

The Dilemma of *Physics* I.8

In *Physics* I.8, Aristotle presents a dilemma concerning change and claims that his solution to it is the only solution. The implications of this claim have gone underappreciated. Firstly, as a question of scholarship, the uniqueness of his solution implies that the problem and the solution are deeply bound together, and that we can have no confidence in understanding Aristotle's solution, his doctrine of principles, without an understanding of the problem as a compelling one. Yet it is hard to see how the dilemma could be compelling without making significant interpolations to Aristotle's presentation.

But there is a much more important philosophical question here. The uniqueness of his solution implies that by Aristotle's lights we will be forced to deny the possibility of change unless we accept the very solution that he presents. This is a challenge to take seriously.

In this paper, I attempt to remedy the first problem and thereby bring the second into clearer focus by providing a compelling reading of the dilemma, and one which does not require us to interpolate any more specific reading of I.8 than the text literally provides. I suggest that the dilemma is a dilemma concerning the principles of change only, but that this restriction makes it no less destructive so long as we wish to make change intelligible in terms of principles. If this problem is to become a problem for us, as I think it should, we must also try to understand what accepting or rejecting the idea of principles of change would mean.

Finally, I will present Aristotle's solution in the context of the clarified dilemma. I will also show that Aristotle's solution is not up to the task of resolving

the dilemma with the limited resources of the first book of the *Physics*. The problem presented in I.8 is no mere logical confusion, but a serious worry intrinsic to the project of beginning our thought from first principles. We have to look beyond the first book of the *Physics* to understand how and why Aristotle's solution is a solution at all, and to evaluate it for ourselves.

Change You Can't Believe In

Much philosophical work of Classical Greece was motivated by a set of problems concerning the possibility of change and plurality. The origin and development of these problems is difficult to track, but their earliest remaining articulation is undoubtedly to be found in the proem introducing Parmenides' cosmological account. Here, these arguments preface a cosmology as the best that can be made of the incoherent notion of a cosmos of change and diversity.

These problems were deeply impressive to Aristotle's philosophical predecessors, and many of their innovations seem to be directly responsive to them. The problems show up throughout Aristotle's own works, in the form of Zeno's paradoxes, and various puzzles about the possibility of generation, extension, and motion. One of these places is *Physics* I.8. Here Aristotle presents an argument against change which, by his report, has long exercised his predecessors. His solution is articulated in the previous three chapters, and in relating it to this problem he calls it the 'only' solution.¹ I believe that this problem and the

¹ Ὅτι δὲ μοναχῶς οὕτω λύεται καὶ ἡ τῶν ἀρχαίων ἀπορία, λέγωμεν μετὰ ταῦτα (191a23-24). The word order heavily emphasizes 'μοναχῶς', 'only'.

uniqueness and character of Aristotle's solution is at the heart of his account of physics, and of his entire theoretical philosophy.

The puzzle of I.8 goes like this: whatever comes-to-be must come-to-be either from what is or from what is not. It cannot come to be from what is not, since nothing comes from nothing, or in Aristotle's own words, something must subsist through the change. Nor can it come to be from what is, since it already is (*Physics* 191a23-34).

Aristotle doesn't attribute this argument to anyone in particular, but he does say that this argument has led some to conclude that "there is no many, but rather only being itself is" (191a33). Without getting into the sticky problem of attribution, let us call this the Parmenidian argument against change, if only for its resemblance to the reasoning and conclusion of Parmenides' Proem.² It suffices that Aristotle considers this a long-standing and widespread difficulty concerning the possibility of change.

But it is not easy to see why this problem would be troubling at all. The dilemma is somewhat underspecified as read. We seem to have three natural options in interpreting the problem but none of these offer a compelling difficulty. Sean Kelsey provides a discussion of these interpretations, and offers his own, in his article "Aristotle's *Physics* I 8" (2006). I take my bearings on the available readings of I.8 from his paper.

First among our readings, we may take 'is' and 'is not' in an unqualified sense: what comes to be cannot come to be from what is unqualifiedly nor from

² Note especially Fragment 8.

what is not unqualifiedly. In this case, it is easy to see why nothing can come to be from what, without any qualification, is not. But there is no obvious difficulty in something coming to be from something which, without any qualification, is. After all, the first and final conditions do not need to be the same in any respect but existence.³

Secondly, we may take 'is' and 'is not' in a predicative sense: what is X cannot come to be from what is already X (since there is then no change), nor from what is not X. But why can't it come to be from not being X? After all, what is not X may still be something else, from which X can surely come.

Both of these interpretations have the virtue of being true dilemmas (they are exhaustive), but both have only one strong horn, the other being so weak as to compel us to find an alternative reading. Lastly, we could try for a hybrid reading, combining our two strong horns: X cannot come to be from being X, and cannot come to be from unqualified non-being. True enough, but we have lost our exhaustive dilemma.⁴

³ For this reading see Wagner 1967, Loux 1992, and Horstschäfer 1998 (footnote courtesy of Sean Kelsey 2006). By 'unqualified' here I mean 'leaving any further qualifications out', where anything which *is* (not matter what it is) *is* in an unqualified sense. In doing so, I exclude a reading which takes 'unqualified being' to mean what is being and nothing else—perhaps the immutable and singular Parmenidean being. But the claim that what comes to be can come to be neither from nothing at all, nor from the immutable one being does not present an compellingly exhaustive dilemma. Not unless we suppose from the beginning that only being itself is, but this is supposed to be the conclusion of the argument.

⁴ For the second reading see e.g. Ross 1936, Code 1976, Waterlow 1982, and Lewis 1991. The hybrid reading is offered by Simplicius 236.20-22 (Sean Kelsey 2006). Waterlow (1982) shares many features of my own reading, even making an argument for the thesis which I believe closes the obvious gap in the 'unqualified' reading of the argument. She does not argue on the basis of any textual evidence for this thesis, and she defends it on grounds that jump the conceptual gun by presupposing elements of Aristotle's solution, i.e. potentiality as in the idea of 'rootedness' she deploys in paragraph 11. If we suppose the argument can only be made to sound troubling in light of Aristotle's solution then (leaving aside that paradox) we still don't understand how it could have posed a problem for Aristotle's predecessors.

Kelsey's own solution is also something of a hybrid. By his reading: what comes to be *a substance* cannot come to be from being *a substance* nor from not being *a substance*. Thus:

Suppose then we think of the problem as placing certain conditions on what substances come from – call this “substance-material” – and then arguing that these conditions cannot be jointly satisfied. The first condition says that substance-material must “underlie”; the second says that it must not “already be” what it will become. If we try to satisfy the first condition, by saying that substance-material is substance, we fall foul of the second, which says that it cannot already be what it will become (namely substance). If we try to satisfy the second condition, by saying that substance-material is not substance, we fall foul of the first, which says that it must underlie (for Aristotle, only substances underlie) (338-9).
In other words, in the coming to be of substance, ‘that from which’ something comes should be understood as a special object, a substance-material. This object must be able to underlie the change, but it cannot be a substance. But if something must exist to underlie a change, and it must be a substance to exist, then it seems there's no way for substance to come to be.

This reading has virtues: it preserves the exhaustive dilemma and it has two strong horns. It also has vices. On Kelsey's reading the argument relies on an idea of change as involving something underlying, as well as a constraint on what may underlie, namely that it exist in the way that substances exist. But these are far from the explicit terms of the dilemma, and seem so rooted in Aristotelian distinctions that it cannot have been on these terms that Aristotle's predecessors found the problem a vexing one.

But his reading also has a weakness in common with the unqualified reading: the horn which says that substance cannot come to be from substance (because it already is substance) doesn't seem like a serious restriction on change. After all,

why couldn't we have change from one substance to another, which would amount to the generation of the latter? This would only be a problem if 'becoming a substance' were the most specific thing we could say about a change.

Kelsey's reading also restricts the problem to one which concerns the generation of substances only. But Aristotle's (purportedly unique) solution is general enough to capture all kinds of change (e.g. alteration, generation, locomotion), and his discussion of this solution in I.8 certainly doesn't seem to restrict the problem in this way. Indeed, at the end of I.8, Aristotle says that the problem is one which caused earlier thinkers to turn away from "coming to be, passing away, and change generally" (191b33).

I do not intend to do full justice to Kelsey's complex argument in this paper. I think Kelsey's reading may be strong enough to stand in the face of such objections but only so long as we don't have a plausible alternative which avoids them. I think such an alternative is possible, one which both avoids these vices and grants us a much more revealing view of the *Physics* as a whole.

Let's begin by reading the argument in the most textually straightforward way, so in terms of the 'unqualified' reading which says "what comes to be cannot come to be either from what is (unqualifiedly) or from what is not (unqualifiedly)." As will become clear, it does not matter to my reading if we begin by reading the problem in this way, or as a matter of predication, or in the 'hybrid' way. My reading is in all three cases ultimately the same.

The problem, as I've said, is that the 'what is' horn of this dilemma is weak. There seems to be no obvious reason why something cannot come to be from

something which already exists, since they need not be in any other respect the same. But Aristotle's explanation of this horn is that 'what is' already is, which only seems to make sense if we read the 'what is' horn in the predicative sense: 'what is already X'. The 'unqualified' argument then looks like this, where X is anything which comes to be:

1. Coming to be is possible. (supposition for *reductio*)
2. X must come to be from what is or from what is not. (Excluded middle)
3. X cannot come to be from what is not, i.e. from nothing. (absurd)
4. X cannot come to be from what is. (??)
5. Coming to be is not possible.

Premise 4 is the weak one, so let's try to repair it. It is weak because X may well come to be from what is, so long as it does not come to be from what is already X. But if we can manage an argument for premise 4, we can get the original argument to work. So:

- A. X can come to be from what is. (supposition for *reductio*)
- B. 'What is' must either be already X or not already X. (Excluded middle)
- C. X cannot come to be from what is already X. (no change)
- D. X cannot come to be from what is not already X. (??)
4. X cannot come to be from what is.

Notice that we could have equally begun from the hybrid or predicative reading of I.8, since in every case the missing premise is the same: premise D of the *reductio*

proof of 4. If we can provide a convincing argument for D, the whole Parmenidean argument will work.⁵

Can we? Aristotle thinks we can, and that this is a premise widely accepted by his predecessors. In a way, Aristotle has already himself accepted this premise in *Physics* I.6, and it's his reason for introducing a substratum as a principle of change: the principles involved in any change cannot act on one another or come to be from one another.

For it is difficult to see how either density should be of such a nature as to act in any way on rarity or rarity on density. The same is true of any other pair of contraries; for Love does not gather Strife together and make things out of it, nor does Strife make anything out of Love... (189a22-26).
A lot of work has to be done to make it clear that this is a statement of D at all, and more still to make it clear that this argument is plausible enough to make us feel the pressure of the Parmenidean dilemma. Insofar as we accept as uncontroversial the idea that something cannot come to be from itself, nor from nothing at all, the Parmenidean dilemma really comes down to the issue of D, of coming to be from something different. I'll argue that Aristotle not only accepts this premise, but

⁵ It doesn't matter what reading we begin with, since D is the common missing premise for all of them.

The Hybrid Reading:

1. Coming to be is possible. (supposition for *reductio*)
2. X must come to be from what is X or from what is not. (Only an exhaustive dilemma if we assume D)
3. X cannot come to be from what is not. (absurd)
4. X cannot come to be from what is X. (No change)
5. Coming to be is not possible.

The Predicative Reading:

1. Coming to be is possible. (supposition for *reductio*)
2. X must come to be from what is X or from what is not X. (Excluded middle)
3. X cannot come to be from what is not X. (D)
4. X cannot come to be from what is X. (no change)
5. Coming to be is not possible.

I consider it the second greatest virtue of my reading that it is indifferent to all the traditional ways of reading the I.8 problem. Notice also that if this reading can make the argument compelling, we can do away with the thought that the dilemma can be dismissed because it confuses the predicative and existential meanings of 'to be'.

insofar as he believes his solution to the dilemma is unique, he argues for D against his predecessors and subjects them to the dilemma on behalf of the Parmenidean.

The Argument for D

If we are to understand Aristotle's solution to the Parmenidean dilemma, and its role in his theoretical philosophy, we must suffer from the dilemma enough to need a solution. This means providing a compelling argument for D. I will argue that D, and thus the dilemma as a whole, is not a problem for change generally but only change among principles (*ἀρχή*). This explains both why Aristotle took the dilemma seriously, and why we find it hard to: it is a dilemma only for those attempting to take account of change on the basis of principles. If we resolve that *all* change is derivable from change among principles, the dilemma is no less destructive for being thus restricted.

I think we have good reasons to take the idea of principles seriously. If we take the idea of principles seriously, we have to take the dilemma seriously. If we take the dilemma seriously, we should try learn from Aristotle's solution to the problem of change, and not just so as to learn about Aristotle's theory, but to learn about what change really is. I'll begin therefore by showing that the dilemma's premise D is related to the idea of principles, and from there I'll discuss what the principles, and thus the dilemma, might mean for us.

Aristotle's positive account, which ends in his solution to the problem of I.8, begins in I.5, with the question of the number and nature of the principles of change. Whatever is to count as the principles of change must not be derived from each

other or anything else, and everything else (everything relevant to change) must be derived from them.⁶ I'll show that these two criteria pull against one another, and that accepting D is the consequence of taking this tension to be unresolvable.

Say our principles are the hot and the cold. In order for *everything* to be derived from them as principles of change, every change would have to be a change from hot to cold, or cold to hot. Change entails a certain kind of difference, something like an asymmetrical two place relation: "X to Y" "Y from X" etc.. Our principles must minimally capture this difference, and so we can't just have one of them.⁷ If a non-principle quality, like dryness, is to be derivable from our principles, we must be able to say that the relation 'not-dry to dry' is derived from or really amounts to the relation 'hot to cold' or 'cold to hot'. Thus, the first challenge a theory of the principles must meet is finding some principles from which everything else is derived, and which are not (in the very same sense) derived from anything else.

This challenge can be met only if the principles are simple in whatever respect they are both (1) underived and (2) everything else is derived from them. Suppose the principles were in some way complex, such that our principles were the AB and the CD. In order to meet the demands of the first requirement, they must be underived, so it cannot be that a change from AB to CD is accountable as a change

⁶ "δεῖ γὰρ τὰς ἀρχὰς μῆτε ἐξ ἀλλήλων εἶναι μῆτε ἐξ ἄλλων, καὶ ἐκ τούτων πάντα." (*Physics* 188a27-28). What's translated as 'derived' here is merely 'ἐξ/ἐκ'. A more faithful translation would be 'from', and I mean nothing more than that by 'derived'. I chose 'derived' for the sake of smoother English.

⁷ In *Physics* I.2 184b15-22 Aristotle distinguishes between monists like Parmenides and Melissus who understand monism to be a denial of change, and monists like Anaximenes who explain change in terms of a single principle's modifications, in his case the rarity and density of air. Aristotle seems inclined to take such monists to have multiple principles (see 188a18-26). In Anaximenes' these would be air, rarity, and density. For Aristotle's purposes, and for ours, this is a good idea. Let monism therefore be a denial of change, insofar as it posits a single principle which admits of no difference.

from A to C along with B to D (or any such thing). For then A, B, C, and D would have to be our principles, since AB and CD are derived from them. Likewise if we supposed that AB, A, and B were our principles: the complex AB would have to be expelled as something derived. Thus by *reductio*, in whatever respect the principles are underived, they must be simple.

And in order to meet the demands of the second requirement, we might say that a change from not-E to E is derived from a change among the principles. If we are ever in the position of saying that a change from not-E to E is a change not of AB to CD, but just of A to C, then the complex AB or CD cannot be principles. This is because the change from A to C, and thus the change from not-E to E, cannot be accounted for as a change from AB to CD. Thus by *reductio*, in whatever respect everything is derived from the principles, they must be simple.

But it is here, upon our recognition that the principles must be simple, that the Parmenidean steps in. We grant to the Parmenidean that nothing comes to be from nothing, and that there is no coming to be unless there is difference: we have a theory of principles just so as to avoid these problems. But in raising the dilemma, the Parmenidean is telling us also that our principles cannot come to be from one another either (this is premise D), and this because they are simple.⁸ The

⁸ One quick way we might try to make this argument would be to point out that the principles cannot be derived from each other, and therefore cannot come to be from each other. But this might equivocate on the meaning of 'derived' which we must hold fixed only in regard to the two requirements. If a change from not-E to E is derivable from a change from A to B, then the whole (not-E to E) has the relevant relation of derivation to the whole (A to B). A and B do not necessarily stand in this relation, and indeed it's hard to see how they could. Needless to say, any theory of the principles in which 'derived' meant that any E (any non-principle product of a change) came to be directly from the principles couldn't tolerate the principles coming to be from one another in just that way. My point here is just that this argument will only work for some theories and not others. We should look for something with the troubling generality of the Parmenidean dilemma.

Parmenidean will claim that the condition on which the principles have the right kind of priority, namely their simplicity, stands against their being involved in change at all.

There are several ways to make this point, so I'll start with one which is intuitive but apparently narrow, and move on to one which is fairly abstract but has the right kind of generality. Both of these arguments are provided for us by Aristotle in his criticisms of the physical philosophers. This means that Aristotle is the one arguing for D, and thus in support of the dilemma, against the physical philosophers. This gives us some hint as to why he describes his own solution to the dilemma as unique.

The first way to put this point reflects the thought behind the passage from the *Physics* quoted above: it's hard to see how love could change to strife, or make anything out of it, or in any way interact with it. If what is hot is such as to remain hot then it can never become cold. But if what is hot is to be such as to become cold, then there will never be anything hot. If the hot and the cold have something in common which allows for their mutual transformation, then they are complex and cannot be called principles.

This is how Aristotle criticizes Empedocles in *Generation and Corruption* I.1, explaining why Empedocles (and the physical pluralists generally) deny alteration as distinct from coming to be:

The actual words of Empedocles may be quoted in illustration—

The sun everywhere bright to see, and hot;

The rain everywhere dark and cold;

and he distinctively characterizes his remaining elements in a similar manner. Since therefore, it is not possible for fire to become water, or water to become earth, neither will it be possible for anything white to become

black, or anything soft to become hard; and the same argument applies to all the other qualities (314b21-26). Aristotle's meaning here is obscure, but with the help of the passage from *Physics* I.5 concerning love and strife we can make some sense of it. The 'sun' a principle or element, is simple in respect of its role in articulating change: it may be hot, and bright, and fire, etc. but these things can never come apart. Thus, the 'sun' and the 'rain' have nothing at all in common, and are only such as to remain themselves. If the principles must always remain themselves, everything derived from the principles (like white and black or soft and hard) will be changeless too.

This criticism of physical pluralism is repeated in *Metaphysics* A.8 989a19-29 in Aristotle's own voice against Empedocles. We also find it in the voice of Anaxagoras as justifying the doctrine that contrary properties are contained in the same thing, becoming alternately apparent by excretion or emergence in *Physics* I.4 and *Metaphysics* Γ.5.

Thus, it is acknowledged by Aristotle and his predecessors alike that nothing simple can stand to anything else as 'that from which' it comes: what is simple must be such as to be itself if it is to be anything at all, and if it is such as to be itself, it cannot change into anything else. While this seems to have been the most ready and convincing argument by Aristotle's lights, I expect it has somewhat less pull for us. Fortunately, Aristotle has a much stronger and more general argument to deploy, one which will be both more convincing to us, and one which will better reveal the shape of the Parmenidean critique of change.

The second way of putting the point that simples can't be involved in change has to do with the implications of this thesis on the structure of time. The argument

is this: the continuity of time and the changeability of simples are mutually exclusive theses, and time must be continuous if change is to be possible at all. The notion of continuity is fairly intuitive to us: a geometrical line is continuous in the sense that it is infinitely divisible into smaller lines. For our purposes, the relevant aspect of continuity is that between any two points on a continuum, there is always another point.

The argument concerning the changeability of simples and the structure of time is most clearly articulated first in *Physics* VI.4, as a claim that whatever changes must be divisible, and again in VI.10, as an argument against the possibility of simples being in motion. The crucial point in both these arguments is that if something is to be changeable, it must be changeable partwise; it cannot be simple in the respect in which it changes. I'll discuss the argument in VI.4, since it is more directly applicable to our argument.

Everything that changes must be divisible. For every change is from something to something, and when a changing thing is at that-to-which it changes it is no longer changing, and when both it itself and all its parts are at that-from-which it changes, it is not changing...; it follows, therefore, that something of that which is changing must be in that-to-which it changes and also something in that-from-which it changes: for as a whole it cannot be in both or in neither. Here by 'that-to-which' something changes I mean that which comes first in the process of change: e.g. a change from white to grey, not black: for it is not necessary that that which is changing should be at either of the extremes. It is evident, therefore, that everything that changes will be divisible (234b10-21).

This is a difficult passage partly because the remark starting with "Here by 'that to which' something changes I mean..." comes so late and makes such an important point. By 'that-to-which' here we should understand whatever has been accomplished so far in any change, whether this is the complete change or some division of it. The question here is this: what must be true of a thing for us to be able

to describe it as changing? If a thing has completed none of the change and is entirely at the starting point (whether this be a place, a quality, etc.), then the change has not yet begun. If it is entirely in the 'goal' or point of completion, then the change is already over. It cannot be in neither (then the goal will come from nothing), so it must be in both in some way.

This is a confusing way to speak because Aristotle intends a very abstract point, so as to capture any possible sense of having parts. A concrete example will make things clearer. Suppose we have a pot of cold water, and we turn on the stove underneath it. The water will go from being cold to being hot. But in order for us to say that the water is changing, we cannot say that it is entirely hot or entirely cold, nor can we say it has no temperature at all. We might say that it is neither hot nor cold but lukewarm, but remember that Aristotle will then repeat the same question about the change from cold to lukewarm, since by 'that-to-which' he means whatever marks the first change.

The water must then be both hot and cold: by this we might mean lukewarm, or we might mean that some of the water is hot and this is mixed with water that is cold, or any number of things. But one way or the other, the water must be divisible. What is changing, in this case the water, cannot be simple and without parts.⁹

Let's return to the question of principles, so as to illustrate how this argument relates to the Parmendean dilemma. Suppose again we say the principles are hot and cold, and we propose that the hot is to become the cold. At one moment,

⁹ I think that ultimately, there's no way to make sense of something being partly at the end and partly at the beginning without understanding the 'changing thing' to be a temporally extended object (as opposed to an object traversing some extent of time). This is a point for another paper, however. All I need to argue, for the moment, is that changing things cannot be simple if time is to be continuous.

there is the hot, at another, there is the cold. Let's call the first moment α and the second ω , and let's suppose that we're picking out the closest possible pair of moments such that the first pertains to the hot and the second pertains to the cold. What is the relation between these moments? Can they be moments on a continuum?

Between any two moments on a continuum there is a further moment, say β . In β , that which is changing must either be hot, or cold, or neither. If neither, then the cold comes to be from nothing. Is it cold in β ? Then β is more proximate to α than ω and we should ask about the moment between α and β . Is it hot in β ? Then the same will follow between β and ω . In both these cases, we face a Zenoistic problem: it is impossible that there could be both a last moment of hotness or a first moment of coldness, and so the change is unintelligible in just the way that principles are supposed to make the change intelligible.

But couldn't it be both hot and cold in β ? Or at some intermediate? This is an attractive possibility, but as per Aristotle's argument in VI.4, it requires us to deny that the change is between simples. If the changing thing is both hot and cold, then we either have a contradiction or we suppose some distinction of the respect in which it holds both properties. But this is to say that the changing thing is complex. If we suppose that the changing thing is in some intermediate state, then this is either via a mixture of the hot and the cold, or something as simple as the principles. If the former, then we have again posited complexity in the changing thing, since it must be one thing in which this mixture is present. The latter accomplishes nothing, because changing to the intermediate between α and ω , namely β , demands a

further intermediate between α and β for the same reason we needed one between α and ω , and so on. This regress is vicious in the sense that we never get the change from α going: it remains that we can never find both a last moment of α and a first moment in which the intermediate is achieved.

The continuity of time demands an intermediate point β , but in β that which is changing can't be hot, or cold, or neither, or both, or some intermediate. If there is to be a change between these simples, there can be no intermediate moment between α and ω , and this means that time cannot be continuous. Notice however that this criticism of change among simples is specific to the problem of a *changing* simple. There is no problem here with something becoming a simple, only something coming to be from a simple: it is a changing-simple that is a problem, not a simple-that-has-changed. The completion point tolerates simplicity, while no other part of the change does, so long as we insist that time is continuous.

But as soon as we reject the continuity of time, we come into range of the many paradoxes raised by Zeno. In order to make this argument as complete as possible, I would also defend (and show how Aristotle defends) the continuity of time in response to these paradoxes, but I can leave this out for now because the continuity of time is often uncontroversial to the modern reader. If we refuse to give up the continuity of time, then we must give up change among simples. Since principles must be simple, it seems we must therefore give up accounting for change on the basis of change among principles.

So why not abandon the very idea of principles? Aristotle gives us a reason to take the idea of principles seriously in the very first moment of the *Physics*:

We do not think we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements. Plainly therefore in the science of Nature, as in other branches of study, our first task will be to try to determine what relates to its principles (184a11-16).
Notice that Aristotle considers it unremarkable that his predecessors referred to principles as categorically diverse as the greater and the lesser, fire and water, plenum and void, density and rarity, love and strife. And he considers it not particularly remarkable that he should contribute another set of novelties: the privative, positive, and substratum. The principles of change are *whatever* the basic objects of change are, with no presuppositions about the sort of thing this might be. All it means to be a principle of change is to meet the two requirements, and the requirements together are just the demand for explanatory and ontological simplicity. The idea of the principles is nothing other than the idea that explanations must stop at some non-arbitrary point: the point at which they are complete.

We give up on the principles at our peril, and yet they are themselves perilous. Their priority demands their simplicity, but their simplicity makes their participation in change possible. The Parmenidean dilemma is a problem as intrinsic to the idea of first principles as is their promise of firm and substantial knowledge.

I've shown that D is a premise relevant only to change among simples, and its claim is that such change is impossible. I've also shown that D is a premise broadly accepted by Aristotle's predecessors, and by Aristotle himself. So with D, the premise that some X cannot come to be from what is not already itself, we have a *reductio* proof of 4, the premise that some X cannot come to be from what is (whether it is or is not already X). Thus, the gap in the Parmenidean dilemma is closed: what comes to be must come to be from what is or what is not, and it cannot

come from either. If this argument stands, and if we take the idea of principles seriously, we cannot rationally admit the possibility of change. So we need a solution. According to Aristotle, there is only one and he offers us this solution in *Physics* I.5-7.

Aristotle's Solution

Aristotle's presentation of this solution is vexed by the very same tension in the idea of principles and as a result we seem to have conclusive arguments telling us that the principles of change are two, and also that they are three in number. He first argues that the principles must be the primary contrary pair. The primary contraries are not derived from anything else (they are primary) nor from each other (they are contraries) and everything relevant to change may be derived from them since in being plural, they can account for the difference entailed in change.

The contrary pair he identifies as his principles is that logically minimal pair necessary to describe any change: the positive result, and the privative from which it came. So in a change to blue, 'blue' and 'not-blue' are the relevant contraries. This makes Aristotle much more vulnerable to the Parmenidean dilemma than his predecessors. The dilemma concerns change among simples, among principles, and so the strategy of Aristotle's predecessors has largely been to limit the threat of the dilemma by making only some small set, or perhaps only one kind of change a change among principles, deriving all other changes from these and thereby allowing derived changes to escape the dilemma. With the dilemma thus limited, the predecessors could focus on a limited solution.

Democritus is the best exemplar of this strategy, but it's common to all of Aristotle's predecessors (including the Platonists discussed in *Physics* I.9). Democritus derives all apparent changes from changes among simples which neither come to be nor pass away nor alter, but change only in their position relative to one another. Within the sphere of changes among principles, Democritus largely yields to the dilemma, attempting to justify derived changes in terms of changes among principles which seem immune to it, like changes of place. All other changes, such as changes in sensible qualities, are derived from these in such a way that they can be called changes among complexes (e.g. complexes consisting of atoms and their relative positions), and so avoid being directly subject to the dilemma. Anyone choosing this strategy is liable to organize the world as Democritus does, into a set of really real things, like atoms and their position, shape, and organization, and a set of less-than-real things, like colors and other sensible qualities.¹⁰ The latter changes are less-than-real because they're not intelligible on their own terms, since only changes among principles are so intelligible. Thus, insofar as they protect apparent changes from the threat of the dilemma, they also undercut their fundamental intelligibility.

Aristotle's suggestion that the principles are whatever is the result of the change along with its privation is in some sense the refusal of a certain kind of 'derivation' from principles taken up by this strategy. It's in this sense that Aristotle will try to avoid reductionism, but as a consequence, all changes on Aristotle's account are subject to the dilemma directly. One sense in which Aristotle's solution

¹⁰ See *Metaphysics* A 985b4 and following. See also *Generation and Corruption* I.I, 315b6-16 and *Metaphysics* 1009b8-38.

is unique is that it actually attempts to solve the dilemma as it stands, rather than limiting its significance to some small sphere of changes and yielding to some or all of its conclusions therein. As an aside, one of the best ways to relate our own views on nature to the problem of the principles and their distinctive dilemma is to understand this as one of the motivations for our profitable reductionism.

Aristotle then finds it necessary to introduce a third principle, the substratum. His primary consideration for this, as I've said, is D, the conclusion that simple contraries cannot directly come to be from one another.¹¹ There are several difficulties in positing the substratum as a principle, but I'll focus on the one relating to D directly, and this has to do with the role the substratum plays in change as described in I.7

The principles Aristotle presents to us in I.5-6 are the contraries and the substratum. The contraries are the positive thing into which something changes, and the corresponding privation. As a block of wood is exposed to sunlight, it becomes pale from not being pale. Pale is the positive contrary here, and, simply enough, not-pale is the privative. The substratum is that which has undergone the change, the block of wood itself. The block of wood goes from being a not-pale-block to being a pale-block.

The difficulty, as I said, is in the number of principles. In one sense, there are three principles: the substratum, the positive, and the privative; the block, pale, and non-pale. But in another sense there are two, since these only participate in a change insofar as they appear in a pair of complexes, namely privative-substratum

¹¹ *Physics* I.5 189a22-27, as quoted above.

and the positive-substratum; the non-pale-block and the pale-block. In other words, in order for the substratum to do any work in allowing for change between contraries (which cannot be direct, but must go through something like a substratum, given D), the substratum must always be a part of a complex. Taken as three, the principles are simple and satisfactorily underived. But in order for anything to be derived from them, they must go about in complexes.

So insofar as anything is derived from the principles they must be two, but complex. If they are complex insofar as they are involved in change, they are derived from something else, namely the simples. We cannot settle on the three simples as the principles, since they do nothing to explain change as simples (nothing can come from a simple), and we cannot settle on the two complexes as the principles, since while they may be involved in changes, they are not themselves underived. We can therefore can't definitively say how many principles there are. Ultimately, we have both three and two. Ultimately, the principles are both simple and complex.

Having completed his account, ambiguities and all, Aristotle says that this view of the principles is the unique answer to the problem of Parmenides. Since the changing thing is complex (like a non-pale-block and a pale-block), Aristotle can make a distinction between unqualified non-being, which is fully nothing, and qualified non-being. The non-pale-block is a non-being insofar as it is not some specific being, namely, not pale. But it is still a being insofar as it is a block. So the pale-block comes to be out of what is not pale (which is non-being enough to account for a change) and what is a block (which is being enough to prevent the ex nihilo problem). This avoids Aristotle's argument concerning time, above, because

the substratum, the block, can be both at the starting point and at the ending point of a change. Aristotle has given us license to reject D, and so to cut our way through the Parmenidean dilemma.

The basis of Aristotle's solution, therefore, is having a way to talk about changing things, *all* changing things, as complex. This complexity I will call 'ontological complexity', and I mean to refer to vaguest and broadest idea that something may be both one and many. Aristotle's specification of this idea, for present purposes, is the complexity involved in the joining of a pair of contraries to a substratum: as matter and form in the case of generation or as substance and predicate in the case of motion, growth, and change of quality.

The Parmenidean Reply

But the Parmenidean has a rejoinder: even if complexity makes change possible, how is complexity possible? If a block is both pale and a block then it's not one but two things. Being pale and being a block aren't the same, so what makes them one? And since to being a block is not the same as being pale, the pale-block is different from itself. The pale-block is not just two things rather than one, but different things than must somehow be the same thing.

And it just gets worse from there: what on earth is a non-pale-block? It must be some kind of complex consisting of a block and the non-pale. But non-pale is not a thing on its own. Aristotle has no recourse to his notion of complexity here, so as to say that the non-pale is only a non-being qua something or other, since 'non-pale'

was supposed to be one of his simples. The non-pale, on its own, isn't anything and so can't contribute to any sort of complex.

Further, if the changing thing is the substratum, then there's no change, since this is posited as that which persists through the change. So the changing thing must be the complex. But the complex non-pale-block is *qua complex* annihilated in the course of the change, and the new complex, pale-block, seems to emerge from nothing. The problem that arose in thinking that simples could come to be from one another emerges again here.

If we suppose change to be a matter of relations, that the block ceased to be related to the non-pale and came to be related to the pale, then Parmenides will raise the same problem about the relations themselves: did they come to be out of what is or out of what is not...?

Aristotle briefly mentions in I.8 that his solution to the Parmenidean dilemma can also be understood in terms of actuality and potentiality. Since there is only one solution, this must be a different articulation of what was given in I.5-7, not a different solution altogether. And the Parmenidean would have a similar rejoinder here: the idea of potentiality is always going to involve the idea of ontological complexity. Aristotle himself delivers this rejoinder against his own theory in *Generation and Corruption* I.3 317b13-33. If substances come from non-being in the sense of what is actually non-being but potentially being, does the merely potential being have a place? a time? a quantity? If so, then are these properties actual or potential? If actual, they float free of a substance, and if potential then it seems the potential being isn't actually anywhere at all. We have to suppose something can

both be Y actually, and not-X actually while being X potentially. But how are all these different (even contradictory) properties to inhere in one and the same thing?

If Aristotle wants his unique solution to work, if, by his lights, there is any solution at all to this problem, it must not only show us how change is possible, but how the complexity relevant to change is possible. This account of complexity must show us how the parts may be ordered as substratum and contrary within the whole changing thing.

Finally, we should notice that this isn't just a problem for blocks of wood. This is a problem about *beings*. Parmenides' argument is an attack on the complexity of beings, and so on the complexity of thoughts. For Parmenides, the only true (thus, the only real) thought is the simple thought 'it is'. The Parmenidean problem, and Aristotle's solution, is as much about the possibility of discursive thought as it is about changing sensible objects.

If, persuaded by these Parmenidean doubts, we refuse to grant ourselves the thought of straightforward ontological complexity, we doubt the thesis which grounds Aristotle's solution to the problem of change. So the question we are left with is this: how is ontological complexity possible?

These arguments probably shouldn't convince us that these problems are unsolvable, perhaps not even that we don't have solutions to them. The aim of these arguments, like the aim of Aristotle's argument in *Generation and Corruption* I.3, is to show us that the solution to the Parmenidean dilemma is far from a mere sorting out of logical confusions, or admitting of some commonsense complexity of predication or of terms like potentiality and actuality. We don't yet know what these

kinds of theses involve insofar as they posit or presuppose ontological complexity.

That's apparent from the fact that they're no less open to the Parmenidean attack than the views of Aristotle's predecessors. Whatever Aristotle has given us in *Physics* I.5-7, or by way of his allusion to a doctrine of actuality and potentiality, whatever sort of solution this may in the end be, it is not yet enough.