Abstract Entities

THE TRADITIONAL PROBLEM OF UNIVERSALS

I. Ontology

A. What is it?

- <u>Ontology</u>, coming up w/ a very general description of the world: what there is and what it is like, at a level that doesn't make it part of the particular sciences. Examples of possible theories, possible questions.

- There are lots of meta-questions about the significance of ontology, how to do it, etc. We will talk about these a lot later, but I think it's best to do some first-level stuff first. So all I'll do by way of methodology is sketch what Quine thinks about these things.

B. Statements of non-existence

1. Threat of Meinongianism

- One of the first pitfalls: how to say that you don't believe in anything. How can one say truly that "Pegasus doesn't exist" — doesn't 'Pegasus' have to exist in order for this to be meaningful?

- we want to avoid the confusion that Pegasus *does* exist - it's an idea. We also want to avoid Meinongianism.

- Aside: an important thing Quine says here should not be missed:

> Wyman, by the way, is one of those philosophers who have united in ruining the good old word 'exist'. Despite his espousal of unactualized possibles, he limits the word 'existence' to actuality — thus preserving an illusion of ontological agreement between himself and us who repudiate the rest of his bloated universe. . . The only way I know of coping with this obfuscation of issues is to *give* Wyman the word 'exist'. I'll try not to use it again; I still have 'is'. So much for lexicography; let's get back to Wyman's ontology. (pp. 75-76)

- note, though, that not everything is terminological here. I take it that Quine is basically saying that there is just one fundamental ontological category: what there is, in the broadest sense. Beyond that there are different *kinds* of things, but those things don't have existence in different senses; they just exist, and have different features. Quine would say a similar thing about Russell's restriction of 'exists' to things in space and time. He would say that there's just one fundamental category — what there is. Some of those things are in time and space. Let's just call them spatiotemporal things. It's a bad terminological decision to use 'existence' for this; moreover, there's no important ontological line there, just a "qualitative line".

2. **Russell's theory of descriptions**

- Quine recommends Russell's theory as the antidote for Meinong.

- Let "Px" be a predicate meaning "x Pegasizes". Perhaps this may be analyzed as "x is a winged horse".

- "Pegasus exists" then means something like "$\exists x$ [Px & $\forall y(Py \rightarrow y=x)$]". So to say that Pegasus does *not* exists is just to say: "NOT: $\exists x$ [Px & $\forall y(Py \rightarrow y=x)$]"

- Thus, in order for this sentence to be meaningful (and even true), there is no need for there to be a referent of 'Pegasus'. All that is required is that quantification is meaningful, and the predicate 'Pegasizes' is meaningful.

C. **Ontological commitment**

- So on Quine's view, we're not "committed" to Pegasus by saying that Pegasus does not exist. Here's what he says:

> We commit ourselves to an ontology containing numbers when we say there are prime numbers larger than a million; we commit ourselves to an ontology containing centaurs when we say there are centaurs; and we commit ourselves to an ontology containing Pegasus when we say Pegasus is. But we do not commit ourselves to an ontology containing Pegasus or the author of *Waverly* or the round square cupola on the Berkeley College when we say that Pegasus or the author of *Waverly* or the cupola in question is *not*. We need no longer labor under the delusion that the meaningfulness of a statement containing a singular term presupposes an entity named by the term. A singular term need not name to be significant. (p. 80)

- As we see, Quine says we *are* committed to entities when we existentially quantify. When we say "there is a prime number greater than 50" that commits us to prime numbers.

- We are *not* committed to things simply by using apparent names of them, like Pegasus, since those uses can be paraphrased away using Russell's theory.

1. **To be is to be the value of a bound variable**

    - In, Quine's view is that quantification is the *only* way one can be ontologically committed to something:

    > To be assumed as an entity is, purely and simply, to be reckoned as the value of a variable. . . . The variables of quantification, 'something', 'nothing', 'everything', range over our whole ontology, whatever it may be; and we are convicted of a particular ontological presupposition if, and only if, the alleged presuppositum has to be reckoned among the entities over which our variables range in order to render one of our affirmations true. (p. 83).

    - It follows that he thinks we're not committed to universals simply by using predicates; we'll return to this below.

2. **Questions about the slogan**

    - Note that it isn't really clear just what Quine means by all this.

    - first of all, it looks a bit like he's being Meinongian when he says "we are convicted of a particular ontological presupposition iff the alleged presuppositum has to be reckoned..." — sounds like he's quantifying over all the things that may or may not exist and saying we're committed to *them* iff ...

    - another thing is that no particular thing must exist in order for "there are Fs" to be true.

    - to make these problems go away it's natural to say something like "we're committed to a *kind* of thing, F, iff Fs must exist in order for...". But we don't really want to quantify over kinds. Maybe Quine is affirming every instance of the schema: a person is committed to Fs iff ...”.

- another problem is the presence of “must be reckoned”. Quine says we’re committed to Fs if there must exist Fs in the range of our variables if our existential assertions are to be true. What does “must” mean here? It must presumably have some kind of modal force (there is literature on this). One quick point of this sort: Quine cannot mean this:

  X is committed to Fs iff: IF [a certain existential assertion of X’s is true], then [there are Fs in the range of X’s bound variables]

  Since the right hand side is true whenever its antecedent is false — X would be committed to Fs whenever his existential assertions were false.

- one problem is that Quine doesn’t want to admit modality.

- But even if he admits it there is trouble. What if it is a necessary truth that if “there exists a red thing” is true then redness exists?

- There is a lot of literature here, and I won’t go further. I guess I’ll work with the following formulation: gather the person’s theory, and let S be any sentence of the form “$\exists x\ \phi x$” that is logically entailed by that person’s theory. For any such ϕ, that person is committed to there being ϕs; and these are *all* of that person’s commitments.

II. Universals and particulars

A. Apparent identity or similarity in nature

- Give the idea (cf. Price’s intro paragraphs)
- The general philosophical task here is to give an account of the appearances and what we ordinarily say and think.

B. Properties vs. relations

- properties, relations
- distinguish relations from *relational properties*
- note the conception of ontology driven by predicate logic - we might well

also be driven to admit functions (for bits of language like ‘father of’) and propositions. Or we might reduce all these to properties and relations — function is a kind of relation; a proposition is a kind of composite made out of things, properties and relations. Alternatively, one might try reducing everything to propositions (or states of affairs or facts) in some way. I won’t discuss that project.

C. **Terminology**

- it’s important to get clear on various issues about use and mention, grammar, etc.

- first, get clear about the grammatical distinction between subject terms and predicate terms.
- So we need to distinguish the predicate, ‘red’, from a *name* of the (alleged) property of being red — ‘redness’.
- We should not say that ‘redness is a predicate’; and we should not say “consider the property red”. Rather, say “redness”, or “being-red”.
- given that there are some other grammatical strictures. ‘Red’, or rather ‘is red’, is a predicate, and so can grammatically combine with ‘Ted’ to form a grammatical sentence: ‘Ted is red’. ‘Redness’ is not a predicate; you cannot write “Ted redness”. You can’t even write ‘Ted is redness’, at least not if ‘is’ continues to be the “‘is’ of predication”. This string of words actually does make sense, but that’s because ‘is’ now is the ‘is’ of identity. And then the sentence is straightforwardly false. So if you want to combine ‘Ted’ with ‘redness’, we need to say: “Ted *instantiates* redness”. Here, ‘instantiates’ is a two-place predicate, and ‘redness’ and ‘Ted’ are subject terms.
- To illustrate these points, let’s consider how to formulate the indiscernibility of identicals, sometimes called Leibniz’s Law:

  Bad: if x=y, then for any property, F, Fx iff Fy

  (Set aside stuff about second-order logic.)

  Good: if x=y, then for any property, F, x instantiates F iff y instantiates F

III. **Natural properties**

- mention Price’s point about “conjoint” recurrences — p. 23.
- point out the Goodmanian/Cambridge trivialization of “sharing a property”
- so Price must have in mind sharing of *real* or *genuine* properties; we might call

them natural properties. (A natural *kind*, in Price's sense, would then be a conjunction of frequently coinstantiated natural properties.) We'd also want to introduce natural relations as well.

- mention that it is hard to give any kind of "syntactic characterization" of the distinction between natural and non-natural properties. Grue/bleen is just one famous example. But even consider the easier example of disjunctions. An atom and a hippo have $A \vee H$ in common. Shall we disqualify this property because it is "disjunctive"? Well, what do we mean by disjunctive? If all that means is: there is some disjunctive predicate that is instantiated iff it is, then every property is disjunctive.
- Probably we'll need some heavy-duty metaphysics to sort out the predicates that express natural properties from the rest.

IV. Nominalism and realism

- nominalism: there are no abstract entities
- realism: there are some abstract entities

- but this raises many questions.

A. What does "abstract" mean?

- There are real questions here. But I won't worry too much about this. It usually doesn't matter - what's usually relevant is whether a certain style of argument establishes the existence of a certain kind of entity.
- it *does* seem to matter when you try to formulate some general reason for wanting to be a nominalist. E.g., that we couldn't know about abstract entities. I'll mostly avoid any general attempt to define 'abstract'. Rosen&Burgess say good things about this. See also Lewis, *Plurality*.

B. Kinds of realism

1. Other abstracta

- of course there are putative abstract entities other than properties and relations — propositions, numbers, events, states, facts, sets, etc. (The status of these things as abstract, and their distinctness from each other, are not uncontroversial.)

- But even within the classic problem of universals there are various kinds of realists:

2. **Universals vs. tropes**

3. **Platonic vs. Aristotelian (i.e., transcendent vs. immanent)**

- platonic: can exist uninstantiated, are not "in" their instances
- Aristotelian: cannot exist uninstantiated, are "in" their instances; Armstrong says they are "abstractions" from states of affairs
- I don't really know for sure what these things mean (maybe talk about my reasons for being skeptical)

4. **Sparse vs. abundant**

- some people think of properties and relations as the meanings of predicates (people often call this kind of view a Fregean view, but the matter is complicated). On this view, there is a property or relation for every meaningful predicate. Some of these of course won't be natural properties. This is an *abundant* view.
- There are other abundant views, e.g., Lewis's view that identifies properties with sets of possible individuals.

- others deny abundance, e.g. Armstrong.

C. **Particulars**

- The status of particulars is usually also included in the debate over universals. In particular, the main debate is the bundle theory vs. substratum theories.

1. **Bundle theory**

- particulars are just collections of or sums of or bundles of universals (or tropes)
- not just any old bundle — contradictory (or at least implausible) objects loom. We need compresence.
- classic objection is that this disallows distinct duplicate particulars. Best response is John's.
- avoid the problem.

2. **Substratum theory**

- a particular is more than just its universals. Subtract the universals and there's something left over — the thing that *instantiates* the universals.

- this solves the problem of distinct indiscernibles

- “Bare” particulars? It is sometimes said that

- This dispute matters a lot to the debate over universals, because of the following. Suppose the bundle theory were unacceptable. Then one could argue in favor of nominalism thus: you *must* believe in one *sui generis* category: particulars. But positing universals would be superfluous — anything that can allegedly be explained with their help can be explained without it. (This would need to be established, of course!) Therefore, we should not posit universals. But if the bundle theory *is* acceptable then this argument does not work - it fails in its first step.

V. **The one over many argument**

This is one of the classic arguments in favor of universals.

A. **Many things can be the same**

- This is what Price is talking about when he says that things can be the same. Many things are white. (Armstrong too.)

B. **Universals explain this**

C. **Or do they? “Wheels that turn...”**

- Do they? It’s a common complaint that universals are idle “wheels that turn” without doing any theoretical work. Suppose we want to explain how it is that two things are both red. We could just say that each is red. Or we could say that each instantiated redness. How is that better?

- we might press this and point out that we’re left w/ the same question: how is it that each is related to redness. Well, it isn’t really the *same* question.

D. **An alternate explanation: resemblance nominalism**

- As Price puts it, why not just stop by saying that red things resemble ("in a certain way")? We'll talk more about resemblance nominalism later, when we get into Armstrong.

E. **Another alternate "explanation": each of the red things is red!**

- seems to me this is perfectly OK. I think this undermines the traditional problem of the one over many.

- This seems to be Quine's suggestion in "On What There Is", although he hedges by saying that it is a response one could make "from one conceptual scheme":

> That the houses and roses and sunsets are all of them red may be taken as ultimate and irreducible, and it may be held that McX is no better off, in point of real explanatory power, for all the occult entities which he posits under such names as 'redness'. (p. 81)

- There are various come-backs the defender of the argument could make here, but really at this point the argument is morphing into some other argument.

F. **Ontology vs. Ideology**

- here Quine's terminology of "ontology" and "ideology" is relevant. Quine admits that 'red' is in our ideology. This means basically that 'red' is a meaningful predicate.

- inquiry into what predicates are meaningful, and which of these must be reckoned *primitive* — i.e., not defined in terms of others — is a legitimate part of inquiry, Quine says.

- But he denies that the admission of a predicate into our ideology requires an addition to ontology

VI. **The argument from meaning (a special case of the argument from the commitments of ordinary language)**

A. The argument

- Quine considers this argument (on behalf of "McX", his realist opponent):

> Let us even grant that "is red", "pegasizes", etc., are not names of attributes. Still, you admit they have meanings. But these *meanings*, whether they are *named* or not, are still universals, and I venture to say that some of them might even be the very things that I call attributes, or something to much the same purpose in the end. (p. 82)

- what is challenging about this argument is that it looks like Quine would have to admit meanings by his own criterion of ontological commitment. After all, surely to say that "is red" *has* a meaning is to say that *there is* a meaning that is had by "is red". Likewise, to say that "is a lawyer" and "is an attorney" *have the same meaning* is surely to say that *there is* a meaning that each of them have.

B. Paraphrase

- Quine's response here introduces the next major move in the game. Quine agrees that *in a sense*, "is red" has a meaning, and in a sense, "is a lawyer" and "is an attorney" have the same meaning, but these claims may be *paraphrased* thus: "is red" is meaningful; "is a lawyer" and "is an attorney" are synonymous. Now there is no quantification over meanings. We do have predicates — 'synonymous' and 'is meaningful'. But these have already been claimed not to be ontologically committing. We add to ideology, not ontology.

- this is generally Quine's strategy: to defend against unwanted ontological commitments, Quine recommends paraphrasing the worrisome sentences in such a way that the commitment is avoided. Sentences that *appear* to quantify over problematic things turn out not to quantify over anything at all, or perhaps they turn out to quantify over things that aren't problematic.

C. How to choose an ontology

- suppose we go along in good Quinean fashion. We go around to all the quantified sentences in our theory and see whether they violate our ontology. If they do, we try to paraphrase them to make the problem go away.

- we will eventually wind up with problems. Some sentences will be very difficult if not impossible to paraphrase. Do we junk the sentences or increase our ontology?

- for that matter, what was a reasonable ontology to start with? And what was a reasonable theory to start with? What has emerged is that Quine's criterion of commitment falls seriously short of any kind of guide to choice of an ontology.

- Quine response by supplementing this with a very general account of how to choose an ontology:

> Our acceptance of an ontology is, I think, similar in principle to our acceptance of a scientific theory, say a system of physics: we adopt, at least in so far as we are reasonable, the simplest conceptual scheme into which the disordered fragments of raw experience can be fitted and arranged. Our ontology is determined once we have fixed upon the over-all conceptual scheme which is to accommodate science in the broadest sense; and the considerations which determine a reasonable construction of any part of that conceptual scheme, for example, the biological or the physical part, are not different in kind from the considerations which determine a reasonable construction of the whole. (p. 86)

- so *general* principles of theory choice — the same ones that guide physicists — lead you to the best theory; and the ontology of that theory is the reasonable ontology.

- Note that the ontology of a theory can be part of what determines its value as a theory. So can its ideology. So the whole Quinean project of paraphrase can be part of how we determine what the best theory is.

- This view is the core of the famous Quinean argument for the existence of mathematical entities — our best theory is mathematical physics, which quantifies over real numbers; therefore, we need to admit real numbers (or, as Quine argues, the sets to which they can be reduced/paraphrased)

- Later in the course we'll discuss challenges to the whole Quinean setup, but I think it is by far the best way we have, at least as a starting point, to think about ontology, so I'll just presuppose it for the moment.

ARMSTRONG AGAINST NOMINALISM

I. **Setup**

- First just a bit on how Armstrong sets up the issue
- The "gross facts are not in dispute". So what are the gross facts? Sometimes it is that there is something identical "in" multiple particulars. Sometimes it is that some things have the property of being white. Sometimes it is that some things are white, some things punch other things, etc.
- Also, his different versions of nominalism are ways of filling in the schema:

  a has the property, F, if and only if ...

  rather than:

  a is F if and only if ...

  Is the former just a variant on the latter? I.e., is he reading "has the property F" "thinly", so that it is just equivalent to saying that the thing is F? Some nominalists might just think that sentences looking like this "a has the property F" are just false, since there are just are no properties.

- Armstrong distinguishes various forms of nominalism: predicate nominalism, class nominalism, mereological nominalism, resemblance nominalism, etc.

II. **Predicate nominalism:** a has the property, F, if and only if a falls under the predicate 'F'

- Armstrong says that not only is this biconditional supposed to be extensionally adequate, but in addition it is supposed to be a reductive analysis. (P. 13)

A. **Infinite regresses**

1. **Better formulation of predicate nominalism**.

   - the earlier formulation mentions "the" predicate 'white'.
   - But there are many tokens of 'white'. This is supposed to be a version of nominalism.

- so the new formulation should be:

  a is an F iff *a* falls under <u>some</u> predicate 'F'

2. **The object regress**

- let *a* be any white thing

1. Suppose *a* is some white thing
2. There exists some x_1 that is a predicate 'white', such that *a* is white in virtue of falling under x_1 (from 1)
3. $x_1 \neq a$
4. There exists some x_2 that is a predicate 'is a predicate 'white'', such that x_1 is a predicate 'white' in virtue of falling under x_2 (from 2)
5. $x_2 \neq x_1$, $x_2 \neq a$

etc.

3. **Is the regress "vicious"?**

- What does that mean?
- The possible predicates objection: the predicates don't exist. That's probably right.
- setting that aside, I'm not sure what the problem is. I mean, I already agree that it is crazy to say that *a* is *F* <u>because</u> *a* falls under '*F*'. But is this made more manifest by the regress? After all, consider any of the elements of the regress. E.g., some predicate 'is a predicate 'is white''. The regress is forcing the predicate nominalist to say that this object is a predicate 'is a predicate 'is white'' in virtue of falling under 'is a predicate 'is a predicate 'is white'''. But the predicate nominalist will want to say this *anyway*. I'm not sure why it follows that nothing gets explained. (Armstrong makes comments on p. 21 about debtors and carpets bulging, but I don't understand them.)

4. **The relation regress**

- this works by cases of falling under, rather than cases of the predicate.

B. **The modal argument**

- Armstrong formulates the argument in terms of "*the* predicate 'snow'". I'll say "some predicate 'snow'" instead.

1. Snow could be white even if no 'white' predicate existed
2. If 1. is true, then snow could be white even if snow did not fall under any 'white' predicate
3. If snow could be white even if snow did not fall under any 'white' predicate, then Predicate nominalism is false

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4. Therefore, Predicate nominalism is false

- is this a good argument? I suppose someone could try to reject 2 by interpreting counterfactual conditionals or modal statements w/ semantic vocabulary as always involving our actual conventions. But that seems not to be what those counterfactuals mean.

- someone could try to reject 1 by claiming that 'white' exists necessarily

    - But the claim that it exists necessarily doesn't sit well with nominalism. What kind of thing is this? Of course, you could be a *kind* of nominalist and say this.

C. **Other arguments**

- it is bizarre to say that snow is white because it is called 'white'. I think this is basically what Armstrong calls the Euthyphro argument. But note it isn't really similar, because in the Euthyphro argument the order of explanation being criticized is said to be backwards: it is said that the gods love the pious because it is pious rather than the other way around, whereas here, though it is wrong to say that snow is white because it is called 'white', it would *also* be wrong to say that snow is called 'white' because it is white.

- Is snow white because it is called 'white' or because it is called 'blanche'? What non-arbitrary answer could be given?

- It's important to be clear whether you're postulating universals to explain predication, or to explain ordinary quantification over universals. These objections don't apply to the latter kind of view.

III. **Class nominalism**: *a* is an *F* iff *a* is a member of the class of *Fs*

A. **Circularity**

- this is right on the surface, and I find it strange that Armstrong doesn't talk about it. (Or does he? I don't remember seeing anything.)

- The analysis analyzes being an *F* in terms of being an *F*!
- it wouldn't be a problem if this weren't a theory of predication, as it isn't for many class nominalists (e.g., Lewis)

B. **We need classes, not aggregates**

- as Armstrong points out, we could not say that *a* is an *F* iff *a* is a part of the aggregate of *F*s. Not every part of the aggregate of one-kg things is one kg.

C. **Commitment to classes**

- Armstrong complains that this view requires the existence of classes.
- this is a reasonable complaint. There is something very strange about set theory — you get a huge number of entities "automatically" as soon as you admit anything at all.

- But perhaps we need sets anyway, for mathematics and physics. We'll defer discussion of this issue.
- Armstrong floats the idea that at least ordinary language references to sets can be paraphrased as plural reference to the members. This certainly seems true for the simplest cases. Anybody have any idea about the current status of this project?

D. **Coextensive properties**

1. **The problem**

- <u>being a creature with a heart</u> = <u>being a creature with a kidney</u>

2. **Possibilia**

- David Lewis is a class nominalist, but does not have this problem. For him, a property is a set of *possible* individuals.
- this does not violate nominalism, but many won't want to accept possibilia

- there's also the problem of necessarily coextensive properties
- Lewis thinks he can solve this problem by using structured properties for "hyperintensional uses" of property talk

3. **Conee's point**

- suppose we're accepting a sparse conception of properties, in addition to being class nominalists. Then it's not obvious we have the problem. (Earl Conee made this point to me in conversation.)

E. **A modal argument**

- On p. 37 Armstrong says this:

> Consider a particular white thing. It is a member of the class of white things; and according to the Class Nominalist its whiteness is constituted by membership of that class. But now imagine that the remainder of the class does not exist. The white thing will be left alone with its unit-class. But may it not still be white? So the remainder of the class has nothing to do with its whiteness. (P. 37)

- this suggests this argument:

1. If Class Nominalism is true, then, where *W* is the set of white things, it is necessary that something is white iff it is a member of *W*
2. But something could be white even if some of the members of *W* did not exist.
3. Necessarily, if some of the members of *W* do not exist then *W* does not exist.
4. Necessarily, if *W* does not exist then nothing is a member of *W*

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5. Therefore, Class Nominalism is not true

- but it seems that premise 1 is not true. What is true is that it is necessary that something is white iff it is a member of the set of white things. (I.e., "the set of white things" has narrow scope relative to the 'necessarily'.)

- perhaps the argument works if we re-do the theory so as to eliminate the circularity. The theory would be: *a* is white iff *a* is a member of <u>this</u> set. But how will we pick out the set?

F. **Natural classes**

- based on pp. 39-40

1. For any things, there is some class of which those things are members
2. If Class Nominalism and (1) are true, then for any things, those things share some one property
3. It is not the case that for any things, those things share some one property

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4. Therefore, Class Nominalism is not true

- I suppose you *could* deny premise 1. That would be a strange set theory. Also it would undercut your view if you argued that we need sets *anyway* for mathematics — presumably we need the full set-theoretic universe.

- You could just deny 3. This seems implausible, if you want your notion of property to be explaining genuine similarity. Note that one *could* just drop this, and use universals to explain predication only. Armstrong seems to want universals to do both things.

- You could give up on Class Nominalism and accept what Armstrong calls "moderate class nominalism" — some classes are *natural* classes, and there's no explanation of this. Armstrong suggests that the new theory is:

Moderate class nominalism: *a* is *F* iff there is a natural class of *F*s of which *a* is a member

- but alternatively, one could retain the original theory but just say that some classes are natural; and say that our *intuition* that things don't share a property is just the intuition that some things don't share a *natural* property.

G. Natural relations and ordered pairs

- Armstrong talks about this in the opinionated intro book
- Relations can't be sets of unordered pairs - they must be sets of ordered pairs.
- argument against this on p. 32. It's pretty bad.

- You can make a good argument, though.
- a decision about which way to construct pairs is a decision about what "ordered pair" and hence "relation" are to mean.
- so suppose you decide to mean Kuratowski pairs, and assert: the <u>five-feet-from</u> relation is natural. That means that the set of Kuratowski pairs <x,y> where x is five feet from y is natural — has a glow.
- Now choose some silly method of pairmaking, and decide to mean it by 'relation'. Say, the method that's like Kuratowski but swaps two particular things, a and b. If I then assert <u>"the relation just like five-feet-from except swapping a for b</u> is natural", I'll turn out right!

H. Natural classes and set-theoretic structuralism

- A natural class is a kind of glow around an entity.
- A structuralist generally says that a statement about classes ϕ will be reinterpreted as the statement: "for any singleton function, f, $\phi(f)$".
- But now, for two things, *x* and *y*, to share a natural property, it will need to be the case that for every singleton function, there's a glowing fusion of singletons containing *x*'s singleton under f and *y*'s singleton under f.
- Now consider one of these fusions that is glowing.
- Under some singleton function, this counts as the set of some *Y*s such that the *Y*s do *not* share a natural property.
- But it is glowing; therefore the structuralist will count the sentence "the *Y*s share some natural property" as being true.

- ******* talk about Lewis's variably polyadic predicate in New Work 193-194

I. Degrees of naturalness

- It should be a matter of degree if naturalness is tied to similarity, Armstrong says.
    - this isn't certainly true if we're sparse. Maybe there's a few perfectly natural classes, and that's all we need.

- at any rate, he then complains that degrees of naturalness of "vague" and "imprecise".

> How do you compare the class of earthquakes with the class of volcanic eruptions with respect to their unity? The ranking of natural classes in terms of degrees of unity is a bit like ranking societies by how free they are. In both sorts of case you can make some sort of ranking. But the ranking will very often not be all that precise and definite. (*Universals: An Opinionated Introduction* p. 24).

- maybe he's right that it will be vague; but it's at least worth pointing out that vagueness doesn't follow from the claim that there are cases of incomparability. More-natural-than could be a partial order.

IV. **Resemblance nominalism**: *a* is *F* iff *a* resembles paradigm *F*s

- this is a rough formulation - Price for example has a more complicated account.

A. **Problem of exact resemblance**

- Price even goes on the offensive and discusses an argument against universals:

> The Philosophy of Universals tells us that resemblance is derivative, not ultimate; that when two objects resemble each other in a given respect, it is because the very same universal is present in them both. This seems to leave no room for inexact resemblance.
>
> Now if we consider the various white objects I mentioned before — the whole series of them, from the freshly fallen snow to the unwashed bow-tie — how can anyone maintain that the very same characteristic, whiteness, recurs in all of them? Clearly it does not. If it did, they must be exactly alike in their colour; and quite certainly they are not. (p. 29)

- by inexact resemblance he really means imperfect resemblance in some one respect — e.g., two things don't have quite exactly the same shade of white. Universals certainly leave room for sharing some properties but not others.

- what could the defender of universals say here?

    - could be sparse and say that whiteness is not a universal. The only universals are things like charge; and whenever you have any charge-resemblance, you have exact charge-resemblance.

    - Price eventually gets around to saying the following: whiteness is indeed a universal; it's just a *non-specific* universal. Two white things *do* resemble exactly in terms of whiteness. They don't share any *shade* of whiteness - perhaps when Price is thinking there's inexact resemblance he's thinking of the shades. (Price puts this by saying that whiteness is a *determinable* and the shades are its *determinates*.) This undermines the final step in his argument. If by "have the same color" he means "have the same shade", then the defender of universals isn't committed to saying they have the same color just because they all instantiate whiteness. But if "have the same color" means "there's some color-property they all have", then the members of Price's series *do* have the same color.

B. Exemplars

- Price worries about the fact that he glossed his answer to the one over many as "these things resemble each other *in some respect*". This looks like it reintroduces universals, since *respects* might be thought to be universals.

- His response to this problem is to defend a theory of exemplars:

> Every class has, as it were, a nucleus, an inner ring of key-members, consisting of a small group of standard objects or exemplars. The exemplars for the class of red things might be a certain tomato, a certain brick and a certain British post-box. Let us call them A, B and C for short. Then a red object is any object which resembles A, B and C as closely as they resemble one another. (p. 32)

- The primitive notion (in his ideology) he is using here is 'x resembles y at least as well as z resembles w'.

- The theory is: x is red iff for any exemplars y, z and w, x resembles y at least as well as z resembles w.

- But now, what are these “exemplars”? Do we name a particular group of exemplars? If so, then there’s a very powerful modal argument: surely a given thing could have been white even if those particular exemplars didn’t exist.
- On the other hand, if we have a general term here for “red-exemplars”, what does it mean?

C. **Russellian argument: resemblance must itself be a universal**

- note that Russell apparently defends the Platonic conception; for him, universals do not exist in time and space: “The [timeless] world of being is unchangeable, rigid, exact, delightful to the mathematician, the logician, the builder of metaphysical systems, and all who love perfection more than life.” (P. 50 — there’s more funny stuff immediately afterwards.)

- he also says that every verb stands for a universal. This may well be true on his view - but if it’s supposed to be an argument then we can ridicule it as presupposing an unsupported conception of how meaning works.
    - of course someone might argue that semantic theory as a whole won’t work well if we don’t have semantic values to employ, e.g. properties, propositions, functions, etc. That may be; but that’s a different argument, one that we’ll discuss later (Bealer).

- Here’s Russell’s argument against resemblance nominalism:

> If we wish to avoid the universals *whiteness* and *triangularity*, we shall choose some particular patch of white or some particular triangle, and say that anything is white or a triangle if it has the right sort of resemblance to our chosen particular. But then the resemblance required will have to be a universal. Since there are many white things, the resemblance must hold between many pairs of particular white things; and this is the characteristic of a universal. It will be useless to say that there is a different resemblance for each pair, for then we shall have to say that these resemblances resemble each other, and thus at last we shall be forced to admit resemblance as a universal. (p. 48)

- Price says a number of things here, but the most important one is: no! Why think that resemblance must be a relation, unless you’re assuming in general that meaningful predicates need to stand for universals? And if you were assuming that, you already have a proof of realism.

- This leaves us with a bit of a puzzle — the Russellian argument looks so bad - how could Russell have missed this problem with it? But I think maybe what was going on was this. Russell figured that his opponent is *granting* that predicate terms, whether 1- or 2- place must stand for something, and just missing the fact that in moving from "x is red" to "x resembles y", while a one-place predicate is eliminated a two-place predicate remains. This would fit in with the conception of semantics that Russell is operating with in this book (*The Problems of Philosophy*): a meaningful sentence expresses a proposition, which is made up of the meanings of the terms in that sentence (e.g. as described in the chapter "Knowledge by Acquaintance and Knowledge by Description".)

- More on this: Why should any analysis of "x is red" be needed at all? Why is the RN's analysis progress at all? Why would you think that it's good to eliminate a one-place predicate in favor of a two-place predicate? So Russell's point could be that the RN's position is unmotivated, even if consistent.

D. **Regress**

- Armstrong says that Price's reply to Russell doesn't work.
- Russell is admittedly wrong to think that the resemblance nominalist is immediately committed to a *universal* of resemblance.
- But now apply the account to "*a* resembles *b*". This will be true iff a,b resemble c, d, where c and d are paradigms of resemblance. For now, let's assume the resemblance relation is four-place.
- But now we need to explain *this* predication. It will be true iff a, b, c, and d resemble e, f, g, and h, where e, f, g and h are a paradigm case the four-place resembling. And so on. Since the number of objects increases in each case (presumably no two of the objects will be identical - but I suppose you could deny that), you have an infinite regress
- as before, I don't quite see why it is "vicious" — why can't each thing be explained by the next
- but at some point there won't be actual paradigms...

- if you had ordered pairs I suppose you could say that "*a* resembles *b*" is true iff <a,b> resembles <*c*,*d*>, where <*c*,*d*> is a paradigm case of resemblance. Now the resemblance relation is two-place. And maybe the truth of this claim is given by <<*a*,*b*>,<*c*,*d*>> resembling <*c*,*d*> — the regress has been stopped.

E. **The regress and the free lunch**

- In the newer book Armstrong admits that this regress doesn't work. What he says is when *a* resembles *b*, then there does *not* need to be any kind of resemblance relating *a* and *b* to something else. The reason involves two things: particular natures and supervenience.

1. **particular natures**

- a particular nature of *a* is a trope that is in essence the conjunction of all of *a*'s (intrinsic?) tropes, except that its conjuncts don't exist. It may be defined as an object that exists iff *a* exists and has the exact actual nature it has.

2. **Supervenience and the ontological free lunch**

- Armstrong defines supervenience thus: A supervenes on B iff it is necessary that if B exists then A exists

    - (note that this is a non-standard definition of supervenience)

- he then says that if A supervenes on B then A is nothing "extra" "beyond" B; that A is "harmless", since it has the same truthmaker as B.

- how *exactly* does this solve the problem? As follows, I suppose. Armstrong admits that if *a* resembles *b*, then it will have to be that *a* and *b* resemble some *c* and *d*, that *a*, *b*, *c* and *d* resemble some *e*, *f*, *g* and *h* and so on. BUT: i) all these things hold in virtue of the existence of the natures of *a* and *b*, so we're not claiming that each stage in the regress holds in virtue of the next, and ii) the ontological economy of the infinitely many things is not a problem since the whole infinite series of things is a "free lunch".

- so, I suppose, this amounts to denying the claim that anytime a predication Rxy holds, it holds in virtue of x and y resembling some z and w. Sometimes Rxy can hold in virtue of the natures of x and y. But if this is the move, then couldn't resemblance be dropped altogether, once we have the particular natures and the free lunch?

- I think the free lunch embodies an implausible accounting of ontological costs. If the account has the consequence that infinitely many things exist, then the account is unparsimonius. Who cares whether some of them are necessitated to exist by others? They all exist.

F. Ordinary quantification over properties

- some of the other accounts seem to give you entities that we could regard ourselves as talking about when talking about properties: classes, predicates. But not resemblance nominalism.

G. Pap's argument from vagueness

- a instantiates Redness vs. a and b red-resemble

    (Question: why not just a is Red??)

- Consider the sequence a_1, ..., a_n, where adjacent members red-resemble, but in which a_1 and a_n do not red-resemble. The description: $R(a_1,a_2)$& ...& $R(a_{n-1},a_n)$ & $\sim R(a_1,a_n)$ is consistent. But the realist thinks that R(x,y) entails that x and y instantiate the same universal, Redness. So $R(a_1,a_2)$& ...& $R(a_{n-1},a_n)$ entails that a_1 and a_2 instantiate the same universal, and that a_2 and a_3 instantiate the same redness universal. Now, — premise missing! — the realist also infers that the universals in question in these cases are the same. If this premise is granted, then it follows that there's some redness universal that a_1 and a_n instantiate. Then — again, premise missing! — it follows that $R(a_1,a_n)$ is true; contradiction.

- This argument fails. There are a number of different questions about the argument. First, is a_n red, just a very different shade of red from a_1, or something related, say, orange? Second, when we say that two things red-resemble each, is this supposed to be equivalent, according to the realist, to saying that they both instantiate redness, or that they instantiate the very same shade of redness?

    - Case 1: a_n is red, and "R(x,y)" means that x and y are both red. Then the argument's premise that $\sim R(a_1,a_n)$ is false.
    - Case 2: a_n is red, and "R(x,y) means that x and y are the same shade of red. Then the first missing premise, that in general R(x,y) and R(z,w) imply that x, y, z and w have the same redness property, is false.
    - Case 3: a_n isn't red, and "R(x,y)" means that x and y are both red.

Then the argument's premise that $R(a_{n-1},a_n)$ is false.

- Case 4: a_n isn't red, and "R(x,y)" means that x and y have the same shade of red. If "having the same shade of red" implies that each is red, then again the argument's premise that $R(a_{n-1},a_n)$ is false. Moreover, the first missing premise is again false.

- Pap *might* have in mind another argument, something like this:

1. a_1 is red
2. So, a_1 instantiates the universal redness
3. But then a_2 instantiates the universal redness (no sharp cutoffs)
4. But then a_2 is red.

.
.
.

Therefore, a_n is red

Here we can choose a_n to be something that isn't red — paradox. The problem is that the problem here confronts the nominalist as well. We could simply consider:

1. a_1 is red
2. So, a_2 is red (no sharp cutoffs)

.
.

Therefore, a_n is red

or

1. $R(a_1,a_2)$
2. So, $R(a_1,a_3)$ (no sharp cutoffs)

.
.

Therefore, $R(a_1,a_n)$

This last argument depends on there not being a sharp boundary in what counts as red-resembling. This could be denied; one could choose some arbitrary level of similarity required for red-resemblance. But presumably the realist could do the same thing. Could choose some particular universal redness, with some arbitrarily chosen cutoff point.

V. **Ostrich nominalism**

Note what Armstrong says about Ostrich nominalism on bottom of p. 16/top of 17. It's pretty weak; it also seems to show that Armstrong doesn't understand Ostrich nominalism.

. . . . .

NOMINALISM AND PARAPHRASE

The question here is this. Assuming a broadly Quinean criterion of ontological commitment, are there sentences that apparently quantify over universals that we ordinarily assert? If so, can this quantification be paraphrased away?

I. Pap's sentences

A. Red resembles Orange more than Blue

1. "If x is red and y is orange and z is blue then x resembles y more than z"?

   - No - the resemblances might be in the wrong respects

2. "If x is red and y is orange and z is blue then x color-resembles y more than z"?

   - if the quantification here is extensional then this is too easy to make true; if there are no red, orange or blue things then "red resembles blue more than orange" would turn out true.

   - (Jackson) Suppose it just happens to be that red, orange and blue are coextensive with triangularity, sweetness and squareness, respectively. Then it will be true that for any x, y, z, if x is triangular, y is sweet, and z is square, then x color-resembles y more than z. Nevertheless it won't be true that triangularity resembles sweetness more than squareness.

     - I don't get this. The paraphrase was for red, orange and blue; the paraphrase did *not* say "F-ness is more like G-ness than H-ness" is always analyzed in terms of color-resemblance.
     - Jackson recognizes this, but says that it would be illegitimate for the general paraphrase to be to use ϕ-resemblance whenever F-ness, G-ness and H-ness are all ϕ, since that quantifies over colors.
     - But that's putting words into the nominalist's mouth. The nominalist might say something like this: if F, G and H are predicates, and ϕ is a more general predicate encompassing them, then . . .

- clearly more work needs to be done here to show that there can be a *generally successful* paraphrase. But Jackson hasn't refuted the nominalist.

3. "Necessarily, if x is red and y is orange and z is blue then x color-resembles y more than z"?

    - (Pap) some nominalists won't like invoking modality, subjunctive conditionals, etc.

    - (Jackson) what about "The color of ripe tomatoes resembles the color of Syracuse University more than it resembles the color associated with boy babies"? It doesn't mean: "for any x, y and z, if x is the color of ripe tomatoes, y is the color of Syracuse University and z is the color associated with boy babies, then x color-resembles y more than z", since 'the color of ripe tomatoes' and the rest are not rigid designators.

        - could rigidify. That would require cross-world comparisons. Etc.

B. **Red is a color**

1. "Everything red is colored"

    - (Jackson) If that were right, then "Triangularity is a color" would mean that everything triangular is colored; but that might turn out true.

2. "Necessarily, everything red is colored"

    - (Jackson) If that were right, then "Red is a shape" would mean that, necessarily, everything red is shaped. But the latter is true while the former is false.

    - (Pap) Again, we need the notion of necessity. One reason to not like that is that necessity seems to presuppose the existence of propositions, since necessity is a property of propositions.

        - But we could resist that view.

C. **I like the smell of roses**

1. "For any x, if x smells like a rose then I like x"

   - No - I might not like x for other reasons

2. But what about "For any x, if x smells like a rose then I smell-like x"?

D. **I have all the attributes of a great general; A and B have at least one common color (where A and B are multi-colored things)**

1. "I have attributes X, Y and Z", where X, Y and Z are in fact the attributes of great generals

   - (Pap) But the speaker might not know what the attributes of a great general are.

   - moreover, this will have the wrong modal properties.

2. "A and B are both (partly) f_1, or they are both (partly) f_2, or . . . or they are both (partly) f_n"

   - (Pap) same problems - these may not be all the colors; the speaker may not know; wrong modal properties.

3. "A and B are both (partly) f_1, or they are both (partly) f_2, or . . . or they are both (partly) f_n, where f_1, ..., f_n are all the colors"

   - (Pap) quantifies over colors

4. "A and B are partly-same-colored"

   - this is not considered. It seems OK. But this primitive predicate will have some funny behavior. Suppose A is partly red and partly green; and suppose you are told that i) B is nowhere green, and ii) A and B have at least one common color. Then you can conclude that B is (partly) red. But how did you make that inference? There seems to be an analytic connection between 'red', 'green', and ‘have at least one common color’ that is left unexplained if ‘partly-same-colored’ is left unanalyzed.

E. Systematic vs. piecemeal semantics

- suppose we could do alright on a case by case basis. Still there’s a worry articulated by Lewis in “New Work”. The piecemeal nature of the paraphrases defeats systematic semantic theory. (This is related to the worry about analytic connections between primitive predicates.)

- Respond in terms of externalist semantics? ????

II. Goodman and Quine

A. The paraphrase game

- as noted before when we studied “On what there is”, Quine thinks that the ontological commitments of a theory are given by the values of its bound variables, *not* its predicates, *not* the quantifier types. (E.g., I would imagine he would claim that a nominalist could perfectly well use the quantifier ‘most’ — there’s no need to stick w/ just ‘all’ and ‘some’)

- Therefore, when confronted with a problematic sentence, the nominalist must either i) ditch it, or ii) paraphrase it.

- Goodman and Quine, and Lewis in “Holes”, show that you can get pretty far with this tactic; but they also point out many limitations of this paraphrase strategy.

B. Why nominalism?

1. Goodman: no difference without a difference in content

> The nominalist’s attitude stems in part, perhaps, from a conviction that entities differ only if their content at least partially differs. So far as individuals go, this is a truism; and any supposed exceptions, such as the case of two objects fashioned out of the same piece of clay at different times, clearly depend on the fallacy of ignoring the temporal or some other dimension. (Goodman, p. 230)

- what is Goodman saying here?

- Here’s what he thinks is bad about classes. You can have two distinct classes that have the same "contents", in the following sense:

{USA} ≠ {Midwest, Prairie states, South, Northeast, Mid-Atlantic, West Coast} ≠ {Alabama, Alaska, . . ., Washington, Wyoming}

{a,b,c} ≠ {{a,b},c} ≠ {{a},{b},{c}}

- So the principle he accepts is roughly this. (See Lewis, *Parts of Classes*, section 2.3). Some systems build up things from others (e.g.: mereology, set theory, structural universals.) Goodman's principle is that you can never get two different "wholes" from the very same starting materials. You can in set theory. Therefore set theory is no good.

- we should note that the principle's defense is a substantive metaphysical thesis, and one that is rejected by some for reasons that have nothing to do with nominalism. (E.g., Wiggins types; Goodman's "clearly" remark about statues and lumps of clay presupposes the doctrine of temporal parts.)

2. Goodman and Quine: "a world of make-believe"

> What seems to be the most natural principle for abstracting classes or properties leads to paradoxes. Escape from these paradoxes can apparently be effected only by recourse to alternative rules whose artificiality and arbitrariness arouse suspicion that we are lost in a world of make-believe. (Goodman and Quine, p. 105).

- the suggestion is that the only natural principle for generating classes is the unrestricted comprehension principle; the substitutes since then are artificial.

- One Platonist response would be to stress work done since that time, (by, e.g., Boolos, "The Iterative Conception of Sets") in which the axioms of ZF set theory are shown to flow from a very natural iterative conception of sets.

C. The framework

- let's look into what Goodman and Quine allow themselves, and what they don't, in setting up the paraphrases.

1. First-order, singular, objectual quantification

Yes: ∃xFx
No: ∃x∃FFx (Higher order)
No: "there is an object, namely Pegasus, that is a winged horse" (Substitutional)
No: "there are some *X*s such that the *X*s carried the piano up the stairs" (Plural quantifier)

- Orthodoxy has it that higher-order quantification would be illegitimate for a nominalist. The quantifier '∃x' ranges over individuals, whereas most think that the quantifier '∃F' would have to range over classes or properties. There is literature about which I know very little about the status of second order logic.

- The Quinean criterion of ontological commitment assumes the objectual reading of the quantifiers. There is allegedly another reading, the substitutional reading, on which "∃xFx" means something like "there is at least one name, α, such that ⌜Fα⌝ is true. Again, there's a bunch of literature on this that I don't know anything about; again it would be something interesting to pursue.

    - Two points to keep in mind if you think that this would help with any of the examples Goodman and Quine deal with. First, you need some account of the truth of the atomic sentences. (Though this seems to challenge Quine's hope of all onto-commitment being at the level of variables.) Second, if the substitutional ∃ just means an objectual ∃ over names, then presumably we could do just as well with paraphrases that use objectual quantifiers over names.

- regarding plural quantification, this was not around when Quine and Goodman were writing. There is an ongoing debate over its legitimacy nowadays, but there is nothing like a consensus that it is illegitimate. The basic idea is that you can say "there exist some critics", and thereby quantify plurally over critics, without this being disguised singular quantification over classes of critics.

2. Plural quantification?

- what is it? Let's look at it grammatically.

- the singular quantifiers are introduced as formal representations of bits of English, e.g., "Some cats scratch" ⇒ "∃x(Cx & Sx)"

- The plural quantifiers are introduced because there are bits of English that resist formulation in terms of the singular quantifiers:

  some critics admire only each other
  if some people lift a truck, each of them will hurt his/her back.

- Would these be symbolized as:

  there is at least one critic who ...?
  if a person lifts a truck, then he hurts his back? (no)

- The defender of plural quantification develops a logical language of plural quantification, with a different grammar from regular logic. The bound variables don't get assigned single objects as their values. Here is a guide:

Singular

<u>English</u>	<u>Logic</u>
John	j
him	*x*
something	∃x
is happy	H
something is happy	∃xHx

Plural

<u>English</u>	<u>Logic</u>
John, Frank, and Bob	j f b
them	*X*s
some things	some *X*s
carried the casket	C
some things carried the casket	for some *X*s, C(*X*s)
he is one of them	y is one of the *X*s

- To initially get familiar with the idea, you could think of the plural terms, quantifiers, etc., as actually being singular, but taking sets as values. Thus, "some *x*s carried the casket" could be taken to mean that there is a set (of people) such that that set carried the casket.

But the idea isn't that this is disguised talk about sets -- it's a different *way* of talking about the same things that one talks about with first-order logic. the only objects one is committed to are those in the domain of quantification; if one says "some people carried the basket", one has only quantified over people, not sets of people.

- Plural quantification can't be reduced to ordinary singular quantification (unless you introduce set-like entities into the domain of quantification). For the simplest and non-rigorous argument, think of: some people carried the casket. It doesn't mean ∃x(x carried the casket), obviously. More rigorous arguments are possible.

- Note the final entry in the chart for plural quantification: the two-place predicate 'is one of'. This enhances the power of plural quantification significantly, as we'll see later.

3. Alternate first-order singular quantifiers?

- Quine and Goodman and Lewis don't talk much about this, but they don't use any quantifiers other than 'all' and 'some'. What about others, like 'most'? It is well-known that 'most' can't be symbolized in terms of 'all' and 'some' (at least not without quantifying over sets). So maybe the nominalist would be happy to add it as a new primitive quantifier?

- What about other primitive quantifiers that are not monadic, such as "There are as many Fs as Gs", construed as a binary quantifier?

  - Let's clarify "binary quantifier". What are the familiar "all" and "some" quantifiers, grammatically? '∃' attaches to a single open sentence to form a grammatical closed sentence. A binary quantifier would connect two open sentences to form a closed sentence. E.g., on the treatment of 'some' that treats it as a restricted quantifier: "(∃x: Fx)(Gx)" — some Fs are Gs. That's what "exactly as many" would be: (EAM: Fx)(Gx).

4. Mereology

- the other obvious part of the framework is mereology. 'Part of' is allowed into ideology. And Goodman and Quine assume unrestricted composition.

- This isn't just an innocent terminological stipulation. This is a big bit of ontology they're assuming.

- moreover, they're assuming a reasonable bit of "small-ism" — that things are made of little bitty parts. This is of course empirically justifiable.

5. No paradoxes for mereology or plural quantification

a. Russell's paradox

b. Paradox of the universal set

- Cantor's theorem: the power set of a set cannot map 1-1 into that set:

    - suppose that P(X) maps 1-1 into X. Let the mapping be f

    - Let D be the set of things, y, in X such that $y \notin f(y)$.

    - D is a subset of X, and so is in P(X), and so there's some d in X such that f(d)=D.

    - Is $d \in D$? (I.e., is $d \in f(d)$?)

        - If yes, then no, by D's defining condition.
        - If no, then yes, again by D's defining condition.

- But if there were a universal set, U, then its power set would map 1-1 into U. That's because every member of its power set is a set, and is therefore in U, and so we can just map each member of the power set of U to itself.

c. Don't arise for mereology

- There is no such as the fusion of all the things that are not parts of themselves. Everything is part of itself; and there is no null individual. (You could also consider the fusion of all things that are not proper parts of themselves. Since nothing is a proper part of itself, that would be the fusion of everything. That's the next thing to consider.)

- There *is* such a thing as the fusion of everything. No paradox arises. The reason is that nothing like Cantor's theorem holds for fusions. And the reason for *that* is that there's no distinction in mereology like that between subsets and members. The analog would be:

$x \in y$	x is part of y
$x \subseteq y$	every part of x is part of y

  But since parthood is transitive and reflexive, 'x is part of y' and 'every part of x is part of y' are equivalent.

  The only thing like a power set of an individual would be the fusion of all its parts (since there's nothing distinct from part-of analogous to subset-of). But that's just the individual, and of course the parts of an individual can be mapped 1-1 onto the parts of that individual.

  Basically what's going on is that mereology doesn't give you the explosion of reality that set theory does. In set theory, if you begin with a set and keep taking power sets, you keep getting more and more things. But that's not true in mereology, as we've seen.

d. **Don't arise for plural quantification**

- can we get anything like the Russell paradox? Well, what would the unrestricted comprehension principle for plural quantification be? This: for any formula ϕ, if there is at least one ϕ, then there are some Xs such that y is one of the Xs iff y is a ϕ

  But this doesn't lead to trouble. You might try saying this: "there are some Xs that are one of themselves. Others aren't. So let's consider the Xs such that y is one of the Xs iff y is not one of itself." But it doesn't make any sense to say that y is not one of itself. 'One of' connects a singular variable to a plural variable, not a singular variable to a singular variable.

OK, let's define 'the Xs are *among* the Ys" as meaning that for any y, if y is one of the Xs then y is one of the Ys. Now can we consider the Xs such that y is one of the Xs iff y is not among itself? No — again ungrammatical.

Could we consider "the Xs such that the Ys are among the Xs iff the Ys are not among themselves"? Well, that is a grammatical expression. But there are no such Xs, so the Russell paradox doesn't get off the ground. For any Ys, the Ys *are* among themselves, so no Ys would be among the Xs. (There are no "null" Xs, just like there is no null individual. The expression "there are some Xs" such that ... is an existential quantifier, and so there must be some Ys among the Xs; equivalently, there must be some y that is one of the Xs.)

- The comprehension principle gives us the "universal Xs" -- there are some Xs such that for all y, y is one of the Xs iff y is self-identical. I.e., there are some Xs such that for all y, y is one of the Xs.

  But there's no problem. Let's try to construct the analog of the power set of these Xs. That would be the Ys such that ...

  ... y is one of the Ys iff y is one of the Xs
  This makes the Ys identical to the Xs
  ...y is one of the Ys iff y is among the Xs
  This is ungrammatical
  ...any Zs are among the Ys iff the Zs are one of the Xs
  This is ungrammatical
  ...any Zs are among the Ys iff the Zs are among the Xs
  This makes the Ys identical to the Xs

  The paradox is blocked again by not allowing a distinction between subset- and member- relations *at the same level*. You *do* have 'among' and 'one of', which are analogous to ‘subset-of’ and ‘member-of’; and they are different predicates; but it’s not the case that each of them connects individual variables to individual variables. This in effect blocks the explosion of reality. The power set is a thing that contains as *members* all the *subsets* of a given set. To get this we need to utilize the ‘member’ and ‘subset’ predicates of individuals.

D. **Simple sentences about classes**

- Goodman and Quine say that some simple sentences about classes are “equivalent” to sentences not about classes:

“Ted is a member of the class of humans” ⇒ “Ted is human”
“The class of humans is a subset of the class of mammals” ⇒ “Every human is a mammal”

- but there’s a perfectly good sense in which these sentences are not equivalent; the ones with “class” in them entail that there are classes.
- Why not just say that for most purposes we can get along with the nominalistic versions?

- what exactly is the goal of their paraphrases? Perhaps it is to arrive at sentences that say the same thing about the purely nominalistic part of the world as do the originals. (It would be good to try to make more precise what this amounts to.)

E. **“Every species of Dog is exhibited”**

- regard a “species of Dog” as the fusion of all dogs of that species.
- Then say “for every x, if x is a species of dog then some y is a dog and is part of x and is exhibited”

- Suppose that a dog of one species could contain a dog of another species as a part. Then this wouldn’t work, since a part of a species being exhibited wouldn’t be the same thing as a member of a species being exhibited.

F. **Simple numerical sentences**

- there are exactly two dogs ⇒ $\exists x \exists y[Dx\&Dy \ \& \ x \neq y \ \& \ \forall z(Dz \rightarrow [z=x \vee z=y])]$
- there are at least two dogs ⇒ $\exists x \exists y[Dx\&Dy \ \& x \neq y]$
- there are at most two dogs ⇒ $\forall x \forall y \forall z[(Dx\&Dy\&Dz) \rightarrow (x=y \vee x=z \vee y=z)]$

G. **There are more cats than dogs**

1. **"there is at least one cat and not at least one dog or there are at least two cats and not at least two dogs or ..."**

    - given the "..." we haven't come up w/ a sentence.

        - maybe fool around with infinitary sentences? Then the sentences won't exist. Is that a problem? The nominalist's intention may still partition the possible worlds into worlds in which the intention is true and worlds in which the intention is false.

    - if we want a sentence, we'll have to stop. We could stop at a point greater than the number of cats that are known to exist. But we may not know how many cats there are. Moreover, the sentence, even then, will be only extensionally adequate; it will be modally inadequate.

2. **use a primitive predicate 'has more cats than dogs as parts" (Goodman)**

    - this may look like it has 'cat' and 'dog' as significant parts, but it doesn't. It's a primitive predicate.

    - then we can say: "for any x that contains every cat and dog as a part, x has-more-cats-than-dogs-as-parts".

    - Goodman notes that you'll need a new such predicate for each comparison: 'has more cougars than wolves as parts', and so on.

    - Lewis&Lewis consider a similar suggestion about comparing numbers of holes to numbers of crackers, and they worry (following Davidson) that since you will need all these predicates, there is a question about how you learned them all.

    - moreover there will be analytic connections that are not explainable by appeal to the meanings of the parts of the expressions. E.g., if a thing has-more-cats-than-dogs-as-parts, and it has-more-dogs-than-beetles-as-parts, then it has-more-cats-than-beetles-as-parts.

3. Bits (Goodman and Quine)

- we need a primitive predicate ‘bigger than’.
  - What are we measuring by? Mass? Number of atoms? (Maybe atomism is false...).

- then we can define ‘x is as big as y’: “x is not bigger than y and y is not bigger than x”

- A bit: a thing that is as big as the smallest cat-or-dog
- A bit of x: a bit that is part of x

- The translation: there are more cats than dogs ⇒ every individual that contains a bit of each cat is bigger than some individual that contains a bit of each dog

- Acknowledged limitation: it works only if no two cats or dogs overlap. Otherwise when we’re fusing bits of cats to construct the thing to measure the size of the cats, we might get too small a thing if the things we’re fusing overlap.

- Unacknowledged limitation in “Steps”: what if not ever cat contains a bit? Then the translation comes out vacuously true. How could this happen? Suppose atomism is true, and not all the atoms have the same size.

  - Goodman contains a footnote saying that he intends all atoms to have the same size, as he understands ‘bigger’. Presumably this is to solve this problem. But now let’s ask what ‘bigger’ means. It’s ok if it means “has more atoms as parts than”. But then it only works under atomism. Could it mean “if atomism is true then x has more parts than y but if atomism is false then x is spatially bigger than y” (despite being primitive!)? Maybe.

- Wrong modal profile, given the possibility of non-atomism, or cats without mass, etc.

4. **Other possibilities**

- A primitive binary quantifier "there are more Fs than Gs"

- What about a primitive two-place plural predicate "the Xs outnumber the Ys"? Then we could say "there are some Xs and there are some Ys such that for all z, z is one of the Xs iff z is a cat, and z is one of the Ys iff z is a dog; and the Xs outnumber the Ys."

H. Ancestrals

- consider the usual recursive definition of the notion of an ancestor:

  base case: if x is a parent of y then x is an ancestor of y
  inductive case: if x is a parent of z, and z is an ancestor of y, then x is an ancestor of y
  "only things that can be shown to be ancestors of y on the basis of a finite number of applications of the first two cases are ancestors of y"

- This is a so-called implicit definition, because it doesn't have the form "x is an ancestor of y iff ---". But there is a familiar way of turning this into an explicit definition:

  x is an ancestor of y $=_{df}$ x is a member of every set, S, such that:

  i) y is in S
  ii) S is closed under parenthood (i.e. if z is in S, then so are all of z's parents)

- This is really neato, but uses sets. Goodman and Quine point out you can get something like this with mereology:

  x is an ancestor of y $=_{df}$ x is part of every whole, z, such that:

  i) y is part of z
  ii) z is mereologically closed under parenthood (i.e. if w is part of z then so are all of w's parents)

  AND

x is a parent and y is a parent

- we need the last bit because otherwise parts of ancestors would be ancestors: take any whole that contains y and is closed under parenthood. It will contain all of y's ancestors; but it will also contain their heads, toes, etc. The head of an ancestor would therefore satisfy the definition, if it weren't for the requirement that x be a parent.

- But now note if cells that beget cells count as being parents then the definition doesn't work.

- Note that here plural quantification would be of some value. The following definition has no such limitations:

x is an ancestor of y $=_{df}$ x is one of every *X*s such that:

i) y is one of the *X*s, and
ii) the *X*s are closed under parenthood (i.e., if z is one of the *X*s, then so are each of z's parents)

I. **Same F as (Lewis)**

- this is adapted from a case Lewis considers. Suppose there are 3 pears, 2 bananas and 4 oranges in the bowl. We might say: "there are three fruits in the bowl", or maybe "there are three types of fruit in the bowl".

- How will this be paraphrased? By i) introducing an equivalence-predicate 'same-fruit-as', and ii) symbolizing the sentence exactly as we symbolized "there are three Fs" above, except that we replace each occurrence of '=' with 'same-fruit-as'.

- By equivalence-predicate I mean a predicate over individuals for which reflexivity, transitivity and symmetry hold, in the obvious senses.

- this seems fine; the only tricky question then is explaining how we know that, e.g., "if x is an orange and y is same-fruit-as x then y is an orange". If same-fruit-as meant "has the same fruit property as" then we can work this out directly, so long as we know that orange is a fruit property. But the predicates are both primitive for the nominalist.

- Lewis then uses this device of introducing same-F-as for purposes of counting to solve other problems. His example is holes. He (well, Argle) wants to identify a hole with a hole lining. But there's no *one* whole lining to pick. How then will there be exactly *one* hole in this piece of cheese? The answer will be that this sentence turns out true given the relevant understanding of 'same hole as'.

J. **Mathematics**

- Goodman and Quine go on to give a very interesting discussion of giving a nominalistic reconstruction of syntax. This is very important because they succeed in giving nominalistic reconstructions of the notion of one formula being a proof-theoretic consequence of another. So at least they can give some reconstruction of what mathematicians are up to when they're doing proofs, even if they can't regard what the mathematicians are saying as true.

- They first regard all formulas as being concrete: inscriptions. *Not* types, as is usual in syntax.

- Let the language include parentheses, variables v, v′, v′′, etc., ∈, | (for alternate denial).

- There is no such thing as *the* symbol ∈. Rather there are many inscriptions of ∈. So we need a predicate "Ep x", meaning that x is an epsilon. Similarly for "Vee x" — x is a vee (inscription of 'v'), etc.

- They then develop predicates for concatenation, for grammar (being a formula (inscription)), being an axiom, being a theorem, etc. The details are very interesting.

  - It's interesting that they don't do it by the mereological way of doing recursive definitions, because they worry that there may not be enough inscriptions. (116, note 14). Rather they have a trick of quasi-formulas (116). I wonder whether they're remembering that they're counting inscriptions that don't contrast with their surroundings.

  - They do use the Bit trick on p. 114. But for them, many characters will contain characters as parts (given that a character need not contrast with its surroundings). Will that matter?

- they go on to claim:

> The gains which seem to have accrued to natural science from the use of mathematical formulas do not imply that those formulas are true statements. No on, not even the hardiest pragmatist, is likely to regard the beads of an abacus as true; and our position is that the formulas of platonistic mathematics are, like the beads of an abacus, convenient computational aids which need involve no question of truth. What is meaningful and true in the case of platonistic mathematics as in the case of the abacus is not the apparatus itself, but only the description of it: the rules by which it is constructed and run. These rules we do understand, in the strict sense that we can express them in purely nominalistic language. (Goodman and Quine, p. 122).

- this is their instrumentalism. But note they have no good story about why mathematics is so useful even though it's not true.

ARMSTRONG'S OBJECTIONS TO TRANSCENDENT UNIVERSALS

I. Why believe in transcendent universals?

A. Meanings?

- Armstrong has already renounced this theory of meaning
- though we do have Lewis's argument that theory of meaning looks ugly if we don't have properties around in some form or other.

B. Tooley: Laws governing uninstantiated quantities

II. Worries about instantiation

A. Participation?

B. Imitation?

C. Primitive?

- better be this: the first two are no good

D. Parthood?

- it's worth thinking about whether there could be a purely mereological definition of instantiation.
- if there were, then we get out of the problem of saying what instantiation amounts to.
- moreover, it might be thought that we have an argument for immanent universals then. For immanent universals would allow a mereological definition of instantiation whereas transcendent universals would not.
- but why would the mereological definition be any easier in one case but not the other — recall my worries about the depth of the difference between immanent and transcendent universals.

- At any rate, let's look at definability. We can't say "*x* instantiates *U* iff *U* is part of *x*", because that would mean that I have the property <u>being an electron</u>.
- We can't say "*x* instantiates *U* iff *U* is part of *x* and *U* occupies a region of space identical to that region occupied by *x*" because i) how will this work

in non-spatial worlds?, and ii) how will this work in worlds where things have parts as spatially big as they?

- So it looks like even Armstrong needs to take 'instantiates' as a primitive. So there's no argument for immanence as opposed to transcendence here.

III. **Relation regress**

- we've seen this before. Suppose a is red. Then a instantiates redness. But this must be analyzed: a, redness, and instantiation must stand in another instantiation′, which must be different from instantiation on pain of circularity. Regress looms.

- note that nowhere in this argument did transcendence play a role. So exactly the same argument works against Armstrong.

- Probably we should follow Lewis and conclude that the goal of analyzing all predication was a bad one to begin with.

IV. **Duplication argument**

Suppose that a and b have quite different properties. According to the theory of transcendent Forms they are in themselves exactly the same. Their only differences lie in their relational properties: their relations to a different set of Forms. But may there not be a difference of nature in a and b, beyond mere numerical difference? Yet this difference the theory of Forms could not account for. (Armstrong, p. 69)

- There is something to this argument: transcendent universals make all properties extrinsic.

- note that it is only the thick particulars that have their properties intrinsically, in Armstrong's sense of 'intrinsic'. Thin particulars don't contain their properties as parts.

- And now notice that this all is true whether universals are immanent or transcendent!

- OK, what will be the response? Presumably it will be that we can recapture *a* distinction between intrinsic and extrinsic properties, even if properties are not parts of their instances.

- it's an interesting question whether this satisfies intuition.

- one final point: one is sometimes tempted to read Armstrong as claiming that it is easier for universals to "do their thing" if they're spatially right slap up against the particulars. But that's silly.

V. **Causal argument**

- people often claim that it's unreasonable to postulate abstracta since they are causally inert. E.g., numbers. Sometimes the argument is that since a causal theory of knowledge is true, we couldn't know anything about them; sometimes the idea doesn't appeal to a causal theory of knowledge but rather a principle about posits, that we only have reason to posit causally efficacious things.

- Armstrong applies this sort of argument to transcendent universals.

- But in what sense are they causally inert? They're involved in causal transactions just as much as are particulars, apparently, since what gets caused and does causing are objects having properties.

BEALER'S ARGUMENT FOR UNIVERSALS

I. Bealer's premises

A. 'Necessary', 'possible', etc., are predicates, or predicate-like

- This means in essence that you can quantify into their scopes, such that the variable is a "singular term"; this, in turn, means that those variables have ranges of values.

- the evidence for this claim is the validity of arguments like the following:

  Anything necessary is true
  Anything true is possible
  ____
  Anything necessary is possible

- only if the 'necessary', 'possible' and 'true' are predicates could its validity explained in the following straightforward way: it has the form:

  $\forall x\ (Nx \rightarrow Tx)$
  $\forall x\ (Tx \rightarrow Px)$
  ____
  $\forall x\ (Nx \rightarrow Px)$

- Something I'm confused about. He says in note 8 (p. 8) that prosententialists deny this premise since sentences like these, e.g., the conclusion, would be represented as: "$\forall p(\Box p \rightarrow \Diamond p)$". Here *p* is a quantified variable but it doesn't have a range, and so isn't a singular term. On the other hand, the 2nd orderist also regards this same symbolization as correct; however, this is *not* incompatible with the premise, I suppose because '*p*' is regarded by her as a singular term and therefore having propositions or sets or whatever in its range. I need to be clearer about what the prosententialist says. Look at this later, when we see what the argument's premises are used to do.

B. That-clauses are singular terms

- this is plausible because of the validity of the following argument:

  Everything true is possible

It is true that snow is white
____
It is possible that snow is white

- a bit of notation. Where A is a sentence, we will use ⌜[A]⌝ for the that-clause ⌜that A⌝.

C. **You can quantify into that-clauses**

- because this is valid:

Whatever is true is possible
$\forall y$ (it is true that y=y)
____
$\forall y$ (it is possible that y=y)

D. **An atomic intensional sentence F[A] is true iff [A] denotes something to which F applies**

- what alternate conceptions might one have?

1. **Sentential operator approach**: "F-ly A" has non-referential truth conditions; "F[A]" is then true iff "F-ly A" is

   - complaint: we don't have a *general* theory of sentences of the form "F[A]"; we just have theories of these sentences for particular choices of 'F'.

   - so what?

   - complaint: consider the following argument:

Leibniz's Law is necessary
Leibniz's Law is that identicals are indiscernible
____
Therefore, it is necessary that identicals are indiscernible

- first of all, how will this approach account for the first premise? "Necessarily, Leibniz's Law" doesn't seem to make any sense. They will need to introduce some alternate semantics for these cases.

- But then the argument's validity will be inexplicable, since the old truth conditions hold for the conclusion.

2. **F[A] is true iff this sentence is "backed" by our beliefs, just as our beliefs "back" the sentence 'Apollo is the sun god'**

- objection: our beliefs are recursively enumerable, whereas the sentences of the form □A are not

- What exactly is this argument? Why think that just because our beliefs are recursively enumerable, the things that are backed by them must be recursively enumerable?

  - if "backed" meant "first-order entailed by" I could see why. For it's a fact that for any recursive set, Γ, the set of Γ's first-order entailments is recursively enumerable. (S is entailed by Γ iff there's a valid sentence A→S, where A is a finite conjunction of sentences of Γ. So just start producing such sentences and run and run more steps of a positive validity machine on those sentences.)

  - But what if "backed" means "second-order entailed by"? Then this won't go through. The set of second-order consequences of a recursive set needn't be recursive.

  - and anyway, "backed-by" doesn't mean "entailed by", surely. The relevant beliefs, in the case of Apollo, are probably beliefs about what is true according to certain stories.

  - no doubt this theory is false, and for reasons in the neighborhood, but it is hard to evaluate it before we are told what "backed" means.

- I would object to the proposal in a different way. If it is to circumvent the problems for sententialism, it must give uniform truth conditions for both “F[A]” and “F*t*”. But then, *if* the terms [A] and *t* denote, the proposal isn’t really denying the premise: it just is giving a strange account of the application conditions for ‘F’. On the other hand, if the terms *don’t* denote, then we can give the objection to sententialism: the proposal doesn’t account for the validity of:

Leibniz’s Law is necessary
Leibniz’s Law is that identicals are indiscernible

Therefore, it is necessary that identicals are indiscernible

II. The argument

- Given the premises above, Bealer claims that the following is a logical truth:

(4) $F[A] \leftrightarrow \exists x\, (x=[A]\ \&\ Fx)$

- So, the following ought to be true:

(*) $\Box\, F[A] \leftrightarrow \Box\, \exists x\, (x=[A]\ \&\ Fx)$

- (This inference isn’t generally OK, if Kaplan is right that “P iff Actually(P)” is a logical truth. But never mind. (Unless someone can make a plausible argument that the expression “[A]” somehow introduces something like actuality.))

- If nominalism is true, then in many cases, the left hand side will be true while the right hand side is false. Let A= $\forall y\ y=y$; let F= “is possible”. The right hand side is false here because the nominalist will identify [A] with a sentence; but it’s not necessarily true that there exist sentences.

III. Scope complications

- matters aren’t quite so straightforward. Bealer worries that the nominalist might play around with different possible scopes for the singular term “[A]”. Apparently his thinking is this. The above argument successfully shows that when “[A]” has narrow scope, then the LHS is indeed false, if nominalism is true. But the nominalist could accept this conclusion, and claim that in *English*, terms like [A] are usually taken to have wide scope relative to modal operators. But suppose we take [A] to have wide scope in both the LHS and the RHS of (*). Then the RHS is

$\exists x\ (x=[A]\ \&\ \Box Fx)$

- But this is unproblematic; not false. So it wouldn't imply that the resulting LHS is false.

- Bealer goes on to say that this won't work in other cases. Start with the sentence:

$\Box\ \forall y\ \text{Poss}\ [y=y]$

- If you take [$y=y$] in this narrow scope, then by running his argument, he says, you can show this is false, if nominalism is true.[1] That's because you'll get a biconditional of which the RHS is:

$\Box\ \forall y\ \exists x\ (x = [y=y]\ \&\ \text{Poss}\ x)$

which implies that it is necessary that for every y, [$y=y$] exists. But it won't, if nominalism is true.

- so the nominalist must take [$y=y$] wide scope. But what will the wide scope version of the RHS be? It can't be:

$\exists x(\ x = [y=y]\ \&\ \Box\ \forall y\ \text{Poss}\ y)$

because that is nonsense.

- We'll need to take it some other way. Suppose we introduce Act_i and Ref_i operators. Then we could write:

$\text{Ref}_1\ \Box\ \text{Ref}_2\ \forall y\ \text{Act}_1\ \exists x\ \text{Act}_2\ (x = [y=y]\ \&\ \text{Poss}\ y)$

- But what would the x be? Could it be an actual sentence like 'Joe = Joe'? No, for what would make it be [$y=y$] in the world in question? The name 'Joe' doesn't name actually, but it would have to name y in the world in question.

- Could x be a definite description? No - consider symmetric worlds; no definite description would pick out one rather than the other.

[1] You can do it, though it isn't precisely parallel to the earlier case.

IV. **A worry**

- I worry Bealer goes too fast with this response to the scope move. His original argument is that (4) is a logical truth, so you can add a □ to each side and get a truth. He then considers various scope possibilities for the right and left-hand sides. But it may be that those readings are no longer supported by a logical truth. What we need to do is be very careful about what (4) amounts to, and then see whether an appropriate biconditional can then be defended.

- To make this clear, let's treat [A] as a definite description. So we'll convert [A] into a predicate, and replace the old singular term with "the *y*: [A]*y*". And we won't engage in the bogus practice of claiming that an ambiguous sentence is a logical truth; rather, we will disambiguate the relevant sentences and separately modalize the results.

- so, the first way to take (4) is letting both occurrences of [A] have narrow scope:

  (4′) the y: [A]y Fy $\leftrightarrow$ $\exists x$ the y: [A]y (x=y & Fx)

- This is indeed a logical truth. So putting a □ on the LHS and the RHS gives a truth; the resulting RHS is false (as Bealer argues), so the resulting LHS is false. But the nominalist can still say that in a typical utterance of "□ F[A]", the [A] has wide scope; i.e., it means: the *y*: [A]*y* □F*y*. So we need to see whether *this* can be shown to be false.

- What version of (4) could we use? We might try letting [A] have wide scope in (4):

  (4") the y: [A]y (Fy $\leftrightarrow$ $\exists x$ (x=y & Fx))

  This isn't a logical truth, since it implies the existence of an [A].

- We might try this:

  $\exists!y$ [A]y $\rightarrow$ (4")

  which does seem to be a logical truth. ("$\exists!y$ Gy" means that there is a unique G.) But this formula is not a biconditional, so we can't modalize both sides of any biconditional as Bealer's argument requires.

- The general criticism is that we haven't been given a biconditional that is a logical truth, such that we can add a □ to each side to refute the wide-scope reading of "□ F[A]". After all, that wide-scope reading is: "the *y*: [A]*y* □F*y*"; but since this isn't a □ statement, it can't be the LHS of a biconditional that results from adding a □ to both sides of a biconditional that is a logical truth.

ONTOLOGICAL COMMITMENT AND META-ONTOLOGY

I. Van Inwagen's Quinean theses

- PvI does a pretty good job of capturing the core of Quine's conception of existence, though I have some doubts about what he says about ontological commitment.

- some of these are pretty vague and/or hard to pin down, but maybe that's to be expected given the subject matter.

A. Being is not an activity

- cf. Austin's "metaphysical ticking"
- the contrast, I guess, is with existentialists, who say that different sorts of things have different sorts of being. Of course PvI agrees that different things have different properties.

B. Being is the same as existence

- the contrast is with Meinong.

C. Being is univocal

- this is crucial. As with the first thesis, PvI grants that there are different sorts of things. But they don't have different sorts of being (and therefore don't have different sorts of existence).

- PvI gives an argument for this. Number words are univocal. (We can say that the number of my cats = the number of great ideas Plato had.) Number is intimately connected to existence. Therefore, existence is univocal.

- This would certainly not convince someone like Carnap. (Maybe sketch Carnap, or Putnam. Illustrate with mereology.)

D. The single sense of being or existence is adequately captured by the

existential quantifier of formal logic

- the contrast is brought out by someone van Inwagen regards as his opponent. (Unfortunately he doesn't cite anyone.)

  Truth-conditions for quantified statements can be given without raising the question whether the objects in the domain of quantification exist. Therefore, quantification has nothing to do with existence. The term "the existential quantifier" is, in fact, a misnomer. We ought to call it something else — perhaps "the particular quantifier". (pp. 237-238).

- perhaps the truth-conditions this person has in mind are substitutional.

- to oppose this person, van Inwagen shows how to regard the quantified sentences of logic as abbreviations for English sentences.

- why did van Inwagen say "*the* existential quantifier of formal logic"? One *could* give a semantics in which '∃' has substitutional truth conditions. And one can also interpret the sentences of formal logic as abbreviating sentences of English. So there is no *the* existential quantifier of formal logic. So the thesis, as stated, is pointless.

E. **Ontological commitment**

- the fifth thesis is just a recommendation for how to conduct ontological debate. The best way to do this is to get the person to regiment their sentences to make their structure clear. This will draw out the person's ontological commitments. Forces driving this will include bringing out the logical relationships between different sentences, and the like.

- PvI claims that Quine does *not* supply any algorithm or thesis as to how to draw out the ontological commitments of a theory, as if that were a pre-existing set of claims one could aspire to discover.

- the reason PvI thinks this is that there's no mechanical way to regiment a theory. Moreover, the very sorts of issues that are in dispute — ontological issues — will be relevant to the question of how to regiment the theory.

- I think PvI is leaving out part of Quine's theory. That is the bit that focuses on existential quantification rather than predicates and names as the means of ontological commitment.

- take someone who doesn't use quantifiers, but uses Russellian names. Perhaps that person is ontologically committed to their referents.
- Some realists will disagree with Quine that predicates don't ontologically commit. (Though others might be happy to accept Quine's criterion, and then show that realism wins anyway.)

II. Alston's challenge

A. Target: paraphrase as a way of eliminating ontological commitment

- this is familiar. Alston lists some examples:

1. There is a possibility that James will come
2. The statement that James will come is not certainly false

3. There is a meaning which can be given to his remarks
4. His remarks can be understood in a certain way

5. There are many virtues which he lacks
6. He might conceivably be much more virtuous than he is

7. There are facts which render your position untenable
8. Your position is untenable in the light of the evidence

B. Synonymy is a two-way street

- the main point is this. If 1 and 2 mean the same thing, then they mean the same thing. So if 1 is objectionable in virtue of committing us to abstract entities, then 2 is as well.

- of course, we could reply that 2 does not commit us to abstract entities, therefore neither does 1

- This leaves us with the burden of breaking the symmetry. Which sentence *really* gives our ontological commitments?

C. Not a problem for a replacement conception of paraphrase

- suppose we do *not* regard Quinean paraphrases as being synonymous with the originals. Then the problem goes away. In each couplet, the first has ontological commitments the second lacks.

D. A conception of meaning

- suppose we could make out a sense in which 2 wears its logical form on its sleeve more than 1.

- then we could say that true ontological commitments are given by sentences that wear their logical forms on their sleeves.

- we could flesh this out by appeal to a theory of meaning. (Lewis, New Work, Putnam's paradox.)

- Given this theory, we can explain the idea of a sentence's having "devious" truth conditions. Illustrate with 'contact', and with 'there is a possible world in which a donkey talks'.

- sometimes a sentence has weakly devious truth conditions, which are devious with respect to predicate or name meaning, but leave the quantificational structure intact. These still would give ontological commitments, but the nature of the objects to which you are committed might not be as bad as you might have thought.

- If 2 gives the truth conditions of 1, then 2 is strongly devious since it appears to be a existential quantification but its truth conditions are not existential. Then it does not ontologically commit.

- How has Alston been answered? The symmetry of synonymy has been broken by the notion of the syntax of a sentence reflecting its truth conditions.

- (Russell had a somewhat similar notion of logical form.)

E. Strict and loose truth

- another possibility would be to say that 1 is only loosely true, while 2 is strictly true. Ontological commitments are given by strictly true things, not loosely true things.

- this seems to me to be a kind of unhappy vague middle ground between replacement and devious truth conditions. Or maybe it's just ambiguous between those two. Better to take one of those other lines.

III. Carnap on internal and external questions

A. Deflationism about ontology

- we now encounter one of the big challenges to the enterprise of ontology. Some people say that it doesn't make sense to argue about ontology. There are various ways of making this out, but the basic idea is to claim that existence-claims are no big deal. If you want to talk the numbers-talk, or the propositions-talk, or whatever, that's fine. Are there *really* any numbers or propositions? Somehow this is a pseudo-question.

    - Yablo does a good job of making this line look plausible in the beginning of "Does ontology rest on a mistake?"

- Note that *some* claims of existence are admitted by everyone to be perfectly legitimate. Platypuses exist; unicorns do not. So the onus is on the deflationist to demarcate the legitimate existence claims from the rest.

- Carnap gives the classic account of this deflationary perspective on ontology. His account presupposes logical positivism. There may be ways to do this without being a positivist, but it's best to start with Carnap.

B. Logical positivism

- we should remind ourselves of just what this program is:

1. **Goal: reject metaphysics while preserving science**

2. **The meaning of an empirical sentence is its empirical verification conditions**

    - so metaphysics fails

3. Logic and mathematics are analytic

- what about logic and mathematics? Those sentences were claimed to be true because they were empty of empirical significance; they were true by convention. (Some said they weren't even true; they just "expressed" the conventions.)

4. A sentence is meaningful only if it is empirical, analytic, or analytically false

C. Internal vs. External questions

> If someone wishes to speak in his language about a new kind of entities, he has to introduce a system of new ways of speaking, subject to new rules; we shall call this procedure the construction of a linguistic *framework* for the new entities in question. And now we must distinguish two kinds of questions of existence: first, questions of the existence of certain entities of the new kind *within the framework*; we call them *internal questions*; and second, questions concerning the existence or reality *of the system of entities as a whole*, called *external questions*. (P. 206)

> Let us consider as an example the simplest kind of entities dealt with in the everyday language: the spatio-temporally ordered system of observable things and events. Once we have accepted the thing language with its framework for things, we can raise and answer internal questions, e.g., "is there a white piece of paper on my desk?", "Did King Arthur actually live?", "Are unicorns and centaurs real or merely imaginary?", and the like. These questions are to be answered by empirical investigations. Results of observations are evaluated according to certain rules as confirming or disconfirming evidence for possible answers. (pp. 206-207)

- But for external questions, the linguistic framework itself contains no rules for empirical verification:

> To be real in the scientific sense means to be an element of the system; hence this concept cannot be meaningfully applied to the system itself. (P. 207)

- note that the internal/external distinction doesn't match up exactly with the general/particular distinction among existence statements. The question "is there *really* a prime number between 100 and 200" has an interpretation on which it is an external question. But some questions, e.g., "are there numbers?" are most naturally taken to be external questions since they would be so silly, taken as internal questions.

D. **Choice of a framework**

- Carnap admits that sometimes there are pragmatic considerations that favor one framework over another.

- but these, he says, aren't "theoretical" questions — i.e., there is no belief associated with adapting one framework, and those using different frameworks don't disagree about anything.

- So again, external questions don't turn sensible. An external question might be taken as a question of which framework to use, but this is just a pragmatic question, not a theoretical one.

- <u>A natural way to view Carnap is to regard the choice of a framework as specifying the meanings of the terms one is using. And of course one can decide to mean whatever one wishes by one's words.</u>

- The frameworks provide an association of verification conditions with each sentence. These verification conditions are the meanings of the sentences, according to positivism.

E. **Mathematics**

- things are a bit more complicated here since the framework doesn't assign verification conditions to mathematical sentences. Rather, the framework provides definitions or linguistic rules in virtue of which sentences are analytic.

- an internal question will be a question about what is analytic. E.g., "there is a prime number greater than one million"

- But just as before, external questions will not be settled by the linguistic rules.

F. **Standard critique of positivism**

- nearly everyone concluded in the 50s that positivism was unacceptable. Here are some of the reasons

1. **Self-refuting problem**

2. Getting the criterion right

- early positivists tried *translating* sentences about scientific entities into sentences about experience (phenomenalism), but that didn't work out.

- So then they tried to just say that a non-analytic sentence must have verification conditions to be meaningful, even if it isn't translatable into statements about observation.

- But it turned out to be very difficult to get this stated correctly, so that metaphysics was out and science was in.

- in a very simplified form, here was the problem. To be meaningful, a sentence was supposed to be verifiable. But you can't verify a sentence about electrons on its own. You only test it out by combining it with all sorts of other background stuff. The background stuff is a bridge between the theoretical statement and statements about observables.

- but even for metaphysical statements, there may well be bridge statements the metaphysician would accept relating these metaphysical statements to observables. (Hempel in Martinich is a good paper to read on this sort of problem.)

3. Quine against analytic/synthetic

- There are various parts to Quine's critique:

- First, Quine had a big influential critique of truth by convention that challenged the positivists' claim that mathematics and logic are true by convention. The core of the critique was that when you define something, you don't create new truths but rather transform old ones.

- Second, in "Two Dogmas" Quine argued that there was no clean or sensible distinction between analytic and synthetic truths.
    - part of the argument was that it's hard to non-circularly define 'analytic'. BFD.
    - another part of the critique is that there are hard cases in which it isn't clear whether a sentence is

analytic. Again, BFD. Just because there are hard cases (or even indeterminate cases) doesn't mean there aren't clear cases.

- So the positivists cannot say that mathematics is analytic
- must they say that mathematics is empirically confirmable, then? Read on...

- Third, and relatedly, in "Two Dogmas" Quine argued against the positivists' claim that each empirical statement could be associated with a unique set of verification conditions.
    - The reason is *confirmation holism*: whenever you allegedly falsify an empirical statement, there's all sorts of background assumptions one is making, and there's no way to localize a single hypothesis for testing on its own.
    - so if meaning is verification, as the positivists wanted to say, what has meaning is the entirety of science: meaning holism results (bits of language don't have meaning on their own)
    - that means that mathematics is confirmable in just the same sense as is everything else in science. (Maybe it is "further away from the periphery of science", in the metaphor at the end of "Two Dogmas".)
        - note that this only affects someone accepting a verification theory of meaning.

IV. Internal/external in light of Quine vs. Carnap

- how exactly does this all impact Carnap?

A. Does Carnap presuppose analytic/synthetic?

- First and foremost, we need to focus on why Carnap was free to be so tolerant about different linguistic frameworks. The reason is that these are just decisions about what language to speak.

    - as Yablo puts it, the internal/external distinction presupposes the notion of a framework that can be freely chosen. And frameworks consist of analytic rules of language use

- But if Quine is right, then no questions are more conventional than others.

- note that Quine himself remains a bit of a pragmatist; he says at the end of

"Two Dogmas" that he agrees with Carnap that there is a conventional element to adopting one ontology over another, but he says that this is just the conventional or pragmatic element present *everywhere* in theory choice.

B. **Does Carnap presuppose positivism?**

- notice further that Carnap needs more than just the analytic/synthetic distinction to defend the internal/external distinction. Suppose Quine is wrong in jettisoning analytic/synthetic. Still, it is far from clear that there can be analytic rules like this:

  If — then $\exists x\ Fx$

  Carnap's positivism does some work here, by claiming that *all* meaning is verification conditions; and there's no reason why existential sentences can't have any old verification conditions we like.

  - or wait: is there a further worry here for Carnap? Perhaps we could complain that there are some verification conditions that wouldn't look "existencey"?
  - My guess is that Carnap might respond that the only legimate notion of a "existencey" meaning would be inferential role, and that's not under dispute.
  - the only way I can see to introduce a more robust sense of "existencey" is my domain **D**, which Carnap obviously would not accept.

C. **Two challenges for non-verificationist no-conflict views**

- any such view needs to introduce multiple meanings for "there is", without assuming verificationism. Here are the challenges:

1. **Avoiding mere restricted quantification**

   - then it would seem that the more permissive ontologist has won, since the less permissive one is just ignoring some things

2. **Our usual model for coming up with multiple meanings doesn't fit**

- we can clearly decide what things predicates will apply to; we can decide the meaning of ‘F’. But it still seems “up to the world” where there is something that satisfies the meaning.

  - why are we free to make this decision? A natural story is that there exist a number of candidate meanings (abundant conception of properties) and we just select one of them to be meant.

  - it is an interesting question how to put this if you don’t believe in properties.

- so: one model we understand quite well — giving nec and suf conditions for a certain expression’s applying to something — is only applicable in the case of predicates.

- another way in which disagreements in ontology are special: *usually*, both sides of disputes can recognize the semantic value of the other side, but not in ontology.

V. Non-verificationist no-conflict views

A. Hirsch

- suppose each side does not supply semantic values for ‘∃’, but rather gives truth conditions. This is what Hirsch does:

> If I start out with the anti-mereologist’s stance, what exactly is involved in changing the meaning of the quantifier with the effect of making the mereologist’s sentences come out true? . . . In general, we explain the meaning of a logical constant by describing the role it plays in determining the truth-conditions of sentences. Thus we explain the meaning of “and” by saying that sentences of the form “p and q” are true if and only if both the sentence “p” and the sentence “q” are true. If we were to explain some imagined change in the meaning of “and” we would do so by describing a change in the truth-conditions of sentences containing “and.” Analogously, we explain the relevant change in the meaning of the quantifier, which will render the mereologist’s sentences true, roughly as follows: In the new meaning, any sentence of the form “There exists something composed of the F-thing and the G-thing” is true if the expression “the F-thing” refers to something and the expression “the G-thing” refers to something. (Hirsch, pp. 5-6)

- as Hirsch notes, this is explaining one meaning of ‘exists’ in terms of the other. And that’s ok. I think he’s right in this.

  - note that it is the more *restrictive* meaning that is needed to explain the less restrictive meaning. That's good, because at least the less restrictive person can admit that sentences like "atom A exists" are true, and hence each side can be using their own meaning in the definition of the more restrictive meaning. Thus, this definition can take place "in neutral territory".

- Note that all Hirsch is doing is showing that two meanings *can* be introduced. He also seems to be claiming that neither is a *better* meaning than the other. He does *not* think that 'exists' is ambiguous in English. He thinks that the mereologist *and* the nihilist are flat-out wrong about English.

- But now, by way of criticism: if we change the conditions under which '$\exists x$' is true, for example saying '$\exists x\, Fx$' is true if Quine says there exists an F, then we will have changed the subject. Why think that Hirsch's definition is any better?

- relatedly: if we give '$\exists$' Hirsch's truth conditions, why shouldn't we just regard '$\exists$x(x is composed of y and z)' as just meaning that y and z exist?

- Hirsch needs to resist the idea that of alternate meanings for '$\exists$', all but one of them are changing the subject. Somehow, there are multiple meanings that all count as *kinds of quantification*. But that is just not explained.

- Also, the comparison with 'and' isn't so good for Hirsch. There just doesn't seem to be anything else in the neighborhood one *could* mean by 'and'. Give other truth conditions and you've simply made 'and' mean something entirely different.

- is the following a problem for Hirsch? There's no *neutral* language from which to state THE FACTS, and in which all other meanings can be stated.

    - is this true? Think about whether the minimal language would count. But maybe gunk is a problem.

- relatedly, there will be magical correspondences between the languages. Say that something is a natural property or relation in one. Then something analogous will be natural in another. But there won't be any way of explaining this correspondence.

- one final point: if you could make out a sense in which one of the quantifier meanings was *best*, then even if you admitted they all count as *quantifier* meanings, there would still be a point to ontology.

B. **Yablo**

- Yablo says that Carnap doesn't really need analytic/synthetic. Here's one thing he does *not* mean: Consider two frameworks, F_1 and F_2, with notions of existence $\exists_1$ and $\exists_2$. Carnap's thought presumably was that the following are analytic:

  If ϕ then $\exists_1 xFx$
  If ψ then $\exists_2 xFx$

  and define the meanings of $\exists_1$ and $\exists_2$ in their respective contexts. Yablo's point is *not*: there's no need for these conditionals to be analytic; they simply need to be true. Or even more cautiously, all that needs to be the case is that there need to be two notions, $\exists_1$ and $\exists_2$, with different true principles governing their application.

- I suspect this is not right because even acknowledging this kind of talk about meanings seems to be admitting analyticity.

1. **Frameworks are games for make-believe**

   - no - Yablo's view is different: he says just make frameworks things in which you're not speaking the truth; you're just "putting forward" metaphors. So

   - on this view, you can't be cavalier about what existence-claims are *true*, and so you can't be cavalier about what you *assert*, though you can be cavalier about what existence-claims you "put forward".

   - he then points out that while Quine doesn't allow an analytic-synthetic distinction, he *does* apparently allow a distinction between literal and non-literal understandings of sentences.

2. **The Neo-Quinean critique of the literal/non-literal distinction**

- But Yablo then argues that one could make the case that there really is no such distinction. The argument would be like Quine's argument against the analytic-synthetic distinction.

    - One of the main arguments is that just as you can never say in advance whether a supposedly analytic will one day be given up, similarly you can't decide in advance whether a sentence will be interpreted metaphorically or literally. You "defer to posterity".

    - As with the analogous Quinean argument, I don't see why this succeeds. Suppose we *grant* deferring to posterity. Still, it is being admitted that we have contributed a certain tendency to be interpreted in certain ways. There may be cases which tend very much to be interpreted metaphorically, and others that tend very much to be interpreted literally. Moreover, nothing in this argument rules out the sense of *stipulating* that an utterance be understood literally, with no deferring. (Compare taking 'contact' and simply stipulating that no deference will take place.)

3. **Who wins?**

- suppose Yablo's neo-Quinean critique is right. So what?

- Yablo suggests that the project of Quinean ontology is in trouble.

- This seems to me just backwards. If the Quinean critique of analytic/synthetic was on Quine's side, not Carnap's, shouldn't the neo-Quinean critique of metaphorical/figurative be on Quine's side, not neo-Carnap's?

- Here is what Yablo says:

> The goal of philosophical ontology is to determine what really exists. Leave out the 'really' and there's no philosophy; the ordinary judgment that there exists a city called Chicago stands unopposed. But 'really' is a device for shrugging off pretenses . . . (Yablo, p. 258).

- But if we can't tell the metaphorical from the non-metaphorical, then there are no such things as frameworks anymore, so we should take all existence-claims equally seriously. No existence claims are "for free"; each is as heavy-duty as the rest. This is a victory for Quine, not Carnap!

- Yablo says that without 'really', the ordinary judgment that there exists a city called Chicago stands unopposed. But it IS opposed: by whatever Occamist spirit originally motivated us to shrink our ontology as much as possible.

- Similarly, the ordinary judgment that there is a way to win the chess match is opposed: by our failure to see, touch or smell ways, and the failure of ways to be integrated into a good theory of anything.

- If we really must give up on anything like "really", then we have a tough choice facing us: either it's not OK to go on saying "there is a way to win the chess match", or there are ways, in the only sense of 'there are' available.

- Granted, the Quine that emerges can no longer be so carefree about engaging in "loose talk" about ways, propositions, etc.!

4. **Truth still matters**

- even if frameworks were cashed out in Yablo's way, there would still be interesting questions about what is *true*. So I think for a Carnapian to claim total victory, multiple meanings for '∃' must be provided.

C. **Eligibility and the univocality of existence**

- suppose we agree that our objections to Hirsch were good. Still, the no-conflict folks can challenge the defenders of ontology as follows. *If* disputing ontologists mean different things by '∃' then they're talking past each other. But what would prevent them from meaning different things? (Especially given that their apparently different "beliefs" almost look definitional of '∃'.) Presumably, only the non-existence of multiple meanings for the quantifier. But how could it be that there's only one meaning for the quantifier?

- that's what I'm trying to sketch in the intro to my book. It's not really an argument for the correctness of the conflict position; it is only a model of how one could defend that position.

VI. Melia on what there isn't

- He says you should not always believe in what your best theory says, if you have reason to think there is a better theory that includes fewer ontological commitments.

- e.g., if your theory say that the average star has 2.4 satellites, but you know there's a better theory that says, e.g., there are 2400 satellites and 1000 stars, or perhaps it says that there are 24000 satellites and 10000 stars. This is an example of an "intrinsic theory". Field's non-numerical intrinsic theories are also examples.

A. Worry 1: are you sure that there *exists* a better theory?

- What are theories? (This seems shallow to me, though I'm not completely sure why.)

B. Worry 2: are you sure this theory is *better*?

- Maybe there is some explanatory virtue lost?

C. Worry 3: are you sure that *this* theory is better?

- What about the infinitary theory you can't write down, which disjoins the theories over which you're agnostic. That, too, is a better theory that's not available to you, not because of ignorance but because of finitude. Maybe it doesn't exist? Does that matter? If it does matter, wouldn't it matter whether the theory *Melia* thinks is better really exists?

D. What part of ontology survives?

- Point: as Melia observes at the end of the article, this doesn't circumvent all ontology. You'll need to be convinced that there really is an intrinsic theory. That can take some hard work (e.g., Field). In cases like the Jackson/Pap argument, that's not trivial. In some of the examples, the barriers to nominalistic translation weren't finitude or ignorance; they were that all the suggested paraphrases seemed to fail.

- same might be true for the argument that we need universals for our best theory of laws of nature. Right — that's not the kind of argument Melia is trying to answer.

- I don't see how Melia helps to answer Bealer.

- on the other hand, learnability worries that afflict Goodman and Quine *do* seem like the kinds of worries Melia is addressing.

FIELD'S *SCIENCE WITHOUT NUMBERS*

I. Quine's indispensability argument

- the basic idea is one we've met already:

    1. We are justified in believing in the entities to which our best theory commits us (the best theory is the one that best combines explanatory power with theoretical virtues like simplicity).
    2. Our best theory is (or contains) mathematical physics.
    3. Mathematical physics commits us to mathematical entities

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    4. Therefore, we are justified in believing in mathematical entities

- if we were doing this properly we should look at the argument in some detail. We should look at why paraphrases of mathematical physics don't work, etc. But we don't have time, so let's move directly to Field

- Field says that this is the one and only powerful argument in favor of platonism

II. Project of paraphrase

- one reaction to the argument would be to try to paraphrase mathematics so that it doesn't make reference to mathematical entities. Perhaps it is really about inscriptions, or perhaps its sentences are really modal (Putnam), or perhaps we accept if-then-ism, etc.

- this might be regarded as rejecting premise 2, or perhaps premise 3, depending on whether we regarded our paraphrase as replacing the old theory or just explaining what the old theory meant.

- Field says that these sorts of strategies don't really address the hard problem, which is how mathematics will be *applied*; at best they give paraphrases of sentences of pure mathematics.

III. Cheap instrumentalism

- an alternate response would be to say that mathematics is very useful, but that it need not be true in order to be useful. Mathematics is a tool, not a body of truths.

- this could be regarded as a rejection of premise 1 — perhaps we don't need to accept the ontology of our best theory if our best theory is regarded as a calculating device. Or maybe it's a rejection of 3: perhaps a calculating device doesn't really have an ontology.

- in a way this is what Goodman and Quine say (though they go beyond *merely* saying this by giving a nominalistic account of syntax.)

- but instrumentalism is unsatisfying if one cannot give an account of why it is that the theory is so useful.

- otherwise one is vulnerable to i) the Quinean argument that the very virtues that make a theory useful are reasons to believe it is true, and ii) the inference to the best explanation argument: perhaps the best explanation of why the theory is useful is that it is true.

IV. **Field's instrumentalism**

- Field defends a much more attractive instrumentalism (or "fictionalism"), since Field has a positive account of why mathematics is so useful. Its components:

    - Mathematics is untrue (at least the bits that assert the existence of mathematical entities).

    - mathematics is nevertheless useful since it makes it easier to infer some non-mathematical claims from others

    - it makes use of the notion of logical consequence

    - it makes use of non-finitary physical theories (e.g., theories with infinitely many spacetime points)

V. **Conservativeness**

- the basic idea here is that if you start with a nominalistic theory stated in a nominalistic language, and you add mathematics to it, you won't get anything new in the nominalistic language.

(C) Let A be any nominalistically statable assertion, and N any body of such assertions; and let S be any mathematical theory. Then A* isn't a consequence of N*+S+'∃x~Mx' unless A is a consequence of N

(C′) Let A be any nominalistically statable assertion, and N any body of such assertions. Then A* isn't a consequence of N*+S unless it is a consequence of N* alone.

(C′′) Let A be any nominalistically statable assertion. Then A* isn't a consequence of S unless it is logically true.

- The first claim is what Field calls the claim that mathematics is *conservative*. Given certain logical assumptions, (C) follows from (C′′). And (C′′) looks pretty good: no mathematical theory anyone has ever offered implies things about the non-mathematical world that aren't logical truths.

- The idea, then, is the following. Suppose we have a nominalistic theory, N, and we want to prove that a certain claim A is a consequence of N. If we know that mathematics is conservative, we can just add a mathematical theory S to N, and derive A from S+N. (More carefully, we derive A* from N*+S+'∃x~Mx'.) If we really can do this derivation, and we know mathematics is conservative, then we are assured that A really is a consequence of N alone.

- Philosophical moral: so that means that the utility of the mathematical theory, S, doesn't require its truth. It can help us deduce nominalist consequences from nominalistic theories, without being true.

- The nominalist isn't out of the woods yet. How do we know that interesting physical theories can even be formulated nominalistically, as N is here? The very statement of our theories usually requires numbers — laws, quantities, etc. are described in mathematical language.

- Field goes on to show that various theories can indeed be stated nominalistically.

VI. **Is particle physics conservative?**

- For Field, conservativeness is what's distinctive about mathematics; it's what makes it OK to be a nominalist. It's not similarly OK to disbelieve in theoretical entities in physics.

- So it had better be that physical theories are not conservative. Let's get clear why.

- So let's consider the question whether the addition of a theory, P, of particle physics to a theory, M, about macrophysical occurrences, is conservative. That is, are there macrophysical sentences, A that can be derived from P+M but which cannot be derived from M alone? Maybe it's easier to ask whether there are macrophysical sentences, A, that are not logical truths, which can be derived from P alone.

- First of all, it's obvious that if P is a "pure" theory of particle physics, in that it contains no non-logical terms from the macrophysical language, then P *will* be conservative.

    - and, of course, the same is true for mathematics: that *pure* mathematics is a conservative extension of physical theories is trivial.

    - the interesting mathematical case is that of an impure mathematical theory, that includes functions that relate mathematical and physical objects. E.g., the mass-in-grams function.

    - it is the latter mathematical theories that Field says are conservative additions to physical theories. (Does that seem right? I think so.)

- So, will an impure particle physics theory P be a conservative extension of M? No. P might, for example, contain the following sentences:

a) any piece of gold foil is made up of gold atoms
b) any gizmo of type G shoots out a beam of alpha particles in the direction it points
c) any beam of alpha particles in the direction of gold atoms will scatter in pattern P
d) Any beam of alpha particles scattered in pattern P will make an observable mark M on any detector present

These sentences imply the following sentence, which is a macroscopic sentence that is not a logical truth:

> Any gizmo of type G pointed at any piece of gold foil will result in an observable mark M on any detector present

(I'm treating 'gizmo of type G', 'detector', etc., as being macroscopic terms. If you doubt this, then you'll just need to add more sentences to P connecting these terms with genuinely macroscopic terms, e.g., 'any object of observable type O is a detector'.)

- One could argue that the mathematical theories we actually use really mix physics and mathematics. (Not just in containing both physical and mathematical terminology; I mean to be considering the view that the mathematical theories we use are, e.g., Newtonian mechanics.) Then those theories would not be conservative. So the question is whether one can separate out the mathematical from the physical. This is what Field goes on to do.

- notice that existing mathematical theories do *not* seem to be non-conservative in this way. We do not consider mathematical theories like this:

  a) there is a unique function, f, from pieces of fruit to numbers such that:
     f(x)=1 if x is an apple
     f(x)=2 if x is an orange
     f(x)=3 if x is a grapefruit
     f(x)=4 if x is any other sort of fruit
  b) for any piece of fruit, x, if f(x) is even then x is green

VII. Application 1: Arithmetic

- this is a very simple illustration of the sort of thing we can do since math is conservative.

- Let's introduce new quantifiers, $\exists_n$, $\exists_{\geq k}$. In Field's example they are new primitive quantifiers, but we could just regard them as abbreviations. These are part of the language of theory N. Note that there are no quantifiers over these "variables" 'n' and 'k'; this theory doesn't quantify over numbers.
- Theory N also has some other non-mathematical vocabulary.

- Let theory S contain arithmetic plus some set theory.

- Now suppose N contains these sentences:

  1. There are exactly twenty-one aardvarks. ($\exists_{21}x\ A(x)$)
  2. On each aardvark there are exactly three bugs
  3. Each bug is on exactly one aardvark

- and suppose we want to know whether the following sentence is a consequence of N:

4. There are exactly sixty-three bugs.

- In fact, 4 *is* a consequence of 1-3. However, working this out by sticking to the language of N would take forever.

- But we can move more quickly. Consider the addition of S to N. We can then infer the following from 1-3:

1'. The cardinality of the set of aardvarks is 21
2′. All sets in the range of the function whose domain is the set of aardvarks, and which assigns to each entity in its domain the set of bugs on that entity, have cardinality 3
3′. The function mentioned in 2′ is 1-1 and its range forms a partition of the set of all bugs

- these sentences Field calls "abstract counterparts" of 1-3, respectively, in that the equivalences 1↔1′, 2↔2′, and 3↔3′ are provable in N+S.

- the basic idea is to use basic set theory and arithmetic, including the mixed set theory that guarantees that there exists a set of all and only the aardvarks.

- one can now prove the following in N+S:

(a) if all members of a partition of a set X have cardinality α, and the cardinality of the set of members of the partition is β, then the cardinality of X is $\alpha \cdot \beta$
(b) the range and domain of a 1-1 function have the same cardinality
(c) $3 \cdot 21 = 63$

and so from 1′-3′ one can derive:

4′ the cardinality of the set of all bugs is 63.

- but 4 follows from 4′ (4′ is 4's abstract counterpart). Since the mathematical theory S is, quite plausibly, a conservative extension of N, one can infer that 4 follows from the theory N (and in particular 1-3), without actually deriving 4 from 1-3.

- The general idea of "ascent" and "descent": to figure out whether a nominalist argument is valid, we can ascend from nominalistic premises to platonistic premises, infer a platonistic conclusion using platonistic reasoning, and then descend back to a nominalistic conclusion. Given conservativeness, the conclusion is guaranteed to follow from the nominalistic premises alone.

VIII. Hilbert's axiomatization of geometry

- this is interesting because it concerns real numbers, not just arithmetic. It also involves geometry, and therefore is closer to real live physical theories.

- remember the general goal. Field's model for the applicability of mathematics is facilitating inferences in a nominalistic theory. So we need to take what appear to be mixed math+physics theories, and split them into a purely nominalistic theory and an applied math theory, the latter of which is a conservative extension of the former.

Primitives: 'x is between y and z' — means intuitively that x is a point on the line segment between y and z (inclusive)

'x, y are congruent to z, w' — means intuitively that the distance between x and y is the same as the distance between z and w

- The theory then includes a number of axioms governing these primitives. For example, the following should presumably be axioms (or consequences of axioms):

  If y Bet xz then y Bet zx
  If y Bet xz and z Bet yw then y Bet xw
  xy Con xy
  If y Bet xz and xy Con xz then y=z

- usually one develops geometry with the *numerical* notion of distance. But Hilbert showed that we can have this without using numbers in the axioms. For we can prove *representation* and *uniqueness* theorems.

Definition: a *legitimate distance function* is a two-place function, d, defined on points, such that:

(a) for any points x, y, z and w, xy Con zw iff d(x,y)=d(z,w)
(b) for any points x, y, and z, y Bet xz iff d(x,y)+d(y,z)=d(x,z)

Representation theorem: there exists a legitimate distance function

- this can be (platonistically) proved from the axioms

Uniqueness theorems: if d_1 and d_2 are legitimate distance functions then $R(d_1,d_2)$

- in this particular case R would be “are linear transformations” — i.e., “$R(d_1,d_2)$” would be replaced with “for some constant, c, for any x, y, $d_1(x,y)=c\cdot d_2(x,y)$”. So we say “the distance function is unique up to linear transformation”. This corresponds to the fact that a unit of measure is arbitrary.

- but in other cases (depending on what axioms were chosen), the resulting measurement functions might be unique in different senses. For example, if we said very very little in the axioms for our primitives, perhaps the resulting distance functions would be unique up to order — i.e., all we could show is that for any x, y, z, w, $d_1(x,y)>d_1(z,w)$ iff $d_2(x,y)>d_2(z,w)$

- So, what’s the point? Well, suppose we have an inference we want to make that is stated purely in the language of Hilbert’s axiomatization. (E.g., the argument on p. 28.) We can add real number theory plus applied set theory to Hilbert’s theory. Then we get representation and uniqueness theorems. We can choose a distance unit (i.e., choose some legitimate distance function), and use what we know about real numbers to draw conclusions. Then we can descend back (via the definition of a legitimate distance function) to a nominalistic conclusion. Conservatism guarantees that the conclusion follows from Hilbert’s axioms alone.

IX. Summary

A. Definition of <u>conservativeness</u>: if A is a consequence of Nominalistic-Theory+Math then it’s a consequence of Nominalistic-Theory alone.

B. Assertion: mathematics is conservative

C. Demonstration: many scientific theories can be reformulated in a nominalistic way

D. Note that if you have such a nominalistic theory, then even if you don’t believe math is true, you can use math to draw inferences; conservativeness guarantees that whatever follows via math follows without the math

E. Claim: this shows that mathematics need not be true in order to be useful in science. For so long as it is conservative, it can still play the role of making it easier for us to see the consequences of nominalistic scientific theories.

X. **Platonistic methods of proof**

- Field acknowledges in the preliminary remarks at the beginning of the book that he quantifies over numbers in proving various things. In particular, he quantifies over numbers in proving the representation theorems.

- Is there a problem? Field thinks not:

> anyone who wants to argue for platonism will be unable to rely on the Quinean argument that the existence of abstract entities is an indispensable assumption. The monograph shows that any such argument would be inconsistent with the platonistic position that is being argued for. (p. 6)

- Is this OK? After all, the Platonist is arguing that no account of mathematic's use can be given by the nominalist. So can't the Platonist say the following to Field? "I see how your account of the use of mathematics goes through if *I* am right about numbers. But if there are no numbers then you cannot give your account of mathematics. Therefore I still say that no nominalistic account of the use of mathematics can be given."

- Field could respond as follows. "My account of the usefulness of mathematics is based on the assertion that mathematics is conservative. This assertion can still be *true* (assuming a nominalistically acceptable account of logical truth and logical consequence) even if there are no numbers. And we have reason to believe in conservativeness. Of course, my *proofs* that certain theories are conservative given in the appendix to chapter 1 are not acceptable to me as a nominalist; but they are not part of my account of the application of mathematics; they are only intended to convince skeptical Platonists that mathematics is indeed conservative."

- Then what about the representation theorems he keeps proving? Are *those* more cases of the use of Platonistic methods only intended to undermine the Quinean argument against nominalism? I was mixed up about this for a long time, but now I see that the answer to this is *no*. The representation theorems are fine for the nominalist to use because they're just part of a conservative use of mathematics; they just are cases of getting to A from N+S. The only bit of Platonistic reasoning that is worrisome for Field is the proofs of conservativeness.

XI. **Why should we be happy with Field's nominalistic versions of theories?**

- After all, the science we meet in textbooks is not like the intrinsic formulation, but is instead formulated using numbers. Why should we be willing to opt for the intrinsic theories?

  - do we need to "manually" look and see whether experimental data equally confirms the intrinsic theory?

  - maybe instead we try to show that the intrinsic formulation of the scientific theory has the same observational consequences as the original formulation. Then the intrinsic formulation would be guaranteed to be just as well-supported by experiment. And I can see how that would be *if* the original theory were neatly formulated in the same nominalistic language as the intrinsic theory, but with mathematical language added. Then we could just use the (alleged) fact that mathematics is conservative. But what if the original theory is just a big jumble of mathematical and physical language?

XII. **Limitations of the use of representation theorems**

- Suppose we have nominalistic A and B; and that given N+S we can prove $A \leftrightarrow A'$ and $B \leftrightarrow B'$; suppose further that we can validly deduce B' from A' in N+S. So we have:

$$\begin{array}{lll} A' & \rightarrow & B' \\ \updownarrow & & \updownarrow \\ A & \rightarrow ? & B \end{array}$$

- Field shows that *if* we have got these A' and B', then we are justified in inferring B from A, even if we don't believe that math is true.

- But what if we've got this kind of situation:

$$\begin{array}{lll} A' & \rightarrow & B' \\ \updownarrow & & \updownarrow \\ A & \rightarrow ? & ? \end{array}$$

- suppose, for example, that we begin with a nominalistic claim A, we construct A', perform some calculations to B', and then want to believe something accordingly. The representation theorems don't give us any way of finding a particular B such that $B' \leftrightarrow B$ is a consequence of N+S.

- does this matter? I don't know.

XIII. Completeness, conservativeness, and logical consequence

- introduce semantic consequence, model-theoretic consequence, and provable consequence.

A is a <u>semantic consequence</u> *of* Γ iff it would be *logically impossible* for all the members of Γ to be true while A is false.

A is a <u>model-theoretic consequence</u> of Γ iff A is true in every *model* in which all the members of Γ are true

A is <u>proof-theoretic consequence</u> of Γ iff there exists a *proof* of A from Γ (i.e., a finite sequence of formulas each of which is either a member of Γ or follows from earlier members of Γ via a rule of inference)

- Introduce corresponding versions of conservativeness.

<u>Semantic conservativeness</u>: if A is a semantic consequence of N+S then it is a semantic consequence of N alone

<u>Model-theoretic conservativeness</u>: if A is a semantic consequence of N+S then it is a semantic consequence of N alone

<u>Proof-theoretic conservativeness</u>: if A is a semantic consequence of N+S then it is a semantic consequence of N alone

- are these importantly different?

- Introduce completeness and soundness.

<u>Soundness</u>: if A is a proof-theoretic consequence of Γ then it is a semantic consequence of Γ

<u>Completeness</u>: if A is a semantic consequence of Γ then it is a proof-theoretic consequence of Γ

- First-order logical consequence is complete, second-order is not.

- When you have a complete notion of consequence, provability is the same thing as model-theoretic consequence, so the corresponding versions of conservativeness are equivalent. But not otherwise.

- Some of Field's mathematical theories involve logical consequence relations for which completeness fails.

- Field often says that what math does is shorten derivations. But this presupposes provability-conservativeness. That's illegitimate.

- suppose Field has to retreat to semantic-conservativeness. In that case, it might be that we use math to derive things that would otherwise not be derivable (though they would be still be semantic consequences). Does that mean that Math is indispensable, and therefore true after all?

XIV. **Space-time**

- Here I won't go through all the details. I'll just try to give the idea of what is going on.

- The point here is to take the sort of thing done with Hilbert's axiomatization of geometry, and re-do it for space-time.

- The use of the term space-time doesn't mean we're doing relativity, as we'll see.

A. **Real facts vs. artifacts of representations**

  - suppose you use a coordinate system to represent space. you won't want to say that every fact about the coordinate system stands for something real in the space. For example, one point in the coordinate system is mathematically distinguished as the origin, but there's no corresponding point in space that's special.

  - we can say that the notion of the origin has no physical meaning easily, by saying that real space is just a set of points, not mathematical entities. There are isomorphisms between real space and 'tuples of real numbers, but no one of those is distinguished.

B. **Absolute rest**

- another thing one might want to say is that absolute rest has no physical meaning. Suppose two things are moving at constant velocity with respect to each other. The claim would be that there's no physical question as to whether one of them (or neither) is *really* at rest.

- How can we make sense of this? If real space consists of points that endure over time, then it would seem like we *could* make sense of absolute rest.

C. **Newton vs. Leibniz**

- Leibniz thought this was a good reason to deny the existence of real points in space. For if there are real points then absolute rest makes sense. But isn't *that* dumb. On the other hand if you're a relationalist about spatial location then you can't make sense of absolute space.

- the problem is that there *does* seem to be reason within Newtonian physics to believe in absolute *acceleration*. Newtonian physics agrees that the world looks exactly the same from frames of reference in uniform velocities with respect to each other; but *not* from frames of reference that accelerate with respect to each other. E.g., rotating bucket.

- so it appears that the theory itself requires the notion of an *absolutely non-accelerating frame of reference* — those are the ones in which Newton's laws hold. Doesn't that require the existence of absolute rest then? For absolute acceleration must be acceleration with respect to the fixed points in space; but then you could make sense of absolute rest after all! So: victory against Leibniz and victory of absolute rest.

D. **Spacetime and affine geometry**

- as it turns out, Newton really doesn't win. You can make sense of absolute acceleration without absolute rest.

- introduce spacetime.

- introduce straight lines through spacetime.

- these can be interpreted as the paths of unaccelerated particles.

- these are *not* determined by the persistence of the *same* points of space, but are rather features of lines through space-time.

- definition of these straight lines does not require distinguishing some of them as “vertical” (diagram) — i.e., as corresponding to the paths of particles AT REST.

- accelerated particles follow curvy paths.

- (Note that you *could* do roughly this sort of thing with temporal parts of things in spacetime rather than points in spacetime. Thus Leibniz’s relationalism could be upheld.)

E. **Intrinsic formulation of neo-Newtonian spacetime**

- it is this sort of conception of spacetime that Field attempts to formulate nominalistically.

- the basic trick is to characterize straight lines in spacetime by a primitive notion of betweenness.

- to get the full neo-Newtonian spacetime, you add a simultaneity relation (dropped in special relativity), and a four-place relation of spatial congruence (holding only between simultaneous points).

- with appropriate axioms on these primitives, you can prove representation theorems as before.

F. **Quantities**

- Here Field takes the quantities basically to be scalar fields defined on points of spacetime. That lets him take the relevant primitives to be relations between points of spacetime, e.g., x is temp-between y and z.