An 'Eerie Quality of the Future': Kepler's Vicarious Hypothesis

by Megan Beets

Megan Beets presented this discussion of Kepler's "vicarious hypothesis," during the LPAC Weekly Report (www.larouchepac.com), Oct. 17. It has been edited for publication in EIR. We encourage readers to watch the video to get the full impact of the animations, which we can reproduce here only as still photos.

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Megan Beets discusses Kepler's "vicarious hypothesis," as an approach to answering the question, "What is the human mind, per se?"

What I want to get into, is zeroing in on this question of mind, per se. Because if we're saying that the senses are inherently failed, flawed systems, then the question is, how do we actually go about sensing what's real? If our senses don't have access to what's real about the universe, what does, and in what way?

So, what I want to do, is go through, in a little bit more detail, the example of the vicarious hypothesis of Kepler. To do that, I want to address the state of astronomy before Kepler. We're talking about the end of the 16th Century, and the beginning of the 17th Century.

In Kepler's time, astronomy was not a branch of physics, it had no concern with physics; it was a branch of geometry and of modelling appearances. So the concern of the astronomer was to come up with some kind of geometrical map, or apparatus of calculation, by which he could predict, accurately, where a particular planet or a particular star would be seen on a particular night. The physics behind that model was of no concern to the astronomer—whether or not this was a realistic, viable idea of what was actually occurring in the physical universe, or represented some kind of knowable principle.

In Kepler's time, you had three predominant such models, or apparatuses of calculation: that of Copernicus, of Ptolemy, and of Tycho Brahe. And what we see here, with this beautiful animation (**Figures 1, 2, and 3**), is the system of Copernicus, with the Sun in the center, or close to the center; the Earth and all the planets orbiting around the Sun, in perfect circles. You have the older system of Ptolemy, with the Earth at the center, not spinning at all, completely stationary, the Sun moving around the Earth, and all of the planets moving around a mathematical point which is moving around the Earth. And then, you have the system of Tycho Brahe, which is a bit of a mix between the two, where you have the Earth somewhere close to the center; the Sun orbiting around that, and then all the rest of the planets orbiting around the Sun.

So, three systems which seem contradictory; but what Kepler shows, in his *New Astronomy*, is that the relative positions and relationships of the planetary bodies don't change at all. What this means is, if you are on the Earth observing the sky, you would have no way of knowing whether Ptolemy's system, Copernicus' system, or Tycho's system were true! All of them model the appearances in the sky, exactly the same.

And so, in the *New Astronomy*, the first thing that Kepler does, is make the shocking statement to the world, that all of these systems, over which there had

FIGURE 1

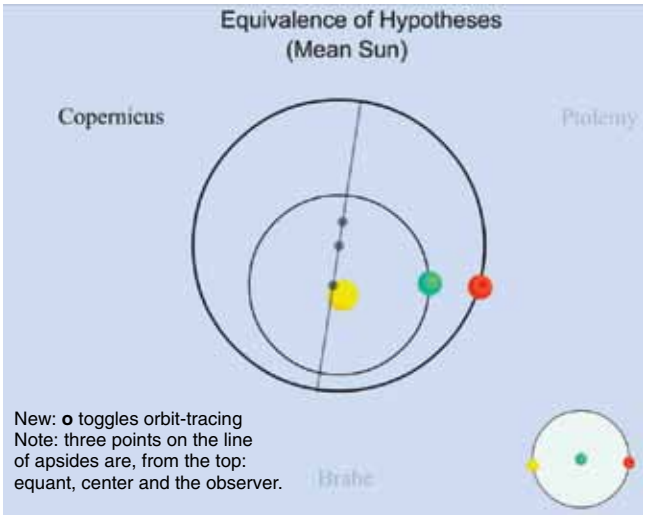

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FIGURE 2

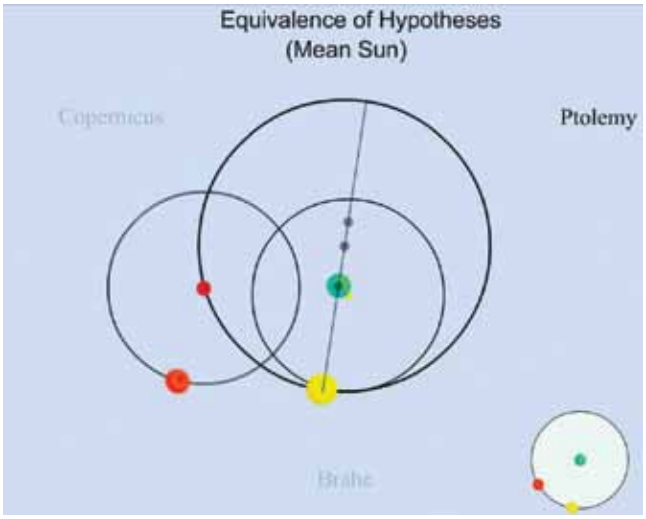

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FIGURE 3

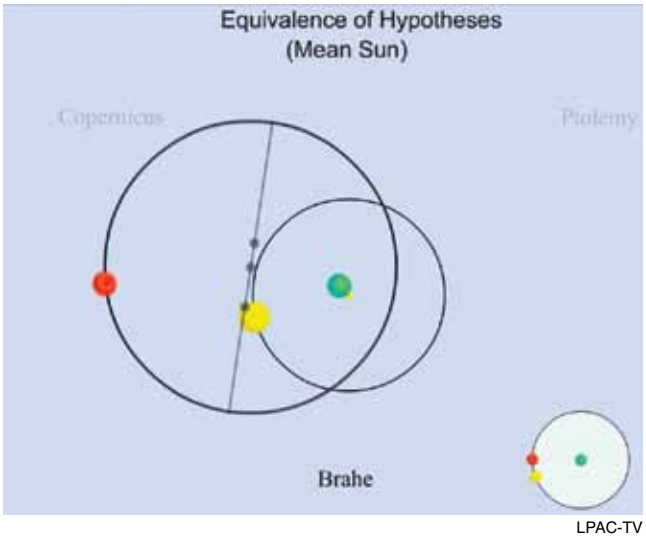

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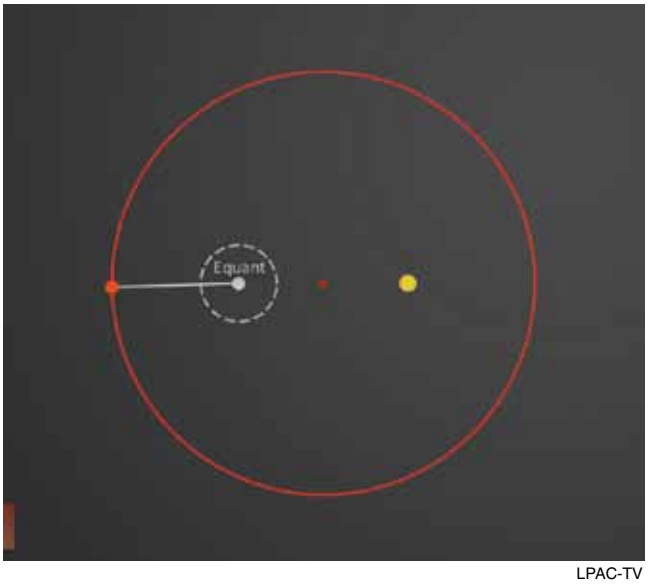
FIGURE 4



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been scientific fights for centuries, were the same: They're of exactly the same quality!

Kepler's Model

Now, once he's done that, he does something quite ironic, which is that Kepler goes about to create a model, which appears to be a mathematical model—and that's his vicarious hypothesis—and I'll qualify in a minute what I mean by that.

Kepler takes a few basic assumptions about the nature of the orbits. One of them is that the orbits are perfect circles. The second one is that the rate of motion of the planet is determined by a point called the equant, which you see represented here with this white point (**Figure 4**), which is a mathematical point—there's no physical body there, but it's a point in space, around which the planet would move an equal distance in an equal time; an equal angle in an equal time. So, regular motion determining the rate of motion of the planet in its orbit.

The third main component of the model—and this is where Kepler differs from the others, slightly—is that he takes the *physical Sun*, when he's using his observations. He takes where the Sun was physically observed on that day. Now, the others had taken something called the "mean Sun," which is a certain mathematical ap-

FIGURE 5

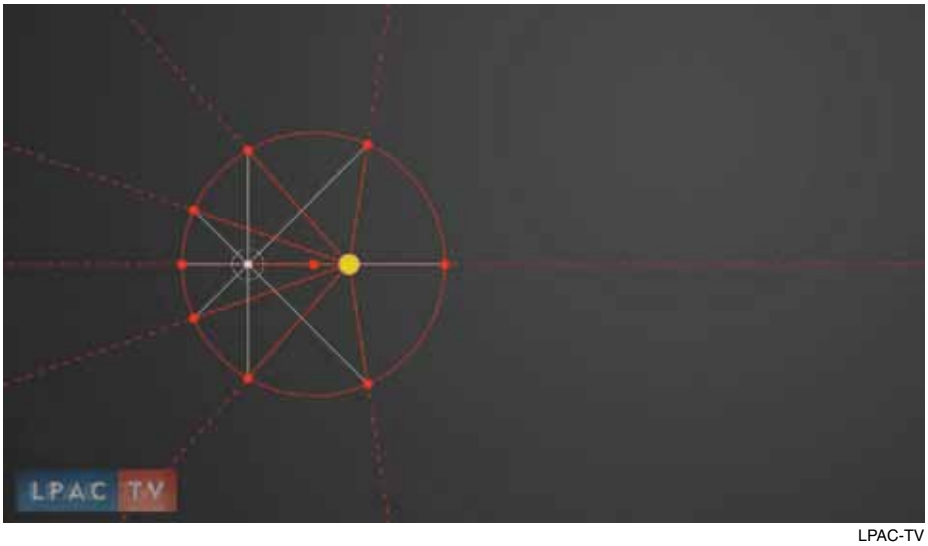

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FIGURE 6

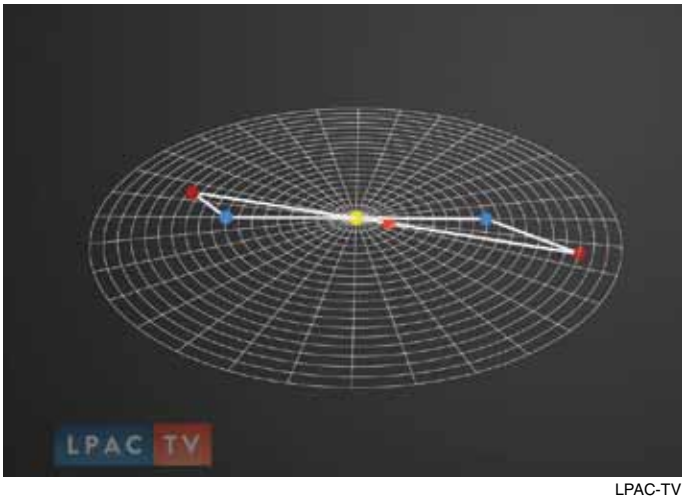

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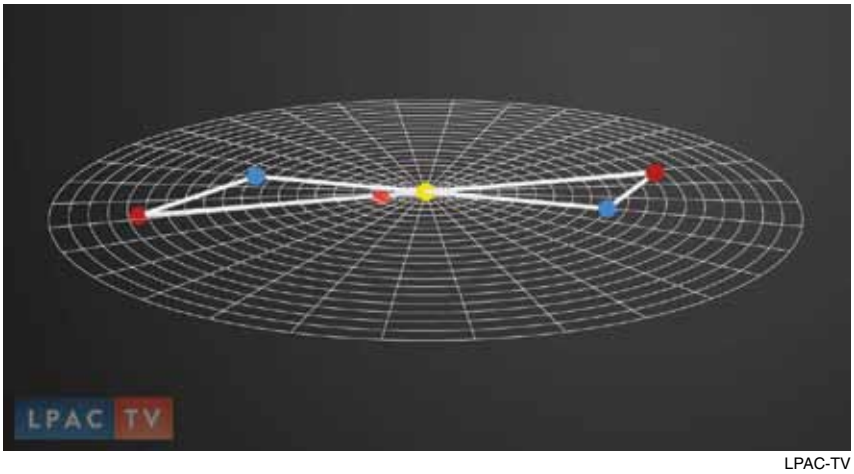
FIGURE 7



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proximation, which didn't actually exist.

So, with this, through a long, long, years-long process, Kepler is able to construct his vicarious hypothesis, which you see here (**Figure 5**): He's able to show more accurately than anybody before, with this model; he's able to forecast where the position of a planet would be on a given night, in something called its "longitude," which is how far along the yearly orbit the planet has traveled. So, using the vicarious hypothesis as the model to calculate the longitudes, Kepler's model is more accurate than anything that had ever been created.

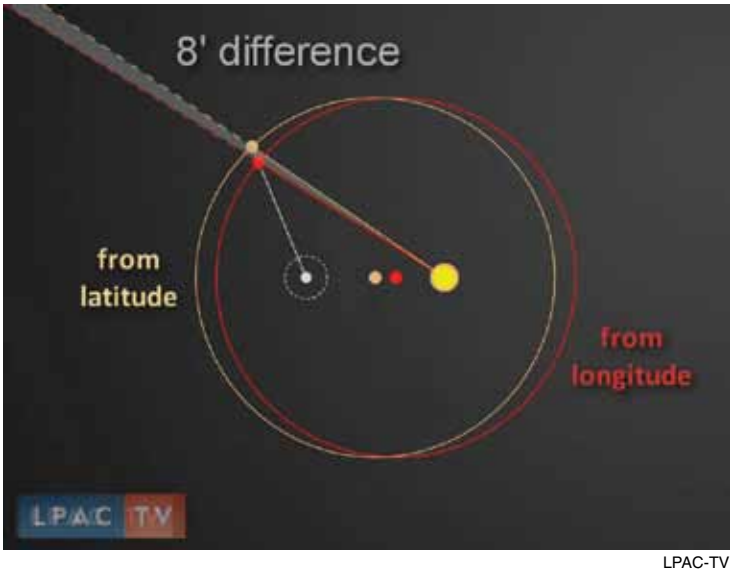
Now, from this model of the vicarious hypothesis, Kepler is able to conclude what the distances of the planet Mars must be from the Sun: He concludes what all the distances must be of the center of Mars' orbit from both the Sun and the equant, which would then tell you the distance of the planet from the Sun. So that's important.

Now he does something else, which is very purposeful: He takes the model of the vicarious hypothesis, and he looks at it from the side. So now, we're getting a second view of the same idea, and that is, he looks at the "latitudes." Now, when we say "latitude," what we're talking about is the fact that the orbit of Mars is not in a perfect plane with the orbit of the Earth, but it's tilted. So we're going to see the planet Mars, not perfectly on the ecliptic; we're going to see it somewhere above, or somewhere below.

So, we take the model of the vicarious hypothesis to look at the latitudes, and that's what we see here, in this video. So you have a top-down view (**Figure 6**), and now, we're turning it, to get the side view (**Figure 7**).

Here we see the planet Mars, both above and below the ecliptic, on its tilted orbit; we see the Sun, we see two positions of the Earth, observing Mars. Now, what Kepler discovers, is that when he applies the distances that he

FIGURE 8



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calculated from the longitudes, to the latitudes, the model is off. What he calculates for the latitudes, given those distances, does not match up with the observations! So, he makes a correction, and he moves the center of Mars' orbit a little bit closer to the Sun, and he corrects it, and now, the latitudes *do* match up.

Now, he takes those distances back to the original view of the longitudes, and he applies these new, corrected distances from the latitudes, to the longitudes, and he finds that it doesn't work. And what he finds is this famous error of eight minutes of an arc difference. So you can see that here (**Figure 8**), that the lighter, orangish color orbit is the orbit with the distances from the latitudes; the darker red orbit is the original orbit that made the longitudes correct, and you see that there's crack, there's a discrepancy. But both are coming from the same set of data, both are coming from the same assumptions, the same model. But according to this, one way you could say it, is that the planet would have to be at two different distances at the same time, to make the appearances work.

The other way you could say it, and this gets a little bit more to the point, is, how do you resolve these two components? Both seem to be true, and yet, both can't be true. And yet, both are supposed to be explaining the same creature. And this is what Kepler was aiming for the whole time in the design of the vicarious hypothesis in the first place: Is that, no matter how many little adjustments you would make, there is no set of distances, which would make both the latitudes true *and* the longitudes true. It's impossible. There's no compromise to be made here.

A Leap of the Mind

Now, this confirms, for Kepler, that the orbit that we're modeling here, the orbit that you could draw on a piece of paper, is a shadow of something else. And this is what he uses as the—I don't want to say "excuse," that's not quite the right word—but to give him the authority to bring in something completely different, which is a leap of the mind, a hunch about an acting power, which his model is not detecting.

Now, what he brings in is something which he calls the "physical hypothesis." And this is interesting, because this is an idea that did not just "occur" to him after the year 1601, when he's working on the orbit of Mars. This is a certain conception, a certain hunch he had about the physical mode of power of the Sun, going all the way back to the 1590s, when he was publishing his first major work, *Mysterium Cosmgraphicum*. So this is not something which some kind of model indicated to him existed; he had had a hunch since he was a very young man.

Now, the idea of the physical power is that the science of astronomy is not a science of geometry, it's a science of physics. And Kepler hypothesized the existence of a motive power, seated in the Sun. And then he goes about, in the later chapters of the work, trying to tease the reader into thinking about what the nature of this could be.

And so first, he proposes that the physical power in the Sun is like magnetism, and he goes about describing the behavior of the Sun as if it were a magnet, and how that would move the planets. But, he says, it's not quite like magnetism.

And then, he goes about describing it as light: What if the Sun were a point-source of light, and it was moving the planet like light? How would that work? And he says, it's not quite like that.

And then he proposes, it's like a river, with a current of water in the river, and—you get the point.

So, again, he's using a method to tease your mind into hypothesizing what the quality of this power of the Sun would be, where it's like light, it's like magnetism, it's like water, in such a way that it's not like any of them.

An Eerie Sense of an Acting Principle

Now, this zeroes in on what I want to get at, which is: What is this power of the mind, which has the ability to detect something, to feel something with such certainty, which is completely inaccessible to the senses? And I just think this example of Kepler is wonderful, because it completely defies the kind of stultified formal environment of science, today, which is based on mathematical proof and mathematical certainty.

The way Kepler discovered gravitation, and the way he went on to solidify that in his *Harmony of the World*, is with a *hunch*, is with a certain *conviction*, a certain kind of an *eerie sense of an acting principle,* in his mind. And thinking that, I just want to return to the idea of the model, for a minute, and the relationship between the model and the principle. Because on the one hand, you can ask: Well, did the idea, did the physical hypothesis in this case come from the model? Well, clearly not! Was the model necessary? Yes. The model was necessary, but not for what the model could show you: The model was necessary, for what it *could not* show you. Kepler had to confirm to himself the particularity of something which the model *did not* have the power to show. And this was the leaping off point for the hypothesis.

EIRNS

"What is this eerie quality of being able to know something, in such a way that you don't know it, but you know it?" As with a string quartet rehearsing a piece: "They're pursuing something which they've never experienced." Shown: the Teatro de Estada Cuarteto Ensamble Clasico, October 1998, Mexicali, Baja California.

Classical Music

And one more point I want to raise about this, which I think is quite provocative: I think this raises the question of what is this quality that we call "the human mind, per se"? What is the nature of this quality? For me, this quality of the mind is most accessible in the example of Classical music, and the kind of feeling of "rightness," that comes in the process of rehearsal and performance of Classical music. And I find this quite delightful.

Take a string quartet, or take a small ensemble, or even take an orchestra: But take a group of musicians who are working on a piece. Now, they've never experienced the correct presentation of this piece of music before. And yet, in the rehearsal process, it's clear to everybody that they haven't achieved it, yet. Now, they're playing all of the right notes at the right time, with each other, but it's clear in the process of rehearsal that, "We haven't gotten it yet! It's not right. It's not right." And they're pursuing something which they've never experienced.

And so, what is this eerie quality of being able to know something, in such a way that you don't know it, but you know it? And then, when you do achieve it, everybody knows it! You've got a recognition of that thing which you were pursuing all along.

So, I think it's this quality of mind that we need to discuss, that we need to explore, because what you're dealing with is a quality in the human being which can experience the future. It has a positive experience of something which hasn't yet occurred, in what we call "the present." And I think it's no coincidence, that this eerie quality of the future was what Kepler pursued. I think it's no coincidence that his conviction about the kinship of the human mind and the Creator's mind, was his mooring point, for his entire scientific process, and that this is what unleashed a complete revolution.