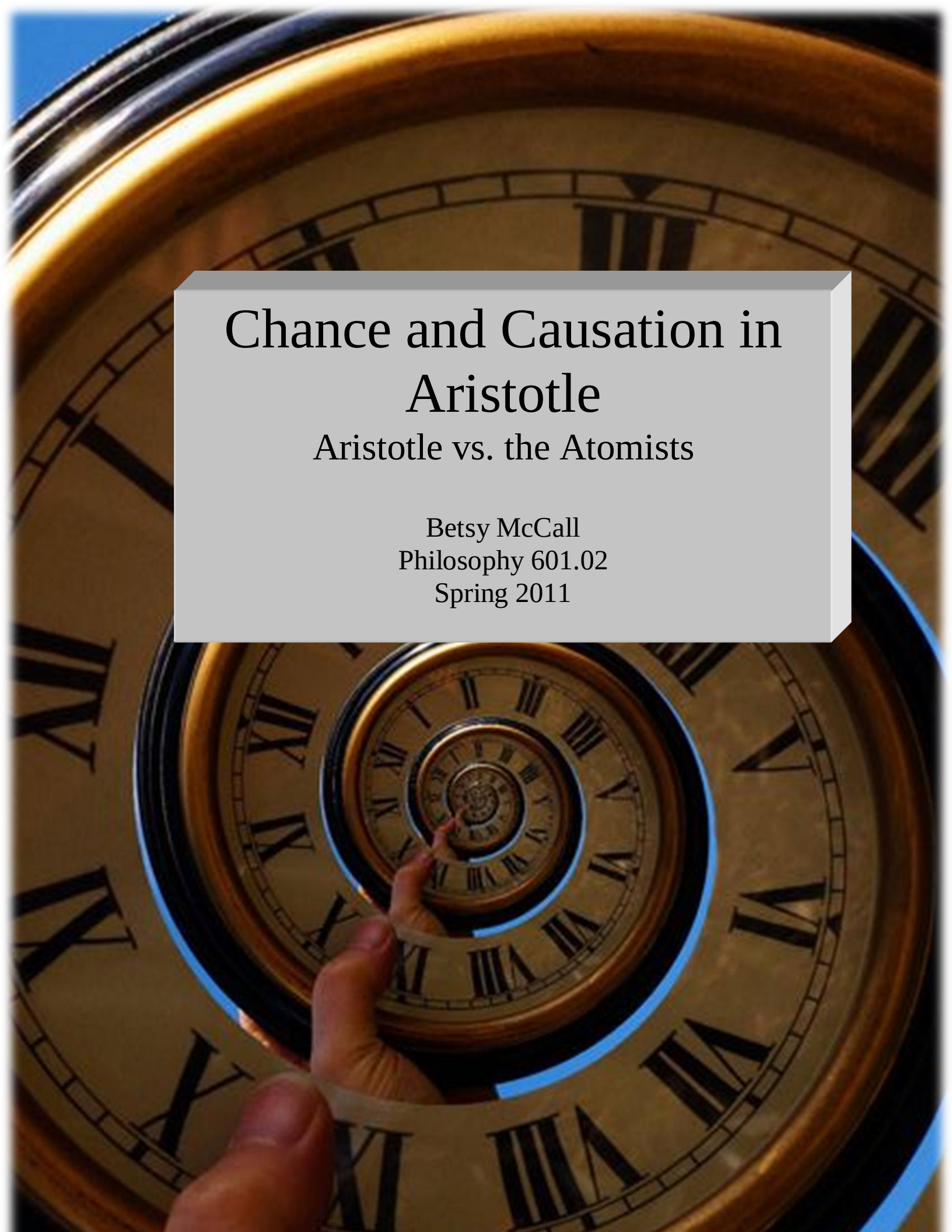

Chance and Causation in Aristotle

Aristotle vs. the Atomists

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Introduction

It will come as no surprise to anyone who knows me that once upon a time, in my wild youth, I debated the willfully ignorant and defended science against crazy beliefs like creationism in Internet forums. I stopped eventually, in part because my life became too busy, but also because it became abundantly clear to me after a time that there simply is no way to persuade people with such beliefs, when their last line of defense is that "I'm not related to no damn monkey!" as my grandfather used to say. It is not rational debate they seek, but merely to pretend to a kind of "knowledge" that makes them feel superior to others when it isn't warranted. Two people shouting at each other, only one with the capability of being reasonable, and only one side with actual facts to debate, is a fruitless activity in the long run. It's a good way to learn the arguments for a time, but since the arguments never change, eventually, it's time to move on.

Ah, but you may be thinking to yourself about now, gentle reader, what in blazes does this have to do with Aristotle?! I'm coming to that. It became clear to me how they were related reading Lindsay Judson's *Aristotle's Physics: A Collection of Essays* (1995). One of those essays discussed the role that chance plays in Aristotle's scheme of causation. Peculiarly, it made me think about those days of debating creationists. There was a very common claim made about the "impossibility" of evolution because it relied on chance. The claim took on a number of variations, but one very common version went that evolutionary theory was saying, essentially, you could take a big pile of parts (in biology, chemicals and proteins, but in the analogy nuts and bolts, and little electronic gadgets) and jumble them up in a giant Yahtzee dice

roller, but when you spilled everything out again, what suddenly emerged was not a big pile of junk, but a fully formed airplane, a jumbo jet no less. The point of the argument, if you can call it that, is that chance can't play a role in creating life, no more than it can play a role in building jumbo jets out of junk; therefore, there must be a designer, just like jumbo jets have designers. Unfortunately, what this claim is arguing against is not, in fact, what evolutionary biologists are saying at all. Even in the design of human built jumbo jets, the process is not without the involvement of chance. Jet engineers aren't bred. Technological innovation isn't planned. And so there are many components in that jet that are the product of some sort of chance; the useful bits are retained, while the ones that lead to dead ends are discarded. Evolution doesn't assert that human beings were created from some Yahtzee jar fully formed like Athena from Zeus' skull, but only that chance plays some role in variation, and then the laws of nature take over: some die, some live, and those that are better at producing grandchildren take over from those that can't. When creationists and evolutionists debate, they end up talking past each other because they use words to mean different things, and no matter how many times the scientist says "That's not what I mean at all," the creationist just keeps on insisting that is. Creationists are willfully, or through ignorance, committing a fallacy of equivocation because they don't understand or refuse to accept the way that scientists talk about chance and random events. If they did, they'd have to come up with new and better arguments, but as we will see with Aristotle, there are no new arguments in this millennia-old debate.

It's on this point that I began to wonder how much of the debate between Aristotle and the Atomists was likewise based on a misunderstanding of the word "chance" as it's used by the two sides. Problematically, we have nearly nothing from the Atomists directly, and know only about them as they are quoted or described (primarily) in Aristotle and other authors. I wouldn't

want to try to piece together the story of evolution from creationist counterarguments, but this is all we've got.

I

What is chance? This is part of the question we need to address up front because my modern conception of chance is almost certainly not what Aristotle is talking about. The word he uses which normally gets translated as "chance", αὐτόματον[1], is the source of our English words automaton, and automatic. I'm going to ignore Aristotle's bit of folk etymology in the *Physics* because it's incredibly wrong, but his main point is that "chance" events happen by themselves, without the intervention of agentive or purposive forces. They are things that we cannot plan to happen, in the way that we can't plan to be under meteor when it falls to Earth. These things don't happen at predictable intervals, and so planning to be hit by a meteor is impossible. The Oxford translation, however, prefers to use the term "spontaneity" and its cognates for this word, at least in the passages of the *Physics* (II.6, II.8) that I'll be focusing on. This seems to better capture what Aristotle is driving at.

Aristotle uses another word for events that are unplanned, but could be so because they involve purposive agents: τύχη, usually translated as "luck", but also "fortune", or more confusingly, also chance (the Oxford translation uses "chance" here). The kind of events that are meant here are things that happen "by chance" but which involve rational choice, events that

[1] All Greek words and passages will be taken from the W.D. Ross text and commentary (see bibliography for full citation) unless otherwise noted.

could be planned to occur, but did not occur at that moment. For instance, someone throwing a javelin and accidentally hitting and killing a passerby. The javelin thrower could have planned to throw it at the man, but didn't. The man could have planned to walk in front of the javelin, but didn't—consider the modern phenomenon of "death by cop". But in this particular instance, neither agent planned for this particular event, but because of a confluence of events, the man just happened to be standing in the wrong place at the wrong time. Hence, Aristotle says in the *Physics* at 197b:

> *Hence, what is not capable of action, cannot do anything by chance* [luck]. *Thus, an inanimate thing, or a beast or a child cannot do anything by chance* [luck], *because it is incapable of choice, nor can good or ill* [fortune] *be ascribed to them, except metaphorically...*[2]*(197b)*

The issue is more complicated working from translations because different translators make different word choices.

Aristotle's purpose in drawing this distinction here is to serve the needs of his teleological philosophy. The distinction between those things that are animated by a purpose, at least sometimes, and those things that are not, is crucial to arguing for that goal. However, this strikes me a bit like putting the cart before the horse. That this distinction is important in a teleological view of the cosmos, of course, is clear, once that is established. But is Aristotle arguing for that viewpoint by creating an artificial distinction that serves that end, but is not warranted otherwise?

To make matters more complicated still, Aristotle tells us that αὐτόματον and τύχη stand in a kind of subset relation to each other, with all things that are the latter also being cases of the

[2] All translations taken from the revised Oxford translation published by Princeton (see bibliography for full citation) unless otherwise noted.

former: things that happen by "luck" are also "spontaneous", but spontaneous things are not necessarily lucky (*Physics*, 197a)—compare, natural numbers to integers (all natural numbers are integers, but not all integers are natural numbers). By this, it appears that he is appealing to the "unplanned" component of αὐτόματον. Both types of events are unplanned in actuality, but τύχη events could be planned potentially. If that is the case, though, Aristotle uses αὐτόματον to refer only to things that *cannot* be τύχη, suggesting that what he really intends is for the relationship to be mutually exclusive, as with rational and irrational numbers. And later, he reinforced this exclusivity relation by saying:

> *...for when anything comes to be contrary to nature, we do not say that it came about by chance* [luck], *but by spontaneity. Yet, strictly, this too is different from the spontaneous proper; for the cause of the latter is external, while that of the former internal. (197b)*

Both of these relations can't be true unless Aristotle is equivocating on the definition of αὐτόματον. However, let us suppose he is speaking colloquially in the first instance, and then settles on the distinction he would like to draw in the second. This is the most charitable interpretation. Whether the distinction is justified remains to be seen.

II

Why all this discussion of chance in the first place? Aristotle is trying to respond to philosophical positions put forward by the Atomists, whose worldview he rejects. He is

responding to the Atomists in a number of books, not just in the *Physics*, and he seems very concerned to demolish their positions in as many ways as he can. We can't look at all of these here, but let's consider for a moment what the Atomists say about chance.

Aristotle discusses motion among the bodies in the universe in *On the Heavens*. Here he describes his understanding of the Atomists' position. He seems to be saying that the Atomists claim that in the beginning of the universe, the atoms were in disorderly motion. He describes this motion as violent and unnatural (300b-301a). The Atomists seem to have been arguing that interactions between bodies (atoms) occurred according to chance encounters with other bodies. In attempting to counter this position, Aristotle appeals to several features of his philosophy, including the notion of the Prime Mover, and his metaphysics, asserting that only some kinds of motion are "proper". Indeed, he says:

> *Again, disorderly movement means in reality unnatural movement, since the order proper to perceptible things is their nature. And there is also absurdity and impossibility in the notion that the disorderly movement is infinitely continued. For the nature of things is the nature most of them possess most of the time. Thus their view brings them into the contrary position that disorder is natural, and order or system unnatural.* ***But no natural fact can originate in chance.*** *(emphasis mine) (301a)*

One thing that is particularly interesting about this quote to me is the idea that order and system are mutually exclusive phenomena. It's impossible for me to completely remove myself from the perspective of modern physics. Considering a system like a star, that is ordered, with large-scale structure, and yet on the small scale, violently disordered as atoms smash together, some forming new elements, some not. Photons are doing a random walk to escape the interior

of the sun and stream at a fantastic rate into space. And it's something Aristotle might have noticed, even looking at human society, another example of smaller scale "chance", but larger scale order. Human societies don't—and really it's not feasible to attempt to—plan and coordinate all activities within in the state to achieve a more optimal outcome for society. Yet with a few basic rules, individuals mostly working alone, and occasionally interacting with others according to these basic rules, the society manages to function smoothly. In order to insist that this analogy just isn't adequate, Aristotle must draw the distinction between the activities of purposive agents and those things which are not. In this way he can insist that societies can function this way, but mindless atoms still cannot.

Aristotle also appeals to a special definition of "disorder": if disorderly things are only those things that are in violation of systemic processes, then the Atomists calling the motion of atoms disorderly makes no sense (according to that definition of disorderly). This does not seem to be the meaning Atomists intend. (Taylor, ftn. 73) By relegating chance events to a part of physics that is disorderly, and thus not "always or for the most part", Aristotle can relegate chance events to non-events, events worthy of no account at all, and he can choose to ignore them. He can insist that physics simply no longer applies, and therefore claim that the Atomists are committing a contradiction. But this is a mere straw man.

In this same section, Aristotle's anti-Atomist argument also relies heavily on another contrast: that of "natural" motion vs. "violent" motion. Motion that corresponds to matter moving toward their proper place as his philosophy says they most do is deemed to be "natural". Violent motion, such as objects striking each other, is the opposite of this, and must be caused, apparently by some agent, and is thus *un*natural. Atomists would surely reject this point of view outright. They would reject the claim that violent motion must be caused by an agent, and likely,

all the rest of Aristotle's argument as well. It's possible that two different uses of the word natural are at work here as well. Aristotle wants it to mean that something is behaving *according to its nature*, while Atomists are simply arguing that this motion occurs *in Nature*. When a rock falls off a wall, it strikes the ground in a violent motion, and even Aristotle argues that this is a spontaneous event, but not violent because it wasn't caused against the nature of the rock to fall to Earth (since it's in the nature of the rock to move closer to the center of the Earth). (Hankinson, 136)

The Atomists themselves may have been somewhat equivocal about chance themselves, as least as interpreted by their critics. Chance events play a central role in the Atomists picture of how atoms interact, but their view is also deterministic. Events are random in the sense that, since we don't know the starting positions of all the atoms in the universe, it's impossible to foresee what will happen precisely—unknowable in practice, but not in principle; however, the atoms interact according to particular rules, and so if we did know what they were doing, their motions would be predictable from that point on (Taylor, 188). This view is completely compatible with Newtonian physics. But if it is deterministic, it leaves little room for choice, by us (or the gods). Some sort of notion of human choice, or free will, or some similar notion, is central to our conception of humanity as rational beings. It's possible that this is the source of concern for those who reject Atomism (and other impersonal scientific views), but it's not clear what the Atomist position on this was.

Let us return to the *Physics* and consider Aristotle's argument for a purposive universe.

III

In *Physics* II.8, Aristotle discusses the role of final causation in Nature. To be clear here, final causation among people is the reason for doing the things we do, or, put another way, the goal we are trying to accomplish by doing something. The final cause for going to school is to do a particular job or work in a particular field, for instance. With agents like people, final causation makes sense because we do do things to achieve certain ends. We make decisions about means depending on what we want to accomplish. But does this notion of final causation extend to Nature? Aristotle thinks so.

> *We must explain then first why nature belongs to the class of causes which act for the sake of something; and then about the necessary and its place in nature, for all writers ascribe things to this cause, arguing that since the hot and the cold and the like are of such and such a kind, therefore certain things* necessarily *are and come to be… (198b)*

In the passages that follow, Aristotle is also going to attack the kind of deterministic view espoused by the Atomists, as well as its impersonal, purposeless character. This chapter is one of those places in Aristotle where the similarity with the arguments I've had with creationists cannot be more clear, and very likely, once upon a time, this is their ultimate source.

Aristotle goes on to say:

> *Yet, it is impossible that this* [Atomism] *should be the true view. For teeth and all other natural things either invariably or for the most part come about in a given way; but of not one of the results of chance or spontaneity is this true. (198b-199a)*

Aristotle is here returning to his definitions of what is "natural" and what is not. Things that are natural are those things that occur "always or for the most part". Things which occur by chance, or spontaneously, are by his definition, not natural, since they make up only the exceptions. Nature is orderly; chance is disorderly. Not a claim the Atomists would subscribe to, but let's see where this is going. Aristotle continues where left off:

> *We do not ascribe to chance or mere coincidence the frequency of rain in winter, but frequent rain in summer we do; nor heat in summer, but only if we have it in winter. If then, it is agreed these things are either the result of coincidence or spontaneity, it follows that they must be for the sake of something; and that such things are all due to nature even the champions of the theory which is before us would agree. Therefore action for an end is present in things which come to be and are by nature. (199a)*

"If it is agreed…" then the Atomists have conceded their position, and they are unlikely to agree to Aristotle's assertion here. So, why don't we ascribe hot summers to coincidence? Because they are part of a pattern, and we don't think of patterns as being coincidental. But does that mean they are purposeful? Is it hot in the summer for a reason? And if we answer in the affirmative, what do we mean by "purpose" in this case? Do we mean an efficient cause (the planet is tilted toward to the sun at that part of the year more than another) or do we mean a final cause (Nature wants it to be especially warm because Persephone is in the underworld, or whatever). Plants grow during the rainy season, but is it raining *in order for the plants to grow*, or do plants grow at that time *because it rains then* and if they grew at another time they'd die? The former claim can only be made sense of in a purposeful universe where Nature can do things for some final cause. The second interpretation does not require purpose in that sense. Which is

the correct interpretation depends crucially on which of the two phenomena came first, which is the more fundamental. Without that information, which you choose is liable to depend on your preconceived notions of Nature. Aristotle must presume that plants preceded the rainy season that it rains to serve the needs of the plants, that in some fundamental sense life, the "soul", is more fundamental than substance, and so Nature acts on its behalf.

Aristotle then drives home his point with the same sort of "painting implies a painter" analogy that creationists today are so fond of.

> *If, therefore, artificial products are for the sake of an end, so clearly also are natural products. (199a)*

He goes on to describe several examples, but the leaves growing and spiders building webs and such cannot be evidence of what he wants to prove. These arguments are only persuasive to those who are already disposed to agree with Aristotle.

Aristotle returns to the discussion of chance at the end of this chapter, in an attempt to attack directly the Atomist claims:

> *The end and the means towards it may come about by chance. We say, for instance, that a stranger has come for that purpose, though it was not for that that he came. This is accidental, for chance is an accidental cause, as I remarked before. But when an event takes place always or for the most part, it is not accidental, or by chance. In natural products the sequence is invariable, if there is no impediment.*
>
> *It is absurd to suppose that purpose is not present because we do not observe the agent deliberating. Art does not deliberate. If the ship-building art were in the wood, it would produce the same results by nature. If, therefore,*

purpose is present in art, it is present also in nature. The best illustration is a doctor doctoring himself: nature is like that.

It is plain then that nature is a cause, a cause that operates for a purpose. (199b)

We are coming up again against Aristotle's own distinction between those things which are "natural" and those things which occur by "chance". He is defining them to be mutually exclusive. By definition, in Aristotle's view, chance things are not natural. It's convenient for Aristotle's argument that such things be so, but it's really not legitimate to define away your opponent's key terminology in order to undermine their position. One can't redefine an electron differently than the physicists in order to prove it can't logically exist.

It's curious that Aristotle argues that if we don't observe something, we can't presume it doesn't exist. This is shockingly anti-empiricist. One would think that he would be the one demanding evidence before leaping to any conclusions. Absence of evidence may not be evidence of absence in some strict sense, but it certainly can't be considered proof that the absent thing really does exist. But if Nature is purposive, then we run into a problem. If we consider the distinction between αὐτόματον and τύχη, it would have to seem that perhaps there is no such thing as αὐτόματον at all; even natural things would have to be τύχη. If Nature if purposive, then Nature can, in theory, do things for a reason; and failing to do something for a reason in a particular instance, when purpose is possible, is τύχη. Whereas, Aristotle tries to make it quite clear, that αὐτόματον can only apply in his usage to situations where purposive decisions *cannot* be made, making even the stone falling off the wall an example for where a decision could be made, by Nature.

Conclusion

Whatever the merits of Aristotle's argument, what is pretty clear is that the Atomists Aristotle is arguing against and Aristotle himself are scarcely speaking the same language. The Atomists claim that chance is inherent in natural behaviour, but Aristotle insists natural behaviour and chance are mutually exclusive. The Atomists claim that while chance underlies the natural interactions of atoms, nature is deterministic in a mechanical sense; if we know what the laws governing the atoms are, and what they are doing at some point in time, then we can predict what happens next. On the other hand, Aristotle rejects determinism and embraces a purpose to Nature. This is the same debate that goes on today between creationists (or even those advocating the milder intelligent design "theory") and evolutionists, and many of the arguments, like the painting analogy, are exactly the same, though a few modern technological metaphors have been extended. Indeed, it's probable that modern debaters are heavily influenced by their ancient predecessors.

Just as it is hard for me to be charitable to creationists who misrepresent evolution in order to debunk it, it's also difficult for me to take Aristotle's anti-Atomist position seriously when he has such a difficult time representing it fairly in his counterarguments. But it is also interesting to speculate on what Aristotle might think of modern science, where, through the use of statistics, we can take chance events and transform them into "always or for the most part" laws, through the use of averages and other measures of general properties. The Atomist position was almost certainly not this sophisticated, but their position was so different from that of Aristotle's that they clearly would not be persuaded by his characterization of their position,

or his rhetorical sleight-of-hand. But, then Aristotle was probably not expecting to persuade them, so much as others in the Greek world would had grown up with gods and man's special place in the world, and who were not yet ready to give up on a purposeful universe.

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