From Kepler to China Today: What Really Is Mankind?

by Jason Ross

Jason Ross of the LaRouchePAC science team gave this presentation during the LaRouchePAC webcast Jan. 30. https://larouchepac.com/webcasts

This presentation is part of an ongoing discussion. On the Wednesday, Jan. 28, weekly Basement Science Team discussion, this topic was addressed from the standpoint of Vladimir Vernadsky, and the ability to look at the human species as a geological force, or, as a biological force, and how, if you examine the characteristics of the human species over historical time, it would seem as though you were observing a different species; that we change in ways that are seen only over evolutionary time in the biosphere itself.

What I'm going to take up today, is the Keplerian dimension of human identity. Kepler, the scientist, had put on the table and developed—really, created—modern science. And he did it in a way where he was very explicit about how he thought about those things, and about the resonance, the connection, the similarity, between the functioning of our minds, and the functioning of the universe as a whole, which not only brought us science, but it brought us a proof of the magnitude of the power of the human mind, of the real magnitude of the human soul.

Kepler created modern science, and gave us "proof of the magnitude of the power of the human mind, of the real magnitude of the human soul."

To address this question: How *does* Kepler give us an answer to "What is mankind?", Lyndon LaRouche said to take two approaches to this: the Classical approach of what Kepler had done in his day; and the modern approach, and how China is embodying this with their work at present.

Kepler as Cusa's Legacy

First, the Classical part of things. Kepler used a technique that was developed by Nicholas of Cusa [1401-64]—a technique that Cusa called the "coincidence of opposites." He used this to develop a new language for science, for astronomy in particular, and to break through the Aristotelian way of thinking, which was based on logic, on syllogisms; frankly, on *words*, on playing with words, categories that concepts are defined in; how phrases, logical phrases, come together. It was not based on letting nature itself speak.

One particular tenet of Aristotle that Cusa and Kepler demolished, was Aristotle's conception that you can't have both "A" and "not-A"—that there are not contradictions. That true knowledge is an avoidance of contradiction—that's how you know that you're right.

Cusa gave examples of how that's actually *not* how to be right; it's certainly not how to *discover* anything. Cusa distinguished between the world of the senses, the rational level of understanding, based upon those senses, and a higher intellectual level of understanding that was reached only by contradictions among those senses. As an example of this, we can take how Cusa uses the "infinite" in Book 1 of his work, *On Learned Ignorance* (*De Docta Ignorantia*). There, Cusa uses geometrical analogies extended to the infinite, to give a way for his reader to understand what his conception of God is, as a *specific lack of knowledge*. We're going to be hearing more about that. A *specific* kind of lack of knowledge, a "learned ignorance," a specific kind of ignorance, is itself a form of knowledge for Cusa.

How could that be? Cusa gives some examples: He says, for one thing, in the infinite, a circle and a line no longer oppose each other; they aren't really different shapes any more, when you take these concepts and extend them to the infinite. This is a way of making a point about the infinite, even though obviously a circle and a line are easily differentiated when they're a finite size.

He says that God is the type of maximum to which nothing is opposed, not even the minimum. How can you have a maximum that's not opposite to a minimum? What kind of maximum is that? He says that we would attain a shadow of this vision of God by consideration of ways in which our understanding failed to reach Him, by developing a specific shape of the ineffable by knowing *in what way it was ineffable*, by what way specific contradictions in thought could be created to get at it.

That's really only a shadow of what Cusa does. If people have read it, it's a tough thing to try to summarize briefly, partly because his whole work is a constant *challenge to your thinking,* and not just adding things to your thought. This act of thinking, this discovery process that he enlivens in the mind, is, itself, the way to an understanding of God, in his view.

The Physics of Contradictions

In Book 2 of *On Learned Ignorance*, Cusa takes up the universe, the created world, and he does this by looking at how the universe itself defies logic, and defies understanding based on sense-perception, based on the senses. One consideration that he uses, is that there is no perfection in the created world, in the universe, including no equality. He says there is only true equality in God; we won't find it in the universe itself, and that would mean that such things as a perfect circle—although you can imagine it geometrically—could never actually exist.

For an actual circle to exist, each point on the circle would have to be exactly the same distance from the center. And Cusa asks, how could it be that they are *so* equally the same distance from the center, these points, that they couldn't have been made more equal? He says, you can't have two lines that are actually exactly the same length. That concept involves an impossibility: Equality itself cannot be embodied in a line. Or in motion: Cusa says that two motions couldn't be identical either. How could two moments of motion be *so* alike, that they couldn't have been made somewhat more alike?

So, from these considerations, Cusa comes to conclusions about astronomy that weren't experimentally shown to be true for some time afterwards. For example, he says that there is no way to have circles in anything, including in astronomy. No planet could move in a circle; circles couldn't exist, because they involve that absolute equality. He also said there could be no absolute equality of motion; there could not be uniform motion, because that would again call on this equality, that could not exist in the universe.

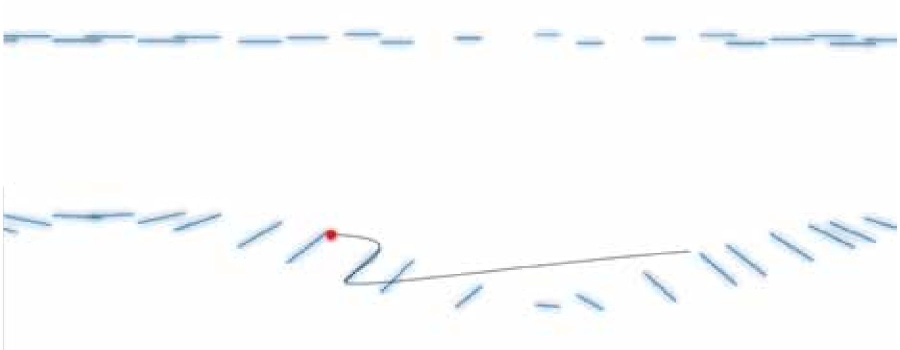
Cusa was addressing a world dominated by an Aristotelian outlook, which said that although the Earth might be changeable, the Heavens are static, they're perfect in their stasis, in their staying the same; the Heavens are perfect in their geometrical existence, they're perfect—you know, God traced them out with a compass and a ruler. Cusa says no, no, it actually can't be like that: It's impossible, and these concepts will not be able to be the guiding understanding behind astronomy. He was way ahead of his day on this.

Kepler's Setting

Now, to get into Johannes Kepler [1571-1630], we have to have some background on what astronomy is, how it got to the state it was in, by the time Kepler hit the scene around the year 1600.

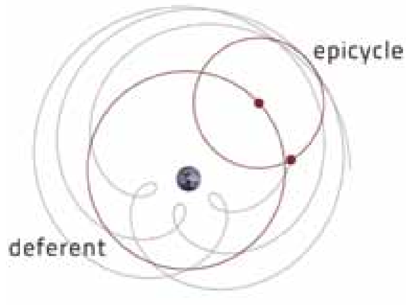
Among the "stars" in the sky, there are some which move; there are also obviously, the Sun and the Moon, which move quite a bit; but also some stars move over

FIGURE 1



As Mars moves among the stars, it periodically appears to go backwards. The sizes and locations of these motions (retrogressions) are indicated here. One part of the Zodiac has more (and longer) retrogressions, while the opposite part has fewer (and shorter) ones.

FIGURE 2



Ptolemy had Mars move around the Earth on two circles: a deferent which went around the Earth, and an epicycle attached to it, which, by its spinning, would make Mars appear to go backwards.

time, so that although almost every star stays in place [relative to the others] from night to night, if you go out and look at them, you find some that are moving, moving stars, wandering stars: The Greeks called these "wanderers"; the Greek word "wanderer" is the origin of the English word "planet."

We see in this video, a type of motion that these stars might make (**Figure 1**). Here you've got, let's say, Mars, and we're watching it move—this is sped up over years and years—every couple of years, Mars "moves backwards."

You have to imagine, against that background, that we have all the constellations, Cancer, Leo, all the other ones, and so Mars moves mostly in one direction, *but also appears to go backwards*. It only goes backwards when it's opposite the Sun, that is, when it's in the constellation that's at its peak at midnight. Mars always moves quickly when it's near the Sun, when we see it at dawn or at dusk; backwards when it's at its peak at midnight. And you can see that these retrogressions, these backward motions, have different sizes in different parts of the orbit. So Mars has a backwards motion, which is somehow tied to the position of the Sun; it also has some parts of its orbit, where it seems overall to move faster, and some parts where it overall seems to move slower.

So how to explain that? That's a difficult thing. Claudius Ptolemy [c.90-168 AD], 2,000 years ago, had written a book called the *Syntaxis*, also known as the *Almagest*—where he explained how the planets move—sort of. He explained how that dot in the sky would move, at least, although he didn't claim to know anything about what was physically happening. The way he did it was, he used two circles for each planet: Each planet would overall move on a circle through all of the stars, through all of the constellations, and on that circle would be a second, smaller circle (called an epicycle), that spun more rapidly and would cause, by their combined motions, the planet to sometimes get pulled backwards, to have these backwards motions (**Figure 2**).

The other aspect of things, was to explain the fact that there's a part of Mars's orbit where those retrogressions are shorter, and there's another part of the orbit where they're longer, and those occur more commonly. To explain this, Ptolemy used the second thing that Cusa proved couldn't exist: He used a certain kind of uniform motion.

So what he did was, and we'll see that in this video (**Figures 3a, b, c, d**), that instead of having Mars simply move around the Earth (this is ignoring the second

FIGURE 3a

In order to account for the varying speed of Mars along the deferent, Ptolemy introduced the **equant**. *He had the planet move on a circle whose center was not the Earth, and had its speed be determined by moving at a uniform angular speed as perceived by another point, the equant. The eight positions on the orbit you see here are equally spaced in time.*

FIGURE 3b

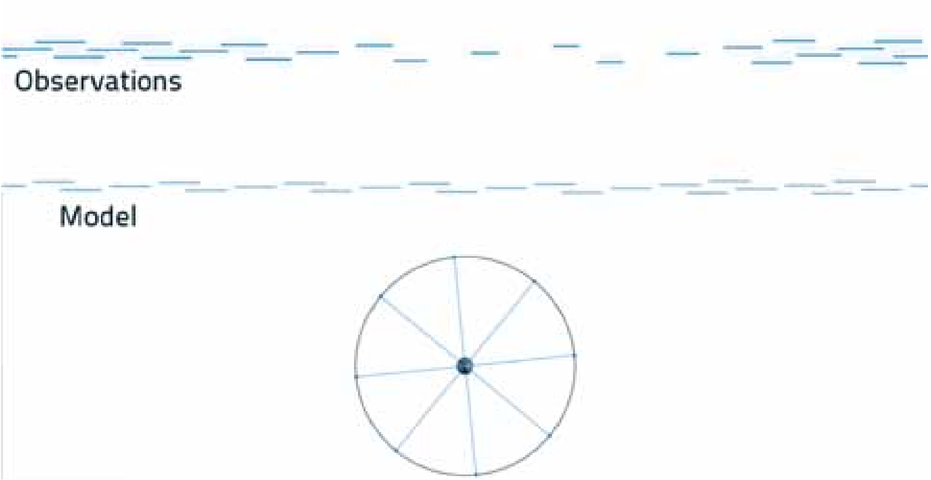


FIGURE 3c

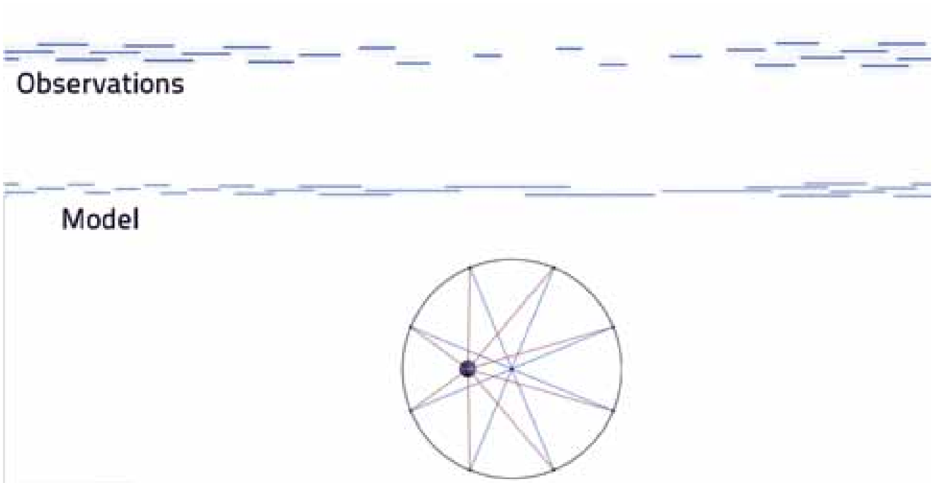
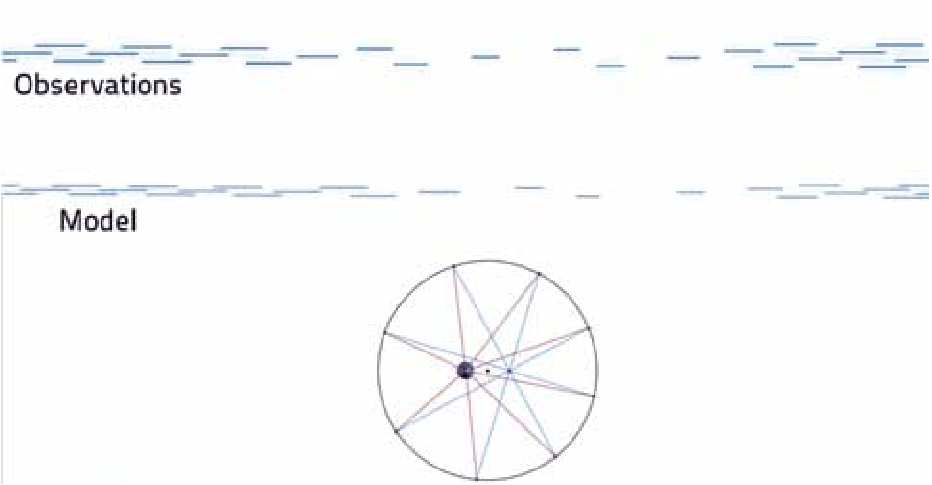


FIGURE 3d



If the deferent were a simple circle around the Earth (3b), the retrogressions would all be equally spaced and the same size. If it were an off-center circle (3c), they would be correctly located, but have the wrong sizes. If it were an off-center circle with a separate equant point to control the motion (3d), then everything works out.

circle upon it—the epicycle), he first tried moving the center of Mars's orbit off to the side, and that helped somewhat. And then he put the center of Mars's orbit between the Earth and the point on the right around which Mars moves at a constant speed. That point on the right is called the *equant*.

That was a difficult thing to take in. Let's watch the video one more time, so you can see how the retrogressions would look if Mars simply moved uniformly (**3b**). Here we move it off-center (**3c**); the retrogressions are in the right spot, but the lengths are long. One more adjustment—we separate the center of position and the center of motion (**3d**); Ptolemy matches the observations pretty well.

And that was his goal, to match the observations. So that point on the right is called the equant point. We'll come back to that with Kepler. So, we've got a circle, which Cusa doesn't accept, and we've got uniform angular motion around another point, which Cusa wouldn't accept.

Then, there's Nicholas Copernicus [1473-1543], who had the planets move around the Sun, or, more accurately, had the Sun stand in the middle of the moving planets. And he actually had more circles, in a certain way, than Ptolemy. He had the planets move on a circle, on a circle, on a circle around a point near the Sun: That was how Copernicus explained the motion of the planets. And the goal of these guys was to accurately predict where you'd see a dot in sky. It wasn't a physical theory! Physics didn't really have anything to do with the Heavens for their astronomical models.

Kepler's Breakthrough

This is where Kepler comes into things. Kepler was a follower of Cusa, and he was convinced since his youth—when he was in school, he wrote an essay on this topic—that the planets do go around the Sun, but not in the way Copernicus thought; not that the planets are moving, and the Sun's sitting in the middle watching them, but that they went around the Sun because the Sun was the cause of their motions: *a physical hypothesis,* that the Sun *physically* caused the motions, not a celestial geometer with a compass and a ruler.

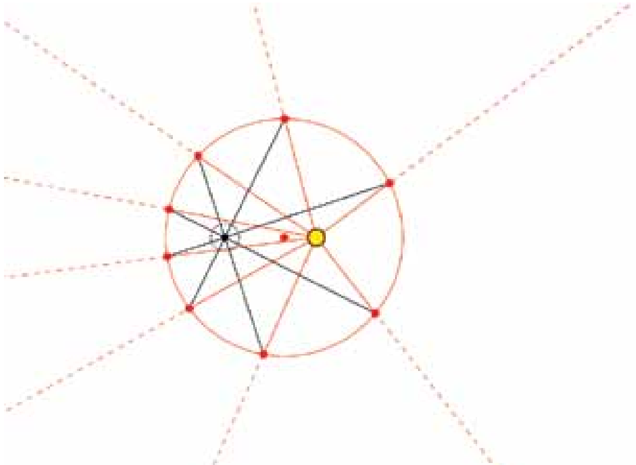
In one of his major works called *The New Astronomy*, Kepler used Cusa's technique of the "coincidence of opposites" in a specific way: to lead to a higher truth, to force people to consider, and he then demonstrated, his physical concept. He did this through what's called the "vicarious hypothesis." In this, Kepler asked one question, and he got multiple, different answers; he got contradictory answers.

Would he then simply try to avoid the contradiction, or would he *use* the contradiction? He used it.

The question that Kepler asked that got multiple, different responses, was: How far away is the center of Mars's orbit from the Sun? What's that distance? Well, he answered the question twice, by using two different aspects of observations: longitude and latitude. Longitude is the motion of the planet overall around the stars through the constellations; latitude is the motion above or below the central line called the ecliptic, which goes through all of the constellations of the Zodiac.

When he creates his "vicarious hypothesis," Kepler uses those assumptions of his predecessors—the circle, the equant, geometry, mathematics—he uses them to create a new model, better than anything anyone had seen before. It worked incredibly well, because it was based on the *real* Sun. For the first time ever, the actual Sun itself was the center and the cause of the planetary motion, which were still then made by circles and uniform motion. That worked great; it gave a distance between the Sun and the center of Mars's orbit.

FIGURE 4



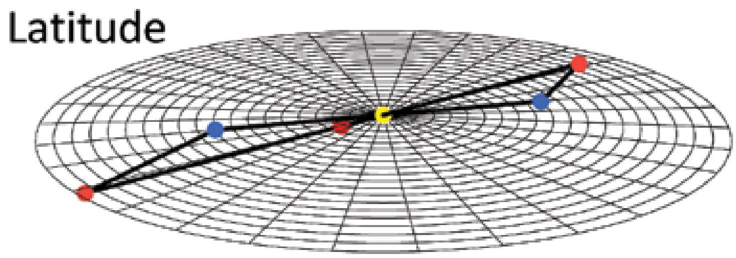
Kepler's **vicarious hypothesis.** *Kepler determined the best parameters for Mars' orbit, including the best distance between the Sun, the center, and the equant, to be able to predict where Mars would be seen. It worked fantastically well, to within observational error. Like his predecessors, he used compounded geometrical motions, but unlike them, he used the actual Sun as the basis of the motions. The distance between the Sun and the center of the Mars orbit is determined indirectly: it is what works. (NB: not drawn to scale—the center is actually closer to the equant than to the Sun in the vicarious hypothesis.)*

In this video (**Figure 4**), we'll see how he used a different kind of observation to get another answer. Here again, you've got longitude, the motion of Mars around the ecliptic, through the signs of the Zodiac; latitude would be Mars's motion above or below the ecliptic. By using some clever trigonometry, Kepler used the fact that Mars goes above and below this plane of the Earth's orbit around the Sun [the ecliptic], and by solving for some triangles, he was able to figure out all of the distances that you see here. Meaning, he was able to get that distance in the middle: How far away is the center of Mars's orbit from the Sun? He got this green length (**Figures 5a, b**).

Now, there was one trouble: That green length was not the same length that he had gotten gotten earlier, in the vicarious hypothesis. So in this next video, we'll take a look at a comparison between the two. What we're going to see is how, when Kepler adjusts the vicarious hypothesis, to use the length which came from the latitudes, a problem arises, and this problem was key in his work to reform and develop a new astronomy.

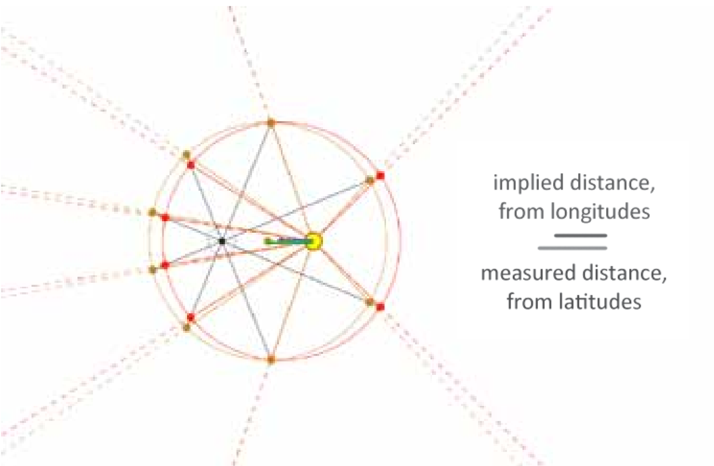
So, we have that green length here, and it, there's

FIGURE 5a



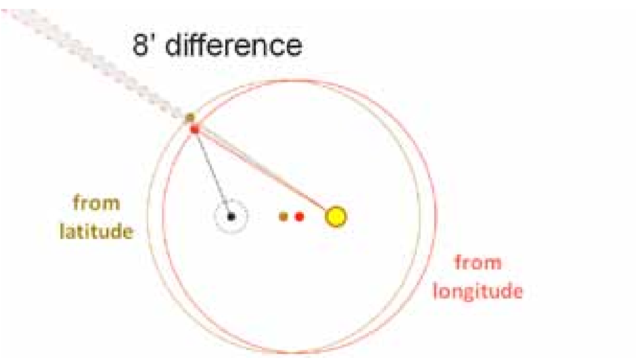
By using the latitude of Mars—its motion above and below the plane of the ecliptic—Kepler could directly calculate the distance between the center of its orbit and the Sun.

FIGURE 5b



The Sun-center distance of the vicarious hypothesis, based on longitudes (purple), is quite different from the distance determined from latitudes (green).

FIGURE 6



When the vicarious hypothesis is adjusted to incorporate the more directly determined distance from latitude measurements, the position of Mars is changed by up to 8 minutes. This 8-minute contradiction between the "senses" of longitude and latitude as applied mathematically to Mars, proved the inherent impossibility of mathematical astronomy, and opened the way to Kepler's "new astronomy, based on physical causes."

another purple length—so what you see here, are two different places where the center of Mars's orbit could be (**Figure 6**). The orange one is based on latitudes, the red one is based on longitudes. The difference between where these models say that Mars will be is 8 minutes (8′); a minute is 1/60th of a degree, just like a time minute is 1/60th of an hour.

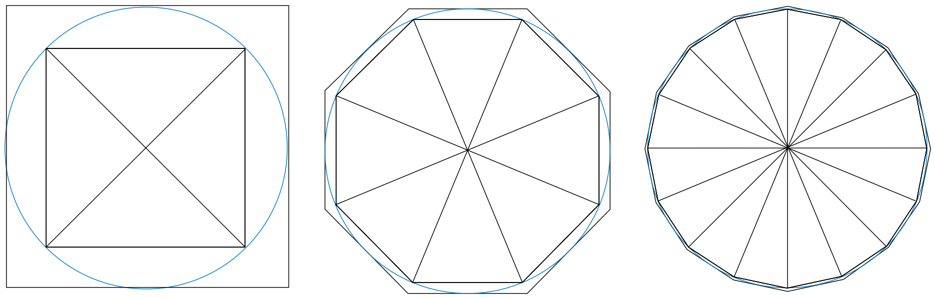
To say that again, Kepler created a model, using longitudes; it worked great. It included a distance that was in doubt, that was derived indirectly. He then used latitudes, in that image where you saw Mars coming up and out of the plane (Figure 5a), to get its distance more directly. That new distance, which is indicated in green, doesn't work with the other one. If he adjusted his vicarious hypothesis to have that green distance, its ability to give direction was broken.

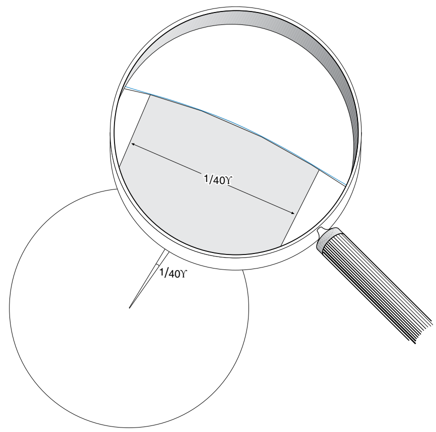
So, he got two contradictory answers: Either the distance is the green distance, or it's the purple distance; it would either be the orange center or the red center here—those are two different distances. And they're also two different positions: Is Mars seen along that red dashed line, or along the yellow dashed line? Well, you can't have it both ways; you can't have two different distances, and you can't have two different positions. And what the data showed, was opposite for each: The longitude data suggested one direction; the latitude data suggested one position of that center. So we have two different, contradictory answers here.

What does this mean? Both answers can't be right. They preclude each other: When you have one, you lose the other one. And Kepler says that this 8 minutes difference in position is the key to a reformation of astronomy, the key to a whole new approach to things. So he concludes that this proves that the approach was wrong: that trying to explain things from the standpoint of the senses, of motion itself, wouldn't do. We now have to bring in a *physical cause* for why the planets moved the way that they did, going beyond the senses, which have tried and failed.

We have to find a unifying conception, under which the contradictions would no longer exist. Kepler did that. He made a physical astronomy; he explained how the Sun would cause the motions of the planets. He had only one measure for that distance between the Sun and the center of Mars's orbit; he had only one position where Mars would be; and it was right. And he forced people to

FIGURE 7





Cusa demonstrated the conceptual impossibility of squaring the circle, indicating that a lower thought cannot comprehend one with a higher origin.

break out of the Aristotelean view, and bring physics out into the Heavens, to make *cause* the reason for why things are, and he used a contradiction to create that new thought.

While Cusa showed that a shape couldn't be the same over time, or be a cause, and that equal motion itself couldn't be a cause, a principle which is always equal to itself—that's a different kind of thing. A relationship between the planet's distance from the Sun and its speed—that's a different kind of thing. And that's what Kepler had done.

Yes, he did say that planets moved in ellipses, but the ellipse was a result, in his view, of two different powers acting on the planets, one moving them around the Sun, the one causing them to come closer and farther from it. So Kepler's ellipse was not a *shape*, like Copernicus's circles. It was a result of a physical process.

I can refer people to science.larouchepac.com for more on this, as well as my video, "On Metaphor: An Intermezzo." So, when multiple, opposing answers all seem equally appropriate, or inappropriate, that indicates that the language we're using lacks the ability to actually comprehend the topic we're looking at. That's the Cusan approach of metaphor employed by Kepler.

Other Contradictions

Let me give a few examples of some other questions that have multiple answers that are equally right (or equally wrong, depending on how you look at it).

If I were to ask you: How many sides does a circle have? You probably have an answer you're thinking of. Now, try to think of another answer that somebody else might give. Compare those two answers, your answer and a second answer; do you think you could determine who was right and who was wrong? You might even have another friend who has a third answer!

I asked this to a group a couple weeks ago and I got three answers: one side, just one curved side; infinite sides, a circle is like a polygon with an infinite number of sides; or zero sides, because sides are flat and a circle is not.

Now, I think you could spend a long time arguing over those three answers and who was right. I think the point to take from it, is there's something wrong with the question. There's something about asking how many sides does a circle have, which is inherently a weird question.

Here's another one: Let's go to the idea of "Eureka!" The use of this phrase, "Eureka! I have found it," goes back to Archimedes, who, while taking a bath, figured out how to solve a problem of a potentially dishonest goldsmith. There was a crown or some piece of gold made for a ruler, and he thought that perhaps there was silver mixed into it, that it wasn't pure gold. He asked Archimedes, "Can you figure this one out?"

The story goes that Archimedes got into a bathtub, and as he hopped in, the water rose up over the sides, because his body displaced a volume of water, and he exclaimed, "Ah! Eureka! I've found it!" By putting the crown in water, he could measure its volume by seeing how much the water level moved; if he knew the volume of the crown, and he knew how much it weighed, you could get its density. I looked up some modern-day measurements of the density of gold (19.3 grams/cubic cm) and silver (10.5 grams/cubic cm). So, if you found out what the density of the crown was, and it wasn't 19.3 grams, but it was a lower number, that would mean that it had that much silver in it mixed with the gold, and you could actually find out if the goldsmith was cheating you or not.

Those numbers I gave for gold and silver were their densities. What if I were to ask: What's the density of carbon? Carbon is an element, like gold or like silver. I'm going to leave this one as a puzzle: Make a note on it, look up yourself and see if you can figure out what the density of carbon is, and see if you run into any trouble with that.

I've got another question: What's the atomic mass of uranium? How much does an atom of uranium weigh? It's difficult, or impossible to answer because there are different kinds of uranium. This is the language of nuclear science going beyond the language of chemistry.[1]

Another one: How many terabytes or petabytes or exabytes of storage are in your brain? What do you think about that question?

Is LaRouche a conservative or a liberal?

Are you a Fox person or an MSNBC person?

There are a lot of questions where posing the question makes it impossible to give a good answer. And in a most profound way, it's the contradictions between our current best efforts at understanding, that pave the way to the metaphorical breakthroughs of developments of fundamentally, actually, new concepts. And that's what the real history of mankind is; it is doing that.

You might ask yourself, for the *concept* of rightness or of justice, what is that concept's temperature? Is that concept hard or soft? Wet or dry, furry or smooth? These are silly questions.

Among all these questions, some had very specific non-answers, while others were more general, but they all reveal that the subject of discussion cannot be explained in the language used to pose such questions about it.

So, when the answers are *specific* non-answers, that let you go beyond things the way Kepler had done, and the way that other examples illustrate—these contradictions mean there's more to discover. It was those contradictions in logic, the contradictions inherent in trying to make logic universal, that let Kurt Gödel prove that Bertrand Russell was an idiot, and that Russell's approach, to try to turn all of science into logic and mathematics, was impossible.

It is contradiction that makes a joke funny, or a reconceptualization in a great piece of music—that contradiction is a mental process, that resonates with the whole universe, in which creative thought itself is a characteristic principle, and itself a force of nature.

Authoring History

Let's take a look, moving into the future, with this Keplerian approach: By applying new discoveries, in the way that Kepler had done, creating the mental tools for the existence of modern science, we have written chapters and books in our history, we've created human history. As LaRouche has been emphatic: Man is his own maker. We make ourselves, we set our own history. We *have* history! There is no history of penguins. If there is, it's about people's interaction with penguins. Or possibly, over a very long term, about how climates have changed, or predators have differed—but penguins themselves don't write their own history.

But *we* create. Think about some of the things that created the new chapters in the book. We had the Stone Age. What moved us beyond the Stone Age?[2] The seemingly magical ability to transform rocks into metals—rocks and metals are *very* different substances! You know, it's not very often that you're not sure whether something that you see is rock or metal; they're pretty different. And being able to change them—that was the beginning of the Bronze Age. We had the Iron Age; we had the development of agriculture, being able to plants seeds, to plant food where you would like to find it in the future, instead of looking for it; to create new kinds of food, to develop corn, to do grafting, to develop new fruit trees; this is something that we *did*, we *made* new kinds of life! We've been making new kinds of life for thousands of years—this isn't a new thing.

Astronomy, navigation, the use of compasses for your directions; reshaping the land with irrigation, with canals, using mills to do the work of animals or ourselves; the Renaissance, the great breakthroughs in art and music that let us develop a more powerful image of ourselves, which itself would enable us to do more in other fields.

The modern science created by Kepler, Cusa, Leibniz, Gauss, Riemann, others, the list goes on—these things unleashed *tremendous* changes in our relationship

1. One kind of uranium, uranium-235, can be directly fissioned in a power plant, and uranium-238 cannot. These different isotope numbers have no particular importance for chemistry, but a great importance for nuclear science.

2. Today, we may look back to the Stone Age as being quite primitive and backwards. How will the future see our era? In what *specific* ways will *we* look primitive?

to nature! Those acts defined us as a species, as a *changing* species, our most characteristic characteristic.

The creation of new materials, the chemical revolution, electrolysis to create metals that were almost impossible to separate before, like aluminum: It's a common metal now. Go back 150 years, it was incredibly rare, and one of the most expensive substances that existed. It was used to cap the Washington Monument, because it was such an exotic metal and such an expensive one. Today, it almost seems like, "Why would you put aluminum on the top? That seems kind of cheap; wasn't it just Reynolds Wrap?" But not at the time; at the time, it was something very special!

Or, let's give a few other examples: pain killers, antibiotics. You would not have a hip replacement surgery if you didn't have anesthesia. That's sort of a necessity for a lot of the things people get done today, unless it was a life or death surgery. Medical scans, etc.

China's Promethean Future

So these different eras, broad-ranging different eras of mankind, the physical world of the Stone Age, the chemical world of the Bronze and Iron Ages, and the electrical age; the nuclear world that we're moving into, those are creating a new book in mankind's history. We make ourselves in that way.[3]

And those are the things that are the real subject of economics. Gambling is not going to be an interesting chapter in the history of mankind. When a history book is written a thousand years from now, about all the things that made possible all those breakthroughs around the year 2000, plus or minus a few hundred years, that real shift in mankind's history, when we finally eliminated oligarchy as a predominant force on the planet—when people are looking back at this in a thousand or ten thousand years, no one's going to be very excited about interest rate swaps; no one's going to be very excited about Wall Street gambling. It's not an essential part of what we are.

Now, let's get to where China's going: the Moon! China's going to the Moon! They're writing that next chapter, by moving there on a permanent, industrial basis, that's the outlook; by planning to use the helium-3 that exists there, as the new, most powerful fuel for the next stage of human development, nuclear fusion. China is setting a course, not only in a physical way, with that next chapter in our history, that next chapter of Man the Maker—but also very powerfully as a self-concept, an extraterrestrial self-concept that doesn't currently characterize most of our thinking. It makes a *new "us."* Sure, it makes profits, it makes money, it makes returns (as does any physical development), but it makes a new "us," it makes a new mankind. We're what we create ourselves to be, in resonance with this characteristically developing universe we live in. *That's economics.*

And what Kepler had done, in surmounting the present to create a future based on that creative resonance—that's the key to redefining ourselves. That's the mankind that we have to create. Economic development, ending empire—those are necessary steps to fulfill this identity for ourselves, which we have to embody.

We yearn for economic justice, we demand peace, we demand an end to violence. And we must develop in our hearts that image of a better mankind that we intend to be, that more beautiful "us" that we will be in the future. We might ask ourselves, what will be that next chapter? Who will be writing it? So, like Alexander Hamilton, I suggest that you take up your pen, and put on your boots.

3. See "Physical Chemistry: The Continuing Gifts of Prometheus," *21st Century Science & Technology* Speical Report, February 2014.