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Class #21: The Weasel
Melia, "Weaseling Away the Indispensability Argument"

I. The Weasel and the Indispensabilist

Melia's article defends nominalism against the indispensabilist but without providing a Field-style rewriting of scientific theory.
He claims that a reformulation is unnecessary because our uses of mathematics in science are not serious.
His paper evokes the position of Carnap's scientist, but without the uneasy conscience.

> A physicist who is suspicious of abstract entities may perhaps try to declare a certain part of the language of physics as uninterpreted and uninterpretable, that part which refers to real numbers as space-time coordinates or as values of physical magnitudes, to functions, limits, etc. More probably he will just speak about all these things like anybody else but with an uneasy conscience, like a man who in his everyday life does with qualms many things which are not in accord with the high moral principles he professes on Sundays (Carnap, "Empiricism, Semantics, and Ontology" 205).

As we saw, Carnap defended the physicist's uses of mathematics by distinguishing between contentful internal questions and contentless external questions.
Internally, it is analytic and obvious that there are numbers.
Externally, the question of the existence of mathematical objects is meaningless.
Quine responded by accusing Carnap of doubletalk, or doublethink.
Field followed Quine, and argued that we must remove the mathematics from science if we hope to ease nominalist consciences regarding abstract objects.
Underlying Quine's position is his holism, which supports his denigration of doubletalk: there is no perspective external to our best theory from which to evaluate linguistic frameworks.

Melia does not oppose Quine's holistic framework.
His article is an attempt to reclaim Carnap's attitude toward the uses of mathematics in science without Carnap's view concerning linguistic frameworks.
Melia's claim is that we can interpret both mathematicians and scientists as taking back all prima facie commitments to abstracta.

> It is quite common for both scientists and mathematicians to think that their everyday, working theories are only partially true (Melia 2000: 457).

Melia calls the practice of taking back a portion of one's claims weaseling.
It has also come to be known as easy-road nominalism.
The weasel accepts that mathematics is ineliminable from scientific theory but maintains that we need not believe that mathematical objects exist.
The weasel can accept, say, that vectors in Hilbert space are indispensable to the practice of quantum mechanics.
The weasel just adds that we can, when speaking most seriously and parsimoniously, deny that our best theory really posits them.
Thus, Melia denies Quine's claim that our ontological commitments are (all of) those objects over which we first-order quantify in our best theories.

Melia defends the weaseling strategy by claiming that scientists use mathematics in order to represent or express facts that are not representable without mathematics.
Such representations are not supposed to be ontologically serious.

> The mathematics is the necessary scaffolding upon which the bridge must be built. But once the bridge has been built, the scaffolding can be removed (Melia 2000: 469).

Mathematics, for Melia, is just a tool for communicating or representing facts about the world.
It is sometimes necessary to invoke mathematics.
We should not be misled by such invocations into beliefs in mathematical objects.

II. Two Versions of Indispensability

At the beginning of his paper, Melia distinguishes Hillary Putnam's version of the indispensability argument from Quine's version.
As a point of exegesis, I don't think Melia's distinction is useful or accurate.
It will be instructive, though, to take some time to explore Melia's characterizations of the indispensability argument.
One reason is that it will give us an opportunity to look at Putnam's influential version of the argument.
Another reason is that it will help us understand a more profound and important error in Melia's article.
Melia ignores Quine's premise that we must find our commitments in the first-order logical regimentations of our best theory, and thus criticizes a version of the argument which is not as strong as it can be.

Putnam presents a variety of different philosophies of mathematics in his work, including at least two versions of the indispensability argument.
In places, Putnam echoes precisely Quine's argument.

> This type of argument stems, of course, from Quine, who has for years stressed both the indispensability of quantification over mathematical entities and the intellectual dishonesty of denying the existence of what one daily presupposes (Putnam 1971: 347).

When Putnam is presenting Quine's argument, it is best to take him as adopting Quine's method for determining our ontological commitments: construct our best theory, regiment it into first-order language, and interpret the theory to see what the values of the variables must be.

Putnam also presents a version of the indispensability argument that does not precisely track Quine's version.
In this non-holistic version of the argument, which we can call the success argument, Putnam argues that we must be mathematical realists in order to explain the success of mathematics.
The mathematical success argument is a corollary of Putnam's scientific success argument.
In the scientific success argument, Putnam argues that we must be realists about the external world since only realism explains the success of science.

> I believe that the positive argument for realism [in science] has an analogue in the case of mathematical realism. Here too, I believe, realism is the only philosophy that doesn't make the success of the science a miracle (Putnam 1975a: 73).

We can represent Putnam's non-Quinean indispensability argument as PS.

PS
PS1. Mathematics succeeds as the language of science.
PS2. There must be a reason for the success of mathematics as the language of science.
PS3. No positions other than realism in mathematics provide a reason.
PSC. So, realism in mathematics must be correct.

By 'realism', Putnam means a philosophy of mathematics on which both mathematical objects exist and many mathematical sentences are true.
Thus PS provides, at least implicitly, an alternative to Quine's method for determining our ontological commitments.
PS implies that what exists is that which provides a (best) reason for the success of science.
Putnam doesn't tell us how to determine which objects provide a reason for the success of science.
It is possible that he intends for us to use Quine's method.
Other methods, like reliance on an eleatic principle, may also be compatible with Putnam's argument.
The eleatic principle says that only objects with causal powers exist.
Thus, PS is vague about how we determine the ontological commitments of a theory.
This vagueness is what opens the indispensability argument to weaseling responses like Melia's.

Melia accurately represents Putnam's version of the indispensability argument as lacking an explicit statement of the method one is to use to determine the objects to which a theory commits.

> Our best scientific theories entail the existence of numbers, sets and functions...Since such claims entail the existence of *abstracta*, we cannot consistently assert or believe in our scientific theories whilst denying the existence of *abstracta* (Melia 455).

In characterizing Quine's argument, Melia focuses on Quine's claim that the reasons for mathematical posits are identical to the reasons for any other posits, like quarks and space-time points.
Melia accurately represents Quine's view about posits.
He also correctly presents Quine's claim that there are pragmatic and aesthetic reasons for choosing one theory over another.
But Melia takes this aspect of Quine's method to reveal a weakness in the argument.
He claims that the introduction of considerations like simplicity in choosing a theory leave Quine's version of the argument open to the weasel.
Quine's claims about aesthetic considerations are merely facts about the under-determination of theories by evidence.
He is not leaving slack in the interpretation of our best theory.
Once we choose a theory, we have to be committed to the objects over which that theory first-order quantifies.

I believe that the most salient difference between Quine's argument and Putnam's argument is that Quine provides an explicit method for determining the ontological commitments of a theory while Putnam leaves that question open.
Quine's argument is resistant to alternative interpretations of the language of science.
In particular, Quine's argument resists weaseling.
We can not, for Quine, take back some of what we allege.
Given Putnam's argument, for which we do not have explicit rules for interpretation of scientific discourse, a weaseling response might succeed.

The weasel says that we can deny that we are really committed to the objects over which we first-order quantify.
That contradicts the version of the indispensability argument that I presented as Quine's.
But, it need not contradict the version I ascribe to Putnam.

There are two questions here.
The first has to do with the proper exegesis of the work of Quine and Putnam.
I think that Melia has it wrong.
But, that's not very interesting and independent of the second question.
The second question is whether there is an opening for the weasel in any version of the indispensability argument.
For versions of the argument which are casual about our commitments, the weasel may have a way in.
For versions of the argument, like Quine's, which are explicit about finding one's commitments in the first-order quantifications of our best theories, the weasel's claims are utterly and unacceptably contradictory.

The indispensability argument is a reluctant platonist's argument.
It is based on some general principles about how to determine one's ontological commitments.
Where Carnap portrays our views about mathematical ontology as pragmatic choices, Quine argues that there are facts about theory choice and about the world.
Moreover, once one decides on a best theory, there are facts about what the theory claims, ones that are not subject to personal or pragmatic preference.

Melia argues that we can choose the theory which makes the world simpler.
He seems to miss the key premise of the indispensability argument, that we find our commitments in the domain of quantification of the first-order version of our best theory.
Melia is correct that we may choose among empirically equivalent theories.
There is some slack in Quine's procedure is at the level of theory choice.
Global considerations about the virtues of theories are difficult to balance and resolve.
But once we choose a theory, we can not, according to the indispensabilist, choose to take back any of what that theory says.

Of course, Melia is free to abandon the key premise of the indispensability argument I have attributed to Quine, that our ontological commitments are not a matter of choice but one of modeling our best theories.
In that case, Melia has to provide an alternative method of determining one's ontological commitments.
As we have seen in our discussion of Field's dispensabilist project, the choice of one's logic is of utmost importance.
Once we give up first-order logic, havoc reigns.
If we adopt a second-order logic, we are already committed to sets or properties.
By adopting other logics, our commitments can be obscured.
Or, we can abandon all hope of finding our commitments in regimented theories and find ourselves back at the point before Quine wrote "On What There Is," fussing with names in ordinary language.

I don't want to give the false impression that there are no viable alternatives to Quine's method.
I believe that Quine's method is fundamentally flawed, as we discussed at the end of our work on Quine.
For the purposes of evaluating the indispensability argument, we must heed Quine's arguments for his method, not merely deny them.

If one wishes to criticize the indispensability argument, as Melia does, one should attack the strongest version of the argument.
I agree with Melia's claim that our uses of mathematics in scientific theory do not and should not commit us to belief in the existence of mathematical objects.
But one can not merely gainsay Quine's claim.
One must provide reasons for rejecting his arguments.

Still, Melia provides an interesting way to help think about our uses of mathematics in scientific theories.
Let's look at that.

III. The Trivial Strategy

The first part of Melia's article contains an argument that a particular strategy, which he calls the trivial strategy, does not successfully eliminate mathematical objects from our ontology.
The trivial strategy is to dispense with mathematical objects by adopting only the nominalistically-acceptable theorems of a scientific theory.
Field had considered a version of the trivial strategy.
Field even suggested using a Craigian re-axiomatization to clean up the resulting theory to ensure that it is recursively axiomatizable.
Field's objection, as Melia rightly notes, is that such theories, even in their Craigian reformulations, are unattractive.
They ignore the structure of standard scientific theories.

> Even if he is right, in a very short time we have come a long way from the view that quantification over abstracta is *indispensable*. Quantification over abstracta can be dispensed with - and easily dispensed with at that - but the theories which do quantify over abstracta are more attractive than the theories which don't. This is a considerably weaker claim and one much more vulnerable to a nominalist assault (Melia 458).

Melia's reading of Field's reliance on attractiveness in theory choice seems uncharitable.
One has to look directly at the way in which Field uses that criterion to determine whether it makes the indispensability theory more vulnerable to assault.
In particular, Field uses attractiveness to insist that the trivial strategy is unacceptable.
Field's reason for ruling out the trivial strategy is not merely that they are, say, subjectively unappealing.
It is that the resulting theory does not contain a sentence-by-sentence translation between the standard theory and the reformulation.
The new theory could not be constructed, therefore, without appeal to the standard theory.
We can eliminate mathematics, but only by proffering a theory whose construction depends not just in practice but in principle on the standard theory.

Whether or not the unattractiveness of the theory it yields is a legitimate ground for rejecting the trivial strategy, Melia's reasons for rejecting that strategy depend on his mereological construction.
The technical portions of Melia's article, the third section and the appendix, contain a purported counter-example to the trivial strategy.
Melia constructs a simple mereological theory T.
He then shows that extending T to T* by adding set theory to T, even adding it conservatively, allows us to derive further nominalistically-acceptable consequences.

Melia's construction uses model theory and the cleavage between model theory and proof theory to construct the result.
I won't pursue the result here.
Melia claims that his construction shows that we can not merely remove the mathematics from physical theories without losing inferential strength.

> There can be more to the nominalist consequences of a theory than the set of sentences entailed by that theory in the nominalist vocabulary. If the nominalist simply takes his theory to be the set of nominalistically acceptable sentences entailed by some platonist theory, he has no guarantee that his theory actually has the same nominalist content as the platonist theory (Melia 461).

Melia's mereological theories are not first-order logical.
They concern the relations of parts and wholes.
Mereological theories include claims about combinations of regions among their logic.
They include variables that range over regions and their mereological sums.
In other words, mereology contains significant mathematical ontology and ideology, built-in.

Mereological theories can be stronger or weaker.
At their strongest, they are pretty much equivalent to second-order logic, and its full theory of sets.
At their weakest, they are tempting to nominalists.
The relations of parts to wholes is less controversial than the theory of sets.
But, those relations aren't quite as uncontroversial, or purely logical, as the theory of identity, which is ordinarily included among first-order logic.
Thus, mereology is somewhere between pure logic and full mathematics.

I'm concerned about Melia's invocation of mereological theories.
Again, one has to be careful, in dealing with the indispensability argument, not to introduce controversial logics.
I'm worried that Melia introduces a logical theory that couldn't possibly be used against the indispensability argument, properly (or at least charitably) interpreted.

But whether mereology is mathematics or logic does not matter here.
Melia's goal is to demonstrate the failure of the trivial strategy.
I'm happy to grant the failure of the trivial strategy, as are both Field and Quine.
Additionally, whether this trivial strategy works or not is immaterial.
There are other constructions which use extensions of first-order logic to rid a first-order theory of its quantifications over mathematical objects and which do not require a Field-style reformulation of science.

Melia uses his construction to motivate the weasel.
But the legitimacy of the weaseling response to the indispensability argument would make trivial strategies moot.
Melia also has non-technical arguments for weaseling, so we should turn to them.

IV. The Weasel and Scientist

Melia posits a hypothetical nominalist who prefers standard theories, like T*, because of their inferential strength, but who also rejects the mathematics used in those standard theories.

> Joe does *not* simultaneously hold contradictory beliefs. Just because, in the process of telling us his beliefs about the world, Joe asserts all the sentences of T*, it does not follow that Joe believes all the sentences of T*. Indeed, since Joe believes there are no abstract objects, he will explicitly say that T* is false (Melia 467).

Compare Joe to his intellectual ancestor.

> Some contemporary nominalists label the admission of variables of abstract types as "Platonism". This is, to say the least, an extremely misleading terminology. It leads to the absurd consequence, that the position of everybody who accepts the language of physics with its real number variables (as a language of communication, not merely as a calculus) would be called Platonistic, even if he is a strict empiricist who rejects Platonic metaphysics (Carnap, "Empiricism, Semantics, and Ontology" 215).

Melia provides a helpful analogy for those, like Quine and Field, who believe that weaseling is doublethink.
Consider the two-dimensional surface of a sphere.
From a three-dimensional perspective, it is easy to describe the surface as the locus of all points equidistant from the center of the sphere.
In order to describe the spherical surface, we appeal to the center point of the sphere and its three-dimensional properties.
But the center is not part of the two-dimensional surface.
From the point of view of the surface of the sphere, we can appeal to the center while not really taking it as part of the world.

> We do successfully and unproblematically describe a particular non-Euclidean world by taking back some of the implications of what we earlier said (Melia 468).

Similarly, consider Joe's story about the angels and the stars.

> In charge of each star is an angel, no two angels are in charge of the same star, and at the precise moment that each star is created the corresponding angel is also created. Moreover, the angels in charge of stars a and b were created at the very same time (Melia 470).

From this story, we can infer that two stars are created at the same time, even though Joe never says so.
Joe, being a nominalist about angels, retracts all the consequences about them.
But he holds the inference about the stars.
In this case, he could have said that there were two starts created at one time directly.
Melia's primary claim, though, is that in stating that claim in terms of angels and then taking back the parts of the claim that refer to angels, Joe is not speaking incoherently or contradictory.
Melia's secondary claim is that our ability to weasel is fortunate, since nominalistic reformulations of our best theories are not always available.

> Sometimes, we just cannot say what we want to say first time round. Sometimes, in order to communicate our picture of the world, we *have* to take back or modify part of what we said before (Melia 468-9).

Besides being foreshadowed by Carnap, the weaseling strategy is related to other current instrumentalist views about ideal elements in scientific theory.
Penelope Maddy alleges that scientists often view certain commitments, e.g. to infinitely-deep water waves, instrumentally.
As we will see in our next class, Jody Azzouni points out that no one believes that the center of mass of a physical system must be a real thing.
Robert Batterman argues that the use of idealizations, which he calls asymptotic reasoning, is essential to the practice of science.
If scientists view some of the posits of their theory instrumentally, there is no principled defense of insisting on literal beliefs in mathematical objects from their mere presence in scientific theories.

V. Competing Theories, Competing Ontologies

I mentioned earlier that Melia erroneously infers that we have a choice whether to believe in the existence of all the objects over which we first-order quantify from the fact that we use aesthetic and pragmatic considerations in choosing among theories.
This mistaken inference is independent of the plausibility of its conclusion that weaseling is not self-contradictory.
It is also independent of the high plausibility of its premise.
We are often faced with competing theories.
Sometimes these theories are empirically equivalent: no evidence sways us to one over the other.
In such cases, Quine's method asks us to balance what the immanent virtues of the theories such as simplicity and elegance and strength and unification.
Some theories are simpler ontologically.
Some theories are simpler in formulation.
These factors of simplicity are inversely proportional.
If no empirical factors sway us toward one theory over another, we may suppose ourselves to be like Buridan's ass among theories, unable to choose.

Melia claims that we should prefer ontological simplicity over formulational simplicity.
He compares a theory he calls T_1, which has no numbers but lots of numerical predicates, to another theory, T_2, which accomplishes the same tasks as T_1, but with few predicates and an arithmetic ontology.

> I accept that considerations of simplicity play an important role in theory choice. But I prefer the hypothesis that makes *the world* a simpler place. For sure, all else being equal, I prefer the simpler ontology. For sure, all else being equal, I prefer the theory that postulates the least number of fundamental properties and relations. But the simplicity I value attaches to the kind of world postulated by the theory - not to the *formulation* of the theory itself (Melia 473).

Quine, with his stated Okhamist preference for desert landscapes would agree with Melia's preference for the ontologically simpler theory, all else being equal.
But, it does not seem as if all else is equal in this case.
For Melia's T_1, all distance relations are different properties.

There is a property of being one cm and another of being two cm and another of being a light year.
For T_2, the same predicate may be used for any distance, taken as a relation between an object and a real number, its distance measure.
His claim that there is no sense in which T_2 is simpler is implausible.
T_2 has one property where T_1 has infinitely many.
We can, it is true, reduce ontology (values of the variables) at the expense of ideology (predicates).
One must be very careful to choose a satisfying ideology.
As Quine says, our choices of language are not distinguishable from our choices of what we say is the fundamental nature of the world.

> The quest of a simplest, clearest overall pattern of canonical notation is not to be distinguished from a quest of ultimate categories, a limning of the most general traits of reality (Quine, *Word and Object* 161).

One could interpret the connection of metaphysics and choice of language as a flaw in Quine's project, as Melia does.
Or, one could reconsider Quine's arguments for holism and first-order logic, and engage them directly, as Melia does not.
This latter route, I believe, is the only charitable and intellectually responsible one.