

So Galileo claims that, against Aristotle, matter doesn't strive left to itself. It's inert; it just continues in a uniform state of motion until acted upon by a force. So the sledge will just keep going in a straight direct straight line at the same speed, unless acted upon by force. It is, of course, acted upon by two forces: air resistance and friction with the ice, so it eventually slows down.

Crucially, the heavenly bodies are not composed of a special kind of different stuff. It is not true that the moon and Jupiter and so forth consist of perfect ether, quite different from anything on the world. No, Galileo wants to say the moon is made of rock, just like the earth. It's got mountains and valleys and all the rest. It's made of ordinary stuff, subject to the same laws. But why then does the moon orbit the earth, and why do the planets orbit the Sun?

Okay, you've got a problem here. I mean, the sledge seems fine, all right? Constant direction, constant speed until acted upon by a force. And Galileo is saying Aristotle's got it wrong. The natural motion of a physical thing, something made if you like, the earth. The natural motion is not towards the center of the earth. The earth's natural motion is just to keep doing what it's currently doing. It's just inert. It carries on doing that until something acts on it to change it.

Fine, now explain why the moon orbits around the earth. Because here's the earth, here's the moon. According to Galileo, the moon's made of the same kind of stuff. Why doesn't it just keep going in a straight line? Why doesn't it, when it's traveling in this direction, just keep on? It doesn't. Why?

So a big problem remains. Enter René Descartes, commonly known as the father of modern philosophy. Certainly an fundamentally important philosopher of the period and of enduring importance. You'll be reading Descartes' Meditations at some point. You will be reading some bits of it for this course, and I hope you'll read the whole of it because it's a good read. It's one of the best-written works of philosophy probably ever written.

Well, he attacks the Aristotelian tradition. He uses, in effect, the skeptical problem of the criterion. He opens his discussion through skepticism, raising these skeptical problems and says the only science worth of belief is one that can withstand skepticism. Why does he do that? Well, the main reason, I think, is to kick the Aristotelian tradition into touch because his main opponents would be people who would be appealing to Aristotle. So Descartes says, well, it's no good giving me tradition. I've got to have something that will withstand the arguments of the skeptics. Just appealing to tradition doesn't do that.

He builds on Galileo's mechanical philosophy, as we'll see, but he makes room for mind. So he goes along with Galileo when he comes to the physical world. The physical world simply consists of bits of matter bashing into each other. But he says the mind is different. The mind is immaterial. It's not matter, and it's quite distinct.

A very, very quick summary of his epistemological approach: he's looking for a reliable basis for knowledge that can withstand the skeptical arguments. He famously comes up with this claim "I think, therefore I am." He says at least I can be certain of that. I can be certain of my own existence, I can be certain of my own thinking. The skeptics can't destroy that. What is it about that that makes me so certain? Ah, I clearly and distinctly perceive that it's true. Okay, so it looks like we can rely on clear and distinct perception.

Then he goes on and gives an argument for the existence of God, which he claims is clearly and distinctly perceived. And then he concludes that because God exists, God must be perfect. God cannot deceive us; therefore, he must have made us in such a way that our faculties are reliable if we use them properly. And he advocates a method of using them properly, and he did actually use this method or something like it. He put a lot of effort into natural science. He was the first person to explain how the rainbow works in detail. He discovered coordinate geometry. So at school when you were learning about x and y coordinates and they were called Cartesian coordinates, that's after Descartes. He suggested the circulation of the blood, which we normally associate with William Harvey. He concluded that the Earth orbits the Sun. He was reluctant to publish that because Galileo, having said that the Earth orbits the Sun, was condemned by the Roman Catholic Church and punished. So Descartes actually suppressed his work in which he was arguing for the same thing. But the most important intellectual legacy of Descartes is really this ideal of a mechanistic science of the world based on the simple mathematical properties of extended matter.

So effectively, what he wanted to say was we can understand the world not in terms of Aristotelian strivings, but in terms of simple, inert matter. Simply consisting of extended stuff, spatially extended. And all the real qualities of matter, according to Descartes, follow from that essence. The laws of motion, Descartes claims, can be known simply by seeing what follows from the essence of matter. If matter is just extended stuff, then we can see why one bit of extended stuff cannot move without pushing other extended stuff out of the way. If matter just is extension, then you can't have two bits of extension, as it were, overlapping. We can see why bodies are passive, why they remain in the same state unless a force is applied. Because there's nothing in the nature of extension, just geometrical extended in space, that implies any activity. So apparently, the passivity, the inertia, can be explained.

Of course, there are some qualities of matter that don't seem to follow directly from its nature as extension. Color, for example. When we look at something and we see it as red or green or blue. Yeah, but that's actually not really a property of the matter. It is to do with the interaction between it and our visual senses. So color is a secondary property. It's not a real property of matter, in a certain sense. It's due to the sensory interaction between us and the matter.

Again, mind is quite distinct. Mind for Descartes is completely different from matter. Its essence is thinking rather than extension. Since matter's essence is extension, non-material extension is impossible. Think about that. Descartes is saying the essence of matter, what really constitutes matter, is just extended, missing space. Now, that means wherever you have extended, missing space, you must have matter. You cannot have an empty space devoid of matter. There can be no

such thing. Extension just is matter. It follows that the whole world is what we call a plenum. It's full-up. There are no gaps.

Now think about what that implies about motion. Suppose you've got a bit of stuff here, it's moving downwards. Well, we cannot have empty space, so if that's moving downwards, the stuff below it has to move and the stuff above it has to move down to fill in the respect. Right? So it follows that all motion must inevitably take the form of a circuit, a vortex. That's the only way you can have motion within a world in which the essence of matter is extension. So there is no empty space. It follows that everything that happens in the physical world, all the motion that happens, must be a series of vortices, whirlpools, one within another, within another, and so on.

Ah, we have that problem about the planets. Why don't the planets shoot off into space? Got it. There's a vortex, a vortex around the Sun, and the planets are carried round in that vortex. And then there are revolts around the planets, which carry their satellites around them. So the satellites of Jupiter, and there's a vortex around the Earth that carries the moon around the Earth, and so on. So Descartes ends up with a rather nice, neat physical theory, and certainly a very effective challenge to Aristotle. He has the makings of an account of the physical world which looks much more explanatory than Aristotle's, much more amenable to mathematical calculation. And he's got an account of the mind which makes it quite separate from the physical world.