posits. The structure posited by a theory corresponds to its primitive notions—its 'ideology' in Quine's (1951) terminology—which includes its logical notions as well as its predicates.

This criterion is ... vague... But notice this: every serious theory of the world that anyone has ever considered employs a quantificational apparatus, from physics to mathematics to the social sciences to folk theories. Quantification is as indispensable as it gets. This is defeasible reason to think that we're onto something, that quantificational structure is part of the objective structure of the world, just as the success of spacetime physics gives us reason to believe in objective spacetime structure. Questions framed in indispensable vocabulary are substantive; quantifiers are indispensable; ontology is framed using quantifiers; so ontology is substantive.

...Is your rejection of ontological realism based on the desire to make unanswerable questions go away, to avoid questions that resist direct empirical methods but are nevertheless not answerable by conceptual analysis? If so, none of [the other] proposals will give you what you desire. None of them lets you bypass debate over the ultimate structure of the world. Far from it: each is simply an alternate proposal about what that structure is like. Given each proposal there remain substantive metaphysical questions, namely those that can be raised in what the proposal grants to be fundamental terms. Furthermore, the very assertion that the proposed variety of structure, as opposed to the quantificational structure that I support, is part of reality's objective structure seems itself to be incapable of being established by either straightforward empirical means or conceptual analysis.

Part VII Appendices

30 Glossary

counterfactual conditional A counterfactual. see haecceity An individual essence. see individual essence. see individual essence

31 English-Hebrew Dictionary

aleguo a תכונה במובן השופע abundant property תכונה מקרית accidental property elud [ולא סוכן! סוכן הוא מי שמשמש כשליחו של אחר. פועל הוא מי שמבצע פעולות.] brute fact עובדה חסרת הסבר צרור, צביר bundle תכונה קטגורית, תכונה בלתי- categorical property מותנית גורם, סיבה cause characterization principle עקרון האפיון k אוסף, קבוצה שלם מורכב composite קונקרטי, גשמי concrete nלק משלם constituent constituent ontology אונתולוגיה של שלמים וחלקים oarcin בחלל-זמן contiguity cosmological argument טיעון קוסמולוגי eounterfactual פסוק תנאי נוגד מציאות [פסוק מהצורה "לו היה___ אז היה ___", כאשר אחרי "לו" מופיע תנאי שאינו מתקיים] determination קביעה, היקבעות determinism דטרמיניזם, היקבעות על ידי אירועי העבר הרחוק וחוקי הטבע disposition דיספוזיציה, כח effect אפקט, תולדה, תוצאה תכונה מהותית essential property event אירוע event-determination קביעה על ידי אירועים דבר קיים existent extensionality principle עקרון האקסטנסיונליות תכונה extrinsic property אקסטרינזית, תכונה חיצונית fine-tuning כוונון עדין ireedom to do otherwise יכולת לעשות אחרת יסודי fundamental haecceity הקסאיטי, מהות אינדיבידואלית immanent אימננטי, חלל-זמני indeterminism אינדטרמיניזם, אי-היקבעות על ידי אירוע העבר הרחוק וחוקי הטבע individual אינדיבידואל, עצם individual essence מהות אינדיבידואלית, הקסאיטי תכונה אינטרינזית, תכונה פנימית תכונה אינטרינזית, תכונה אינטרינזית, תכונה פנימית לא בר-רדוקציה irreducible תורת היחס חלק מ- mereology טרופ מונאדי, טרופ חד מקומי monadic trope monadic universal - אוניברסל חד מקומי

monocategorical ontology אונתולוגיה חד-קטגורית טבעי natural טבע nature נומינליזם nominalism nomological של, או נוגע ל-, חוקים non-instantiable לא בר-מימוש object [אובייקט [מונח רב משמעי] see: existent, individual, non-instantiable, particular ontological argument טיעון אונתולוגי ontological category קטגוריה אונתולוגית ontology אונתולוגיה, תיאוריה אונתולוגית over-determination היקבעות-יתר ervigitr פרטיקולר טרופ פוליאדי, טרופ רב-מקומי polyadic trope polyadic universal -אוניברסל רב- אוניברסל פוליאדי, אוניברסל מקומי polycategorical ontology אונתולוגיה רב קטגורית מניעה מראש preemption קטגוריה אונתולוגית primary ontological category ראשית לא בר-ניתוח primitive תכונה, איכות, מאפיין property reasons-responsiveness רגישות לטעמים, רגישות לנימוקים reduction רדוקציה, העמדה על, זיהוי עם משהו מאוסף רחב יותר, גזירה מתורה כללית יותר רגולריות, סדירות regularity **rejoinder** תשובה לתשובה relation DD relational ontology אונתולוגיה של יחסים סדרה seauence self-determination קביעה עצמית תכונה במובן הדל sparse property מזויף spurious oובסטנציה [המונח לרוב מתורגם "עצם", substance אך תרגום זה שמור אצלנו כחלופה למילה ["אינדיבידואל"] see: individual oובסטרט, מצע substrate הכלה תחת subsumption תשובה לתשובה לתשובה תשובה transcendent טרנסצנדנטי, לא-חלל-זמני הבסה trumping גם את.ה [לטינית] גם את.ה ultimate origination היות מקור אחרון

32 Hebrew-English Dictionary

object (could mean either existent, individ- אובייקט ual, non-instantiable, or particular) constituent ontology אונתולוגיה של שלמים וחלקים monadic universal אוניברסל חד-מקומי monadic universal אוניברסל מונאדי polyadic universal אוניברסל פוליאדי polyadic universal אוניברסל רב-מקומי ontology אונתולוגיה monocategorical ontology אונתולוגיה חד-קטגורית polycategorical ontology אונתולוגיה רב קטגורית relational ontology אונתולוגיה של יחסים class אוסף property איכות immanent אימננטי indeterminism אינדטרמיניזם individual אינדיבידואל event אירוע effect אפקט cause גורם tu quoque [Latin] גם את.ה concrete **גשמי** existent דבר קיים determinism דטרמיניזם disposition דיספוזיציה trumping **הבסה** ultimate origination היות מקור אחרון determination היקבעות over-determination היקבעות-יתר subsumption הכלה תחת reduction העמדה על haecceity, individual essence הקסאיטי nomological -חוקים; של, או נוגע ל immanent חלל-זמני constituent חלק משלם nature טבע natural טבעי ontological argument טיעון אונתולוגי cosmological argument טיעון קוסמולוגי monadic trope טרופ חד מקומי monadic trope טרופ מונאדי polyadic trope טרופ פוליאדי polyadic trope טרופ רב-מקומי transcendent טרנסצנדנטי relation **on** freedom to do otherwise יכולת לעשות אחרת fundamental **'OIT** fine-tuning כוונון עדין disposition **n** non-instantiable לא בר-מימוש primitive לא בר-ניתוח irreducible לא בר-רדוקציה transcendent לא-חלל-זמני

property מאפיין haecceity, individual essence מהות אינדיבידואלית abstract מופשט spurious מזויף preemption מניעה מראש substrate **מצע** mereology מראולוגיה nominalism נומינליזם substance סובסטנציה substrate **סובסטרט** regularity סדירות sequence **סדרה** cause סיבה contiguity סמיכות בחלל-זמן brute fact עובדה חסרת הסבר characterization principle עקרון האפיון extensionality principle עקרון האקסטנסיונליות individual עצם agent פועל counterfactual, counterfac- פסוק תנאי נוגד מציאות tual conditional particular פרטיקולר bundle צביר bundle צרור class [although in most contexts it is better to קבוצה translate "set"] determination קביעה event-determination קביעה על ידי אירועים self-determination קביעה עצמית concrete קונקרטי ontological category קטגוריה אונתולוגית ontological קטגוריה אונתולוגית ראשית primary category regularity רגולריות reasons-responsiveness רגישות לטעמים reasons-responsiveness רגישות לנימוקים reduction רדוקציה composite שלם מורכב effect תולדה effect תוצאה mereology -תורת היחס חלק מ ontology תיאוריה אונתולוגית property תכונה intrinsic property תכונה אינטרינזית extrinsic property תכונה אקסטרינזית categorical property תכונה בלתי-מותנית sparse property תכונה במובן הדל abundant property תכונה במובן השופע extrinsic property תכונה חיצונית essential property תכונה מהותית accidental property תכונה מקרית intrinsic property תכונה פנימית

Advanced Topics in Metaphysics

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