Transcript: Philosophy VIDEO 2.3 – Wanderers: Is There A Pattern?

What is a mathematical expression for the motions of the wanderers?

That was Plato's question. So I said at the end of the last video.

Wanderers?

He means the planets.

Our word planet is Greek for wanderer. Mars and Venus. They move. The other stars stay fixed. That's weird. What gives? Can we provide some math formula that explains it? Or describes it? By the way, it wouldn't surprise me at all if some Babylonian astronomer asked first, but I don't have a name. So we'll give Plato credit.

Well, it was a long time before anyone gave any good answer to this best question ever. But, when it showed, it was worth the wait. Inspired by Copernicus' bold, heliocentric model for the solar system (which we only even call the solar system because Copernicus was so very right), Johannes Kepler formulated three laws of planetary motion, first publishing in the early 1600's. So it took about 2000 years to answer Plato's question.

Then, less than a 100 years later, Sir Isaac Newton dramatically expanded the scope of Kepler's result and refined it, giving us his laws of motion and universal gravitation. In short, Newtonian mechanics. I'm going to assume you have heard of it.

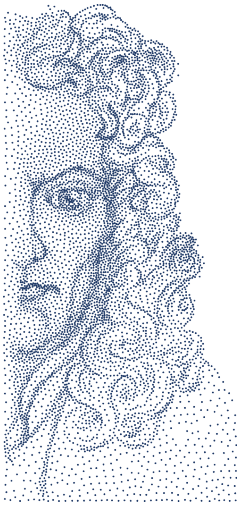
Physics marches on. Newton wasn't the last word, as I'm sure you know, but Newtonian mechanics was a huge big deal. Our concept of the kind of thing physics is still runs on rails laid down by Newton. So Plato's question, which led to this, was a good question

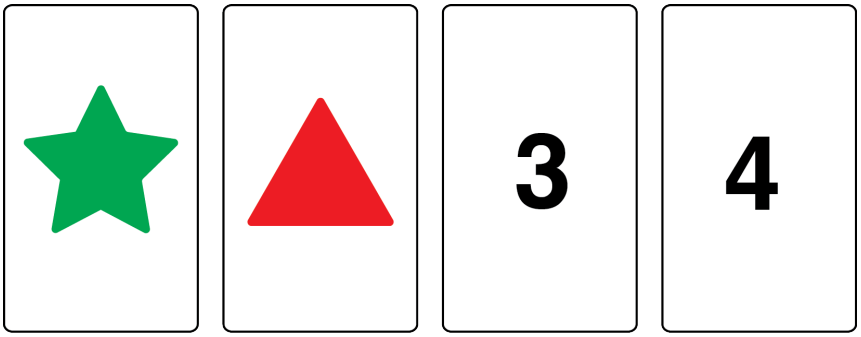
Plato gets zero credit for the answer. He and his students didn't find any good answer. Does he get half-credit just for the question, because it was so-so smart? I mean: assuming he even asked it. Which we don't 100% know for sure that he did. But let's suppose. Suppose he asked for the kind of thing Kepler and, later, Newton finally provided. How much was just the question worth?

To answer a question with a question: was Plato in a position to know how good his question was? Or was it just a guess, a shot in the dark of the night sky? Plato liked math, and we—who know the history of physics—know that seeking to marry the power of mathematics with the workings of the solar system is an awesome, winning

research strategy.

But, like I just said, it was only Newton's astounding success that convinced people that cards with stars on one side are likely to have simple, elegant math on the other side, as it were. You see what I did there. It turns out my apparently arbitrary card rule was secretly a metaphor for Newton's great insight! The universe is like a card, face up, that has orderly number on the hidden face.





Newton wasn't the first to think so. Plato thought so. Other ancient thinkers did, too. Galileo was very loud about it. The book of Nature is written in the language of number, he said. So when we put Nature to the Question, as Bacon says, the answers come back in math.

Fulfilling this long-standing hope for math answers, out of the Book of Nature, was Newton's great achievement. Mere hope is not a plan, let alone a proof. So we can't just assume Plato knew already that obviously there's got to be some Newton-style answer. No, before Newton, I say it was not rationally self-evident that Newton-style answers were the Next Big Thing.

How could Plato know that there was some simple math formula to explain the motions of the wanderers.

Note the importance of adding that verb: explain. Why is it important? For one thing, because maybe you could even find a simple math relation but it still wouldn't explain a thing. How not? Sadly, the world is full of people bound and determined to see significance in striking, often simple relations that are probably not significant. Sun spots and the stock market. Astrology, as opposed to astronomy. Let me give you an amazing fact that recently came to my attention. (There's this thing called the

internet. You would not believe the stuff you find there. OK, here goes.)

The speed of light through vacuum is **299,792,458 m/s.**
The Great Pyramid of Giza is to be found at geo coordinates **29.9792458, 31.134658**.

Use Google to verify both of these facts. They are true. And that's a darn simple math relation. The speed of light and that first geo coordinate are identical—well, except for the decimal point.

I'm not saying it's aliens. But it's aliens.

No, seriously, I'm not going to argue about it, but I'm gonna go out on a limb here and declare this is probably without scientific interest. I'm not saying it's aliens. I'm saying it's not aliens.

Just pointing to numbers—even real ones—doesn't guarantee you are a scientist, as opposed to a crank.

Let me tell you a personal story. Not only am I old enough to remember when there was no internet, I'm old enough to remember when there were video stores where you rented VHS tapes. I had a friend who managed a video store. And in his store, in addition to renting videos, they sold used videotapes. And on this particular day a customer came in and was taken by the display of used videos for sale.

You knew they were used because there was a huge sign. It was 3 feet high. You could read it from across the street. It said: USED VIDEOS. And the customer said: "Wow, a brand new copy of *Gremlins* for only $6!" And my friend, who is sarcastic, said: "Good customer, you are welcome to purchase the item in question for $6. But I direct your attention to the sign which indicates—in letters fit to announce the start of a major war—that this is, in fact, a used copy of *Gremlins*."

And the customer stepped back, seeing the sign for the first time, then looked in wonder at the copy of *Gremlins* he cradled in his hands. And he said: "But it's shrink-wrapped." And my friend goes: "we have a shrink-wrap machine in the back. You want to see it?"

The poor customer. Like a kid whose parent is explaining how presents get in the stocking even though Santa doesn't exist.

What's the point?

The customer was operating with a heuristic—a rule of thumb—for determining what is new. The rule was:

If it's shrink-wrapped -> it's new

Not a bad heuristic, but breakable. Fallible.

Who among us does have a bunch of fallible heuristics cluttering our attics? For example:

If it's mathematical -> then it's science

Math makes it look shiny and clean. Like shrinkwrap.

A lot of pseudoscience in the world that has been impressively shrinkwrapped with math.

Mathing things up doesn't make them science.

Back to Plato. Plausibly, he had no way of knowing his whole 'wanderers' project was workable. So he got lucky, although he had to wait until he had been dead for 2000 years. Chance favors the prepared mind. But even so: lucky is not the same as smart. Even if you praise Plato, for asking, if it was luck, there's no way to imitate him. If asking the right questions about physics—or anything else—is luck, then the thing to study is not questions but physics, poetry, anything else except Q itself!

Maybe the university isn't a place where people ask good questions—because who knows what's a good question?—but a place where people just ask a whole lot of questions. And some of them turn out to be good. And so the people who ask them get declared geniuses, because they got lucky.

To put it another way: earlier I said some critics think philosophers are just big babies. Because babies, if you have met them, ask a ton of questions. Are they good questions? I wouldn't say so. A lot of it is babbling. That's ok. Babies are employing a kind of brute force method of making cognitive progress.

Maybe the whole university is sort of a big baby. Maybe society needs institutions that, like babies, are cognitively open—flexible, neuroplastic, as the brain scientists say. If that's right, then it's probably kind of right to say that the university is made of questions. Because babies are. But it's maybe not right to encourage study of Q, per se. Because babies can't study Q. There's a lot of stuff babies don't know, so babies have an instinct for learning. But babies are not Socrates. They do not know what they don't know. If we tried to turn Q into some kind of pre-school enrichment

program it would be a total waste of time.

But now let me push back a little.

In case you haven't noticed, I'm winding up for a good Plato joke. Well, I like it. Here it is.

Plato asked for a mathematical function for the motions of the wanderers. Maybe he didn't have a good reason to know there would be such a thing. I'm here today, asking you about questions and questioners. Questioners are a kind of wanderer. This university is filthy with wanderers, teachers and students alike. Babies are wanderers. That's why there are bars on their crib. Is there some sort of pattern to this, or isn't there?

Maybe there is, maybe there isn't. If there isn't maybe we can't teach Q. But that's a really interesting negative result, if that is the result, if only because it threatens to spread.

How can we say what counts as science? Science is good. It seems like science comes stamped with some special mark of quality—like shrinkwrap on new things. But what is the shrinkwrap that certifies something as science? It's not just that it's got math on it. It's not that it's the result of asking questions. It's not even that it's true.

We know that science is fallible. But even when it fails, doesn't it have to fail … better. Failing in a reasonable and defensible rather than just plain dumb way?

If so, then what is the way? We've got a science faculty. But it seems kind of circular to say: science is whatever they do in the science faculty. Because, after all, maybe the university should be sliced up some other way. If that would make more sense.

Questioning questioning risks failure because, maybe, we won't get answers. But even failing to get an answer is an interesting result. Negative results are results. We want to know what we don't know—about science, about how people think and learn. Questioning questioning isn't the only angle on that topic. But it's as good a guess as any, I say, about what will be a good question.