What Brunelleschi Knew And How He Knew It

This edited transcript of LaRouche PAC's regular "New Paradigm" internet television show of April 9, 2014, now nearly two years old, complements the discussions of the role of Filippo Brunelleschi contained in EIR*'s previous issue of Dec 11. It has never before appeared in* EIR.

Megan Beets: Good afternoon, today is April 9th, [2014]. My name is Megan Beets, and I am joined in the studio today by Mr. Lyndon LaRouche and Jason Ross, of the LaRouche PAC Scientific Research Team.

Now, just to set the context of today's discussion, the world is currently suffering the effects of what has been an absolutely fatal breakdown crisis in political guts and political leadership in the United States: We have a fascist President installed in the White House, who is acting on behalf of a British Empire to drive the world to the brink of thermonuclear war, a war of extinction. Now, in the United States, three-quarters or more of the American people, no matter your so-called party affiliation, hate this guy, want him out—need him out for their survival.

Now, what is the so-called "opposition" party, the Republican Party in the Congress, doing? What is their strategy? Well, rather than act to impeach this guy, and he *is* impeachable, their strategy is... "We'll wait for the next election. We'll wait until 2016, when we'll install Jeb Bush" or something like that."....

Now, not only are we responsible for stopping the threat of thermonuclear war, but those of us who are willing to take leadership, such as yourself, Mr. LaRouche, are also leading the fight to ensure the basis for the continuation of civilization. And this is what we're going to get into today: What is the basis for the operation of the human species in the universe? What is the basis for human progress, and progress of mankind on Earth, and beyond?

As you have outlined recently, what people have to understand are two crucial groupings of scientists in the past 600 years of mankind's history: The later grouping, which we covered a couple of weeks ago, being the current of Gauss and Riemann into Planck, Einstein and

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Brunelleschi's Dome, Santa Maria del Fiore, Florence, Italy.

Vernadsky; that was set up on the basis of the earlier grouping which Jason's going to discuss today, which is, Filippo Brunelleschi, Cusa, and Kepler. So with that, I'll turn it over to you.

Who was Brunelleschi?

Jason Ross: All right. Yes, as we discussed last week and then three weeks ago on these triads, and just to reference a couple of other things for people to check out, besides those shows of March 19th and April 2nd, are also Mr. LaRouche's two recent papers, "Is Satan Still Operating from Inside Bertrand Russell's Corpse?" and "The Incompetence of Twentieth Century Science Education."

So, today we are going to go into some more detail on the first triad, that of Brunelleschi, Cusa, and Kepler, in particular on Brunelleschi. Just to read a quote from you, Mr. LaRouche, from the show of March 19th:

> Okay, so let's look at these two cases: All right, what did Brunelleschi prove? Brunelleschi proved the falseness of the straight line, of the existence of the straight line in the small. That was his great achievement. He extrapolated from the understanding that you can not use arbitrary predetermined lines in any way, to determine how processes work.

And then a little later, you said:

> He came up with a whole new architecture, but more: He took the simple thing of a simple, hanging chain, the hanging chain model. ... Then came Kepler as a follower, implicitly of Brunelleschi, and specifically of Cusa; he was very explicit about it. He solved the problem. So a third member of the triad came up with a solution! But Kepler's solution depended upon both the implications of what Brunelleschi had done, which enabled Cusa to make his discovery. But the solution was not yet reached. The solution was done by Kepler.

You added:

> So all competent modern science depends upon the reference to Kepler, in terms of Brunelleschi and Cusa. Anyone who eliminates any one of these three, Brunelleschi, Cusa, or Kepler, all as one group, is an incompetent in science, intrinsically.

So, to make sure we are not incompetents in science, we're today going to focus on Brunelleschi, about whom I was mostly unaware until rather recently, so we have some things to share about him.

Obviously, the most pronounced achievement of Brunelleschi is the dome of the Cathedral of Florence, the Cathedral of Santa Maria del Fiore. This is still today the largest masonry dome in existence on Earth, although it was built centuries ago. The cathedral was actually begun in 1296, which was when the first stone was laid, and some of the initial layout of the length of the church was designed. In part of the building boom of the Fourteenth Century of Florence, continued work was done, and then there was a debate, and actually a referendum, in 1367, to choose on the general design of the cathedral. The two choices were between the designs of one Neri di Fioravanti and Giovanni di Lapo Ghini.

The two designs differed in that Giovanni di Lapo Ghini proposed a Gothic style cathedral, one where,—unlike the dome as it looks today,—it doesn't have the flying buttresses, which are the stone arches on the outside of the cathedral that help hold it inwards, that you see in the Gothic cathedrals; those buttresses allowed the walls to have many more windows that let in a lot of light, and that was why they were built. That was one of the two proposals. The other one, from Neri di Fioravanti, did not go with a lot of large windows as you can see, but got rid of all those buttresses, going for a simpler look, what he thought was a more "Florentine" look.

And the referendum was held and this is the design that won: Brunelleschi's father had actually voted in the referendum, and he had voted for this design, so there's a family connection to it. Part of the proposal from 1367 was for a dome of this sort to be built.

Now, nobody knew how to build that dome in 1367, but they still boldly decided that was the design they would pursue, and they would build up the rest of the cathedral and worry about how to build the dome later, which is what ended up happening. So the cathedral was being built; Brunelleschi was born in 1377. He lived a couple of blocks away from the cathedral, so as a young child, as a young man, he would have been familiar with the construction work that was taking place. Everyone in Florence knew this was going on, and he was right next to it.

FIGURE 1

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Depictions of the Sacrifice of Isaac, done for the competition to adorn the doors of the Baptistry next to Santa Maria del Fiore. On the left, the panel by Lorenzo Ghiberti; on the right, that by Brunelleschi.

So, Brunelleschi became apprenticed as a goldsmith, which at the time was among the highest of the trades, because of the detailed work that was done, and because of the things that you could do as a goldsmith. Brunelleschi—we don't have the actual model, but supposedly he even worked on building a clock that was powered by springs rather than weights, in his work as a goldsmith, which, if true, would have been the first spring-powered clock. It's a little bit uncertain, as is much about his life.

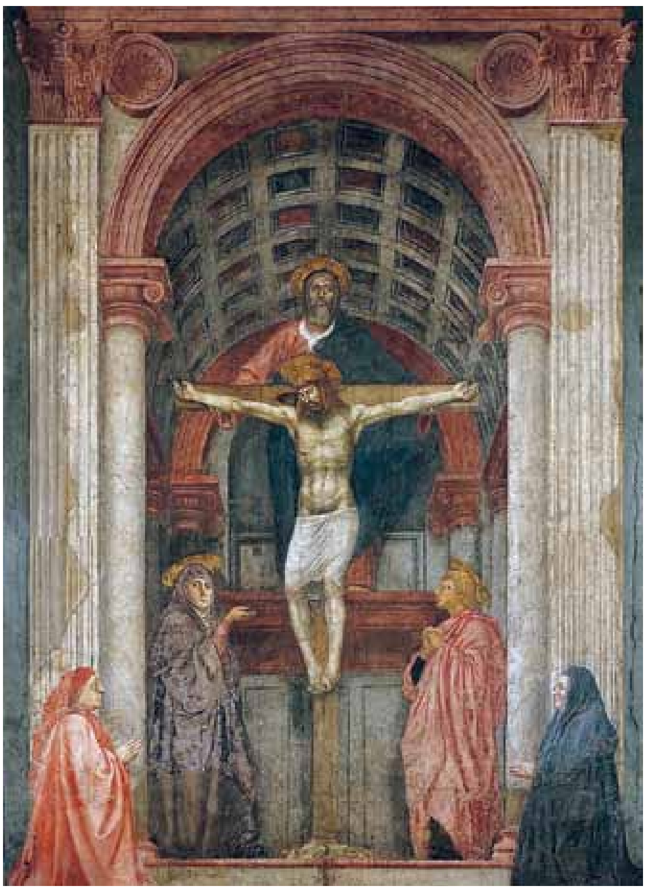
His Early Breakthroughs

So the cathedral's being built. The plan, to give a sense of the proportions, I'm not sure if you can see, but there are people standing at the very top, on the lantern, at the railing there, and you can see how tiny they are compared to the size of this dome. The peak of that cross above the gold ball at the top, is 375 feet in the air. So this is significantly taller than the U.S. Capitol—this is a tremendous building.

So, back to Brunelleschi's life: In 1401 or 1402, there's a competition that he entered to design doors for the Baptistery of Florence, and he's one of two finalists in this competition, along with Lorenzo Ghiberti. So, I would actually encourage everybody to look at these—it's hard to see these in this video, I know; but if you take a closer look at them, you can compare the designs of Ghiberti on the left, and Brunelleschi on the right. (**Figure 1**), This was one sample panel of Abraham's sacrifice of Isaac, before the angel stops him. Ghiberti won; Brunelleschi was not commissioned to build the doors, and he then set off on a trip to Rome. He went to Rome with his friend, Donatello, where he studied buildings, he studied construction, he studied art, to the extent that there were things to look at.

And in doing this, he developed the concept of perspective. So Brunelleschi really made a breakthrough in how vision works, and how perspective works, and made the breakthrough out of the flat paintings, that were seen, to the actually spatial ones.

FIGURE 2



*Masaccio's The Holy Trinity (*Santa Trinità), *a fresco in Santa Maria Novella in Florence.*

This is a painting by his student Masaccio. (**Figure 2**) It's called *The Trinity* and it's in Florence. This was

FIGURE 3

The Pantheon in Rome, completed in approximately 126 A.D. by the Emperor Hadrian.

FIGURE 4

The Roman aqueduct Pont du Gard*, opened in 60 A.D. in the south of France.*

the first real perspective painting. And you can see, as you look at it, you've got Christ; you've got above him a dove, which is the Holy Spirit; and then you have God the Father behind him. And you can tell that there's a sense of depth, you can tell by the way that ceiling is drawn behind him that it really appears that this goes back in space. And you can imagine when it was first painted,—and the paint wasn't falling apart as it is now,—how realistic this must have looked, and what a shock it was to people to see a wall that looks as if it actually extends back.

Today, we might take this for granted, but it wasn't always known. And this came from Brunelleschi. Leon Battista Alberti, who later wrote a book on painting, credited Brunelleschi as the inventor of perspective, which in this painting uses a vanishing point to create a real three-dimensional space, such that you can recreate the scene as a three-dimensional model, and you can place Christ and the Father,—you can actually place them spatially. This turns something flat into something spatial.

So, among the things that Brunelleschi would have seen in Rome was the Pantheon. (**Figure 3**) Now the Pantheon, built by Emperor Hadrian—a Roman temple to all of the gods,—is almost exactly the same width as the Dome of the Cathedral in Florence. They're basically the same width. The Pantheon, however, is a purely circular dome, whereas the one in Florence, as we saw, had ribs, and it's in the shape of an octagon.

Now, even though this is the same width, it's not as tall as Florence's Cathedral, and if you look at it from the side, you can barely even tell that there's a dome. In fact, it's ugly from the outside; it's hardly an inspiring sight. But this gave Brunelleschi an opportunity to look at how the construction occurred.

In the Pantheon, for example, the walls at the base of the dome are twenty-three feet thick: That's how thick it had to be made to contain all of the stress, the architects thought. Also, when this dome was built, it was built by putting up a huge amount of scaffolding that actually filled up the entire space of the dome, upon which the concrete was then set, and then hardened, and then the wood was all removed.

This use of wood to set the shape is called "centering," and let's take a look at why that would be done. This is a Roman aqueduct; this is the Pont du Gard, today in France. (**Figure 4**) And so, if you want to make a structure that's wider than the longest piece of stone that you can make, you have to put many pieces of stone together, and the arch is the shape that lets you span a distance. These arches were made with centering: If you just started building the blocks from the side, they'd of course just fall in. It's only once you have the entire arch built and put in the keystone, that it then supports itself; before that it's not stable, it doesn't have an internal stability. And we'll turn to what Brunelleschi did on this.

So this is a picture of some more modern—well, more contemporary—arch-building in Morocco, (**Figure 5**) and you can see there's the centering, which is put underneath the arch: It sets the shape; you then lay the bricks. Once the mortar hardens, you can then remove the centering, and the arch maintains itself.

FIGURE 5

creative common/Haven La Chance

Arch-building in Morocco in September 2011.

FIGURE 6

Iranian Historical Photographic Gallery

The Taq Kasra arch, located in Salman Pak, Iraq. It is estimated to have been erected in the now-disappeared city of Ctesiphon in approximately 540 A.D.

Here's another, very old, large arch: This is a vault in what is today Iraq. (**Figure 6**) This was built 1500 years ago in one of the Persian empires, and this is in the shape of an upside-down catenary. Catenary means "chain," it comes from the word for chain: If you hang a chain—I meant to have one but I forgot—but if you have a chain or rope, and you let it hang, it'll make a shape which is this, upside-down. It's a very stable shape.

His Challenge to Stupidity

Let's return to the Dome: The year is 1418, it's August, and a competition is again being held in Florence. Brunelleschi has returned; this is 50 years after the 1367 referendum that decided on the overall shape. The Cathedral is built, and they're ready to figure out how to start building the Dome. And just as in the doors of the Baptistery, again, the final two designers are Ghiberti and Brunelleschi. Brunelleschi, in proposing how to build this Dome, says he's going to do it without any centering, he's not going to use any scaffolding: He's going to build this Dome, piece by piece, such that it's stable as it's being constructed, not only when it's finished.

Nobody else thought this was possible. This really astonished people. The way the story goes, is that when people said, "how're you going to build it? How're you going to build it?," he gave them a challenge: he said, "I'll tell you how. To figure it out, you have to figure out how to make an egg stand stably on its end."

So he challenged them; people tried, and they couldn't do it. And they said, "All right, Brunelleschi, how do *you* make an egg stand on its end?" And he said, "like this"—he cracked the bottom of the egg, so it was flat, and then set the egg there. And as the story goes, "Well, if we knew that, we all could have done it!"

And he said, "Exactly! But you didn't know that." He said, "I know how to build this Dome. You wouldn't understand it. I'm your man. Hire me."

Well, the decision wasn't reached until 1420, but he was hired—along with Ghiberti, which was sort of awkward, but Brunelleschi was in charge of the construction, and so in 1420 he was able to start the building of it.

Now, while the committee was still deciding who would build the Dome, how it would be done, Brunelleschi got a few other commissions, so I want to show some pictures of some of his other work: This is the Ospedale degli Innocenti, which was an orphanage. (**Figure 7**) And in the likeness of the great palaces of the rich families, Brunelleschi built what's called a *loggia*, this patio or this porch on the front of it. This is something he had designed; he really changed the way the columns were used, and this was part of an overall humanist orientation of concern for human beings: a large, beautiful building, built at the expense of one of the guilds, to take care of the orphan children of the city.

This is another work of his, and—out of order,—this is the Pazzi Chapel, the "singing chapel," which actually came much more towards the end of his life. (**Figure 8**)

Now, back to the Dome: Just to give a sense of how high this thing is, the Cathedral reaches up to a height of 140 feet,—that's the height of the whole length of the nave; then you see the Dome. Before it starts, there's another section, which has those large circular windows—it's called the "tambour,"—that's another 30 feet. So, the Dome begins at 170 feet! That's already more than double the height at which the Pantheon's dome began in Rome. It then extends up to a height of over 300 feet, more than double, again, the height of the Pantheon.

FIGURE 7

The façade of the Ospedale degli Innocenti*, Florence.*

Now, in terms of why centering couldn't be done, you couldn't get enough wood to build this. It would have taken between 500 and 1,000 trees; there were no trees that were even tall enough. In later centuries, the only place the British Navy could get timber for their masts of over 100 feet for its largest ships, was in the New World. There simply weren't enough tall trees anywhere in Europe that they could find. And the same was true at the time this was built. It would just be impossible.

The other thing is that because of the time it took the masonry to set,—because it ended up taking sixteen years to build this Dome,—if a wood frame had been built, it would have lost its shape over sixteen years, and it wouldn't have worked anyway! So, even if you had had all the wood, you couldn't have done this with a center.

Inventions

But Brunelleschi had a totally different approach to space and to the physical nature of construction. Instead of looking at a shape very geometrically, as was done with the earlier arches and domes we saw, where you design a geometric shape that you'd like,—It's not inherently stable during its construction, so you have to support it,—get the shape, and then you're fine,—Brunelleschi has built a structure—obviously, he succeeded—where along the way, it's stable. So the stability is built into every part of the Dome, not into the Dome as a whole. As an early Italian historian had said, "It was as if every part of the Dome was the keystone" that gave the stability: It was everywhere stable.

Now, let's talk about actually building the Dome and the techniques that Brunelleschi used. One of them was that there's a lot of material that you've got to bring up there. If you were going to have workmen carry four million bricks up those steps, it's going to take you forever, and it just wouldn't work. So what Brunelleschi had done: he designed a new kind of winch. (**Figure 9**) Before Brunelleschi, everybody used treadmills for building these cathedrals,—like the hamster wheel you see at the pet store, but a large one, with people in it. And people would run in these treadmills, and it would twist and wind a rope, which would lift up along a

FIGURE 8

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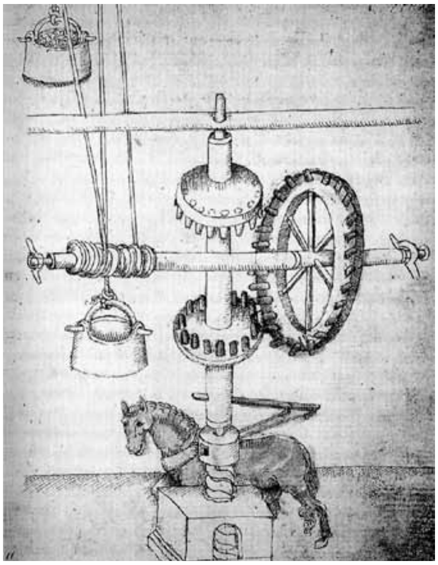
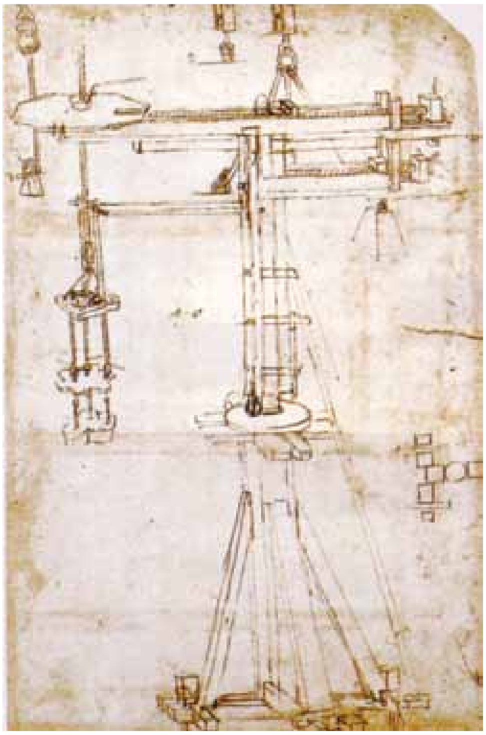
Brunelleschi's Pazzi Chapel, completed in 1443.

FIGURE 9



Brunelleschi's winch, featuring forward and reverse gears.

FIGURE 10



Code Ambrosiano

Leonardo da Vinci's depiction of Brunelleschi's crane.

pulley, it would lift a load up to the top, where you would have your materials delivered.

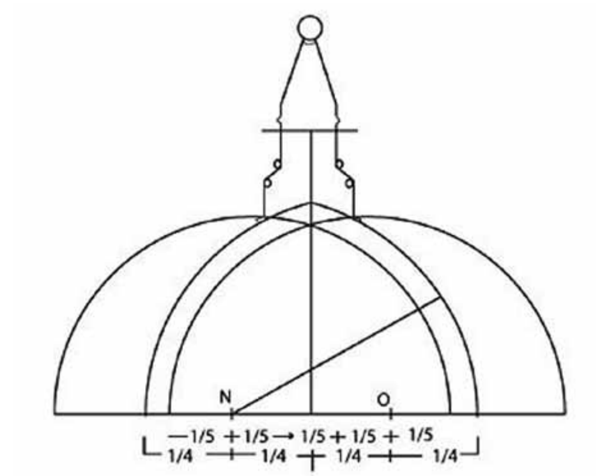
Well, instead of having people do this job, Brunelleschi's design used oxen—this illustration uses a horse instead,—that instead of walking in a treadmill, they walked in a circle. And he also developed for the first time, a gear system. So just like in your car, you can switch your car into reverse,—the same thing with this. You could see the axle that's being twisted by the animals, this vertical axle. There's two different ways it can engage with the horizontal winch system. And by raising or lowering the axle that the animals are turning, you can put it in either forward or reverse, because every time you bring a bucket of materials up, you obviously have to bring it back down again.

Apparently oxen are very stubborn, and they will happily walk forward as long as you ask them to, but they won't walk backwards. So to avoid having to get them out of their harnesses, and turn them around, Brunelleschi developed this transmission system so they could always be oxen, and walk forward, and everybody was happy.

Another thing that he had to do, was once you got the material up the top of the Dome, you had to then put it in the right place. Some of these things that he used, weighed thousands of tons. We're going to get to what some of these large components were. So he also designed a crane, which is perhaps somewhat hard to see, but a crane, called a "castello." (**Figure 10**) This is a drawing by da Vinci—da Vinci was actually involved later with the work on the Cathedral. Da Vinci sketched a number of the things that Brunelleschi had done, and so some people thought that he had invented them. but he was just drawing what Brunelleschi had made: a crane complete with counterweight, so you could position and get all of your larger objects exactly where they needed to be in the Cathedral—another major innovation.

Now, on the shape of it: This is a diagram of the shape of the Dome. (**Figure 11**) It's not a spherical dome. It goes up to a higher level, so it's called a "pointed fifth," where you take two portions of a circle, and then they would meet at a point, except there's a hole left at the center of the Dome, and this is part of

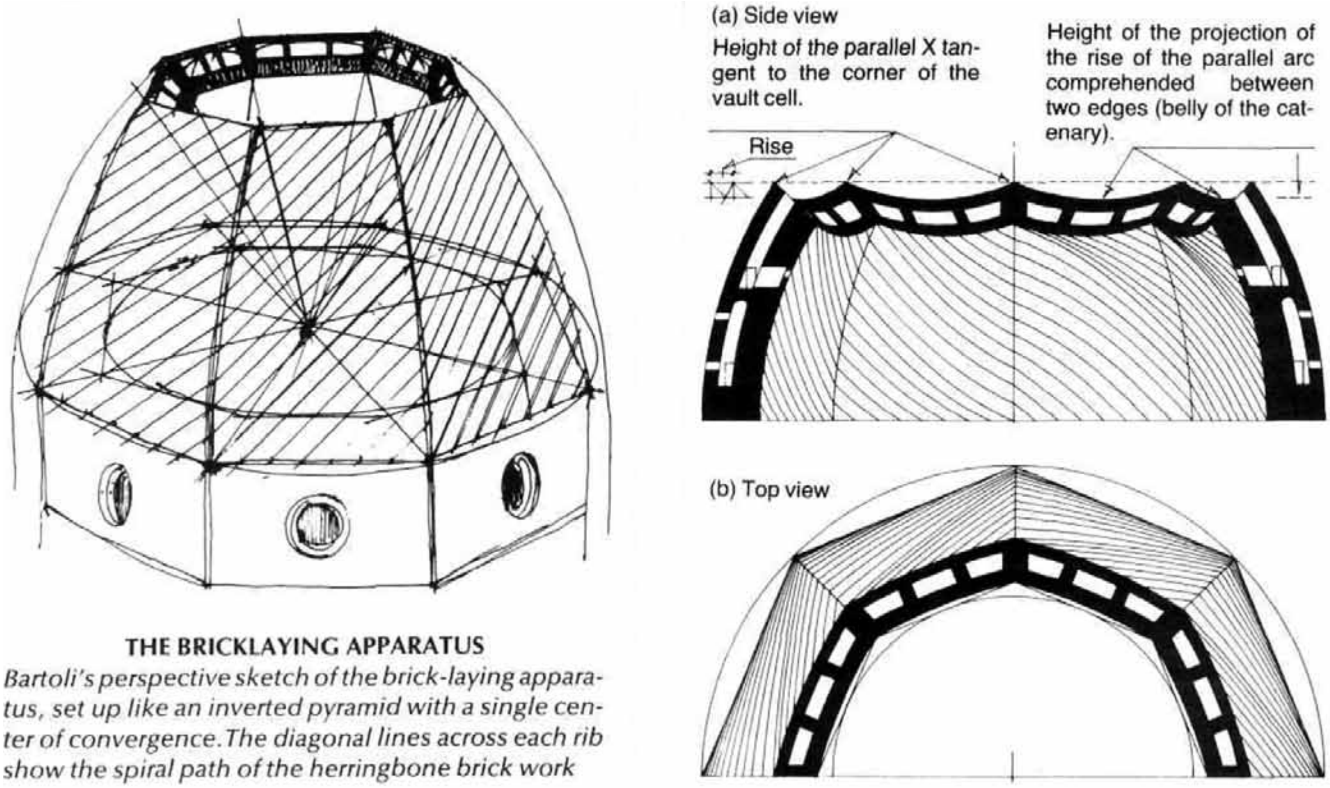
FIGURE 11



Lando Bartoli

Drawings adapted from Bartoli's Requiem per una cupola, *Florence, 1988.*

FIGURE 12



Lando Bartoli

Drawings adapted from Bartoli's Requiem per una cupola*, Florence, 1988.*

what made it so tall and magnificent compared with the frankly ugly Pantheon. It also reduces the amount of horizontal stress at the base by designing it this way.

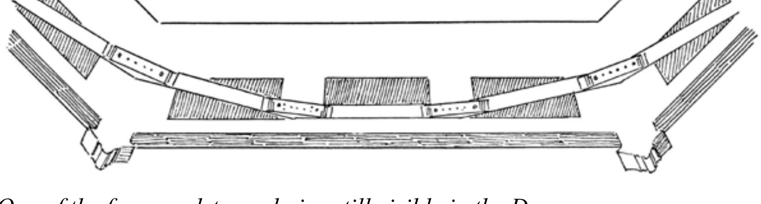
So, when Brunelleschi did his construction—this shows you—the Dome is actually two domes: there an inner dome, and then there is an outer dome which is the one we see from the outside. (**Figure 12**) The inner dome, at its base—remember the Pantheon in Rome, twenty-three feet thick; Brunelleschi's inner dome is only seven feet thick at the base and only five feet thick at the apex. The outer dome is only *two feet thick* at the base, and *one foot thick* at the top. Imagine, something of this size, that outer dome, only *one foot thick*: The outer dome is supported by the inner dome.

So in doing this, he had to use this catenary again, and he actually built *catenas*, he built chains inside the Dome, like the hoops in a barrel that hold the staves together. So this is a picture of one of them. (**Figure 13**) There are four sandstone chains, where large blocks of sandstone had been quarried: These are some of the things you needed the crane for, because people couldn't have carried these and put them into place. They're just too heavy. The crane would be used.

Enemies Attack Him

So these sandstone chains were built, in not exactly circles, because the thing's octagonal, but there are four of these chains that help hold the stress in, that pull the Cathedral inward so it doesn't explode outwards. The records also indicate that there are four iron chains as well, although they can't be seen. If they're there,

FIGURE 13



One of the four sandstone chains still visible in the Dome.

they're inside the masonry; and also a wooden chain, which is still there—a wooden chain to help hold the stress, which is astonishing.

Another aspect of the construction—well, let's go ahead and do this: Some of the bricks that were laid in the Dome, which was made out of brick rather than stone—brick is lighter than stone, because it has so many air pockets in it. He had the workmen lay the bricks in a very unusual pattern, and it also required unusually shaped bricks, custom-made, custom-shaped bricks: four million bricks.

FIGURE 14

The herringbone brickwork in the space between the inner and outer domes.

To get a sense of the work involved, these bricks, after they were formed and put in their molds—it might take two years of preparation before they would be fired,—seasoning time—and the unique pattern that Brunelleschi used, this herringbone or fishbone pattern, meant that you didn't have just pure shelves of bricks all the same, that could then shear apart. (**Figure 14**) It also meant that, because of the orientation, it helped the lower levels support the ones above it. So every aspect of this is unique in terms of the engineering, the industrial engineering to produce everything, in terms of the actual construction techniques.

Okay, a couple more things about the construction: Brunelleschi also received the world's first patent. It didn't work out so well, but he built a ship to bring the marble from the quarries to Florence. As you see, the ribs on the Dome are a nice white color; that's from marble which had then been placed around the brick. And Brunelleschi said, "I'll make a ship that'll do this," and some people think it was to have been powered by either treadmills or oxen that would actually have paddlewheels. Unfortunately the ship sank, the marble was lost; some of it was recovered in an amazing salvage operation. But this just shows you how many different things Brunelleschi's working on: perspective, construction, engineering.

One other thing about the construction is that, according to the official records, only one workman died in building this Dome, which is phenomenal, considering the height. Brunelleschi had safety rules, safety harnesses, safety platforms. The people working at the very highest levels weren't allowed to drink wine, pure wine—they had to dilute their wine with one-third water, so they wouldn't be quite so drunk while working at those heights. And there were strict rules that no one was allowed to sit in the baskets when they were going up and down; you had to use the steps.

As he was building this Dome, at a certain point, Brunelleschi was thrown in jail for not paying his dues to the guild, which was a very small amount of money, and was obviously a political attack against him. And he was attacked explicitly by some of his detractors. People were more cultured at this time, and when they insulted each other, on occasion, they wrote sonnets. So, I'd like to read you these shared insult sonnets. This is from an acquaintance of Ghiberti who attacked Brunelleschi, and he wrote this sonnet to him!

O you deep fountain, pit of ignorance,
You miserable beast and imbecile,
Who thinks uncertain things can be made visible:
There is no substance to your alchemy.
The fickle mob, eternally deceived
In all its hope, may still believe you,
But never will you, worthless nobody,
Make that come true which is impossible.
So if the "Badalon," your water bird,
Were ever finished—which can never be—
I would no longer read on Dante at school
But finish my existence with my hand.
Because I am certain that you are mad, as you
hardly know
Your own profession. Leave us, please, alone.

So this guy didn't have to commit suicide, as he had offered, because Brunelleschi's ship, the "Badalon," didn't work. But here's Brunelleschi's response.

When hope is given to us by Heaven,
O you ridiculous-looking beast,
We rise above corruptible matter
And gain the strength of clearest sight.
A fool will lose what hope he has,
For all experience disappoints him.
For wise men nothing that exists
Remains unseen; they do not share
The idle dreams of would-be scholars.
Only the artist, not the fool
Discovers that which nature hides.
Therefore untangle the web of your verses,
Lest they strike sour notes in the dance
When your "impossible" comes to pass.

FIGURE 15

The Renaissance astonomical instrument called the gnomon in the Cathedral of Santa Maria del Fiore, invented in 1475 by Paolo Toscanelli, and restored by Father Leonardo Ximenes in 1754.

Columbus and Kepler

So, it's very blatant: What you're doing is impossible, and you're an ignorant beast, so give up, it'll never happen, "experience teaches us it's impossible. . ." And look at what Brunelleschi said, "Untangle the web of your verses, lest they strike sour notes in the dance, when your 'impossible' comes to pass."

So, a few more things about the Dome: The cupola was completed in 1436, which was a momentous year. Pope Eugene IV came to consecrate the Cathedral. The bishop laid the last brick in the cupola later that year. And then, from 1439 for several years, the Council of Florence—which would have been the Council of Ferrara except that the plague had them move to Florence, courtesy of some financial help from the Medicis—the Council of Florence, organized by Cusa, was held in this amazing Cathedral, the cupola of which had just been completed. And there's no doubt that the experience of such an awesome work helped the conference, gave a new impetus and concept to the Council. I'm not going to say too much more about that: We need to have a whole discussion about Cusa, but that's not happening right now.

So, the last few parts: In 1446, Brunelleschi passes away, after having seen the cupola finished. And then, as I said, some other people are involved, as I said. Da Vinci as one of the workmen in Verrocchio's workshop helped cast the large bronze ball that you see at the top; and then in 1474, or '75, Toscanelli added a plate into the lantern with a hole in it, so that the Sun would make a nice spot down below. (**Figure 15**) He used this to correct the Alfonsine astronomical tables, to have the most accurate observations of the Sun that had ever yet been made. Due to the incredible height of the Dome and its stability, it was now possible to have greater precision than ever before by watching—basically, it's a sundial—the spot move along floor. That marbled circle that you see there is the summer solstice.

So, Toscanelli was able to redesign these tables which were used by navigators to get around the seas. He works on a world map; Toscanelli had written to the Portuguese royal court to propose sailing west to get to China. He didn't hear back from them, but later Christopher Columbus found Toscanelli's letter, and wrote back to him, very excited. So Toscanelli and Columbus, in 1481, entered into a correspondence about this; in 1486, Columbus petitioned to have an audience with the court of Spain, Ferdinand and Isabella. And as we know, in 1492, armed with the knowledge of astronomy from Toscanelli, and a map provided him by Toscanelli, he set sail west to reach the Orient.

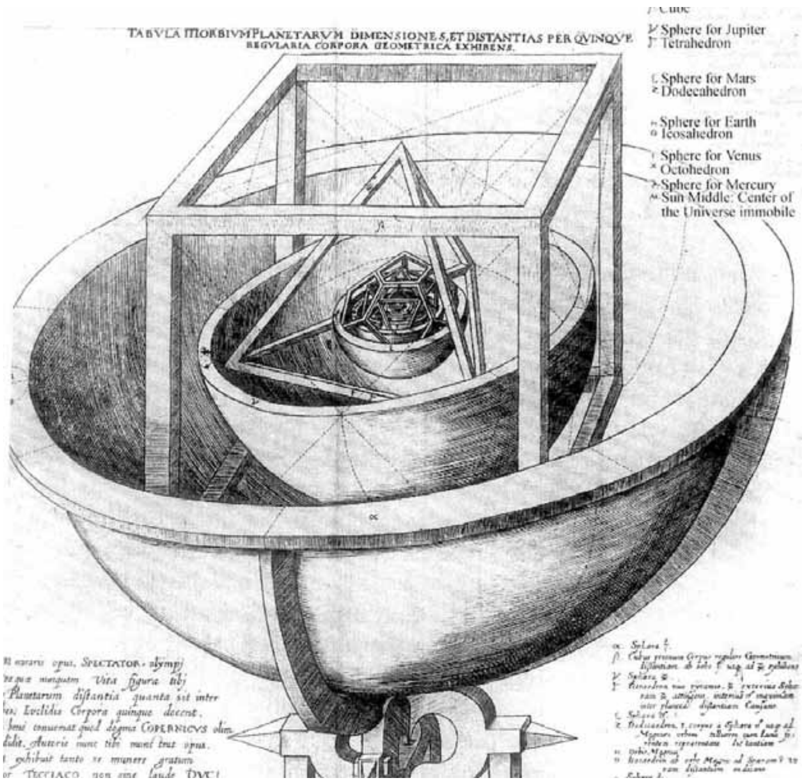
So the Dome, in a very real way, helped in the creation of the New World. I know that's a lot already, but I do want to say a little bit about Kepler, too.

Just very briefly, on this triad—and Cusa, we're going to have to come back to—but what Brunelleschi had done with understanding that in the small, space isn't geometric, it's physical,—this is what Kepler used to solve a problem that had been puzzling him since he was a young man in college. It was in astronomy: Why do the planets move the way that they do,—not just individually, but all of them? Why does the Solar System move as it does, and he did think it was a *Solar* System.

In his first major book, from 1596, the *Mysterium Cosmographicum*, Kepler published this model (**Figure 16**) for the distances between the various planets in the Solar System; Kepler said that they wouldn't just have arbitrary distances, there must be some reason to it. So what he did was that he looked at something that was characteristic of space itself, which was these five Platonic solids, as they're known. They get small toward the center, but you can see that we have spheres, separated by a cube; inside it we see the triangle-based tetrahedron; inside it a dodecahedron; and then an icosahedron, and an octahedron.

Those five shapes are the only ways that you can divide up a sphere evenly, with regular shapes. In other words, it's the only five ways that you could, for example, take an orange, and cut up the peel into tiles, such that all the tiles look exactly the same and were regular shapes—only five of them.

FIGURE 16



From Kepler's Mysterium Cosmographicum.

From Brunelleschi to Kepler

Why are there only five? Space seems to be empty: It doesn't seem to have any characteristics about it, but if you look at doing things in space, you find that some actions are possible, and some aren't. So Kepler believed that given that these were something inherent in how space works, that it would then be found in the spatial organization of planets.

To determine whether he was right or not, he had to get a more accurate idea about how the planets moved, so in his second very major work, *The New Astronomy* he completely revolutionized the process of astronomy: very briefly, he took this Brunelleschi approach, that in the small, there is no linearity; there is only physical action. And he implemented his idea that he had had since his college days,—that the Sun was making the planets move,—and developed the idea that at each moment, the distance from the Sun was determining how much the Sun was moving the planet and would determine its speed. He then had to figure out a way to use that motion at each moment, and turn it into an orbit as a whole.

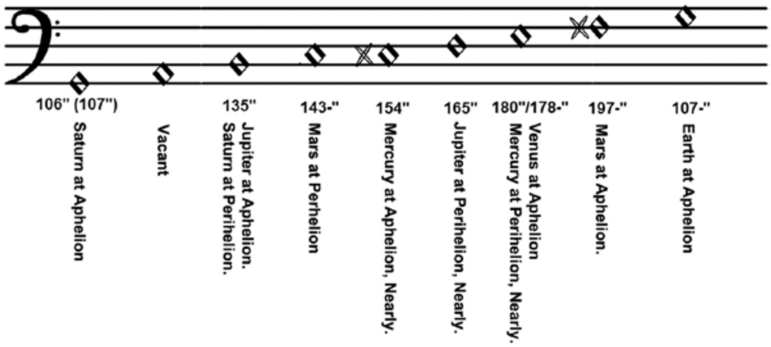
He also had to come back to the distances of the planets, because these solids indicate overall one distance for each planet, but every planet has two characteristic distances—its closest distance from the Sun and its farthest distance. To figure this out, Kepler then moved to another domain—it seems like another; it seems like another sensory domain,—even though he goes beyond the senses,—namely sound.

So just as these solids divide the spatial space, Kepler also looked at dividing aural, "heard" space, the space of hearing, of sound, of music. And by looking at the harmonic intervals, not by building up music from the half-step, from the smallest musical interval—he did not do that! Instead, he looked at the larger ones that were most stable: the octave, the fifth, for example. He built up an idea of how to create the scale, and then looked at how the planets could achieve a musical completeness: How could the planets move, such that they created both the major and the minor scales? (**Figure 17**)

So Kepler puts himself in God's shoes; he designs the Solar System himself; he explains why he would have first used the solids as his main grounding, and then he would have incorporated the necessities of music to develop an entirety of the system where noth-

FIGURE 17

MAJOR SCALE



One of Kepler's depictions in the Harmonia Mundi.

ing was left to chance in the planets, at least not in those two extreme distances. And just to show you,—you don't have to look at the numbers,—but either the closest or farthest motions of the planets had speeds which, if the speed of motion were heard by the Sun,—which doesn't have much of a sense of hearing,—as sounds, then these visual speeds as sounds would be harmonic. What a confluence of different senses that seem to be different! They weren't: It was all one type of harmonics for Kepler.

So putting the whole thing together, Kepler created the Solar System, as a system. He implemented in the small, as Brunelleschi had done, how everything is physical in the small, and he developed the concept of an "all" and why the "all" should be as it is.

We'll talk more later in other shows about Cusa, who obviously we just mentioned here, as well as the other triad: about Planck in the small, Einstein in the large, the paradoxes between them, and how to resolve that. But hopefully, we provided some good insight into why—how it is that these three, Brunelleschi, Cusa, and Kepler, helped define modern science, and why we have to know what they did.

Lyndon LaRouche: Well, first of all, one thing which is left out here, is the question of the catenary. Because you have two concepts which are at the center of Brunelleschi's work: one is the infinitesimal, and it was always,—this was the understanding of light. The attempt to understand a system of light, which was one of his earlier works. The second was the hanging chain principle.

Now, the hanging chain principle is something which destroys entirely the concept of linear space and time. His whole design, his construction, was based on the hanging chain principle, which existed widely in Italy. You had these deep clefts and so forth, and you would have bridges from one side of cleft to the other side, and you would walk across these bridges, the bridges would dance, [laughter] themselves. And this is the famous song. . . .

Ross: Oh, "Funiculi, funicula."

The Struggle against Zeus

LaRouche: Yes, that was the song which was on this theme of the hanging chain. So what happened, is now suddenly you are out of the area of space as such, entirely; it does not exist. What exists is action in space, and you have to define the action in space by its own characteristic. And the hanging chain principle is a demonstration of that characteristic.

So this is the relationship—you know, from that point on, everything that was the so-called "Classical Greek," heretofore Classical Greek, fell apart. Because there was no way you could have a linear construction of the universe. And through the whole process, that's what you're getting at: there's no linear construction order of the universe. It is not based on a mathematical system.

So mathematics is the deadening of the soul, and we see the mathematicians, we see they have Dead Souls. It's like the accountants: The accountants have the characteristics of having Dead Souls. They die in the middle of their work, but they weren't going anyplace anyway.

So this is what the crucial issue is. So the idea, the notion that there is an infinitesimal, comes not from the small. It comes from the large, because we experience the relatively large. And we find that the principle of action does not correspond to a linear extrapolation. And then, you get everything which then comes from Kepler's work, is actually a finished work! Which is why I've defined this thing as a finished work. That Kepler made a phased completion of a concept, of the idea of *physical space*, action in physical space, as opposed to linear space. So the point is, it was everything against Euclid, and everything that Euclid represented was recognized as being *evil*. And the necessity was to find a principle which corresponded to that which is not evil.

And evil was equated with slavery: raw human behavior, as a slavery, or a system which reduced itself to slavery. It comes up in the case of the Great Pyramids, where the lie was the attempt to interpret the Great Pyramids as being a linear construction, made by slaves and so forth—nonsense! It couldn't have been done that way. They were floating these things down the Nile, and that's why it was there,—they were floating these things. They were using sand as a fluid, and they were using the sand as a fluid form, as a means of construction.

And at the base of these Great Pyramids, what you had there were not slave quarters,—these were engineering quarters! So the Great Pyramid project was an engineering project which used the Nile and used the sands of the desert—it was not as much desert then, but the sands of the desert were used as a device, an engineering device. By moving sand and moving water and displacing one thing and another, you came up with an engineering scheme. And what they called the "slave quarters" in the standard interpretation were actually the engineering headquarters, in which the families lived in these quarters, next to these pyramidal constructions. They lived there, and they did the work.

egyptphoto.ncf.ca

The pyramids at Giza, Egypt: great projects which were completed in 2540 B.C.

But they did the work based on use of sand and water as media of action. It's a completely different conception!

So the struggle has always been the anti-Zeusian struggle. Zeusians always insisted that you could do things only one way, by massive use of slaves: the human being as a slave, with no constructive, no dynamic conception whatsoever. And so what the history was, was based on this fraud, this assumption that you have to start from slaves, from primitive human work, done primitively.

The idea of the intellect, the development of the intellect, was completely opposed. And so what you get in this when you get to the hanging chain principle,—you see a very simple demonstration by these hanging chain bridges particularly characteristic of Italy—"Funiculi, Funicula"—that this kind of process was a characteristic, a physical characteristic of physical space-time. It wasn't the whole characteristic, but it was a reflection of the characteristic.

So, he didn't go to zero, the concept of a mathematical zero point. There was never a zero point in his work! The point was, the universe was defined by an *action process*, a process of action, which is only cognizable by the noëtic powers of humanity; that is, the use of the hanging chain as a bridge across a chasm, was typical of this kind of demonstration.

So the problem has been to get away from what has happened essentially since the year 1900, the beginning of the century. This was a return to primitivism! It was actually a force of evil! And don't kid yourself about this thing: These guys were all evil. Their motives were evil. David Hilbert was not a simple-minded character in Paris in 1900: This guy was an evil guy! He was motivated by evil! He produced garbage, which is what evil generally does.

Ross: It's sort of unavoidable.

LaRouche: Yes, it is. But the point is, we're still stuck with people who think in terms of a Euclidean system, and Euclideans are stupid, they're inherently stupid. They're chronically stupid.

Gauss and Riemann

Ross: Right. You know, the fight in science, in reality it's a fight against this oligarchical concept; it's a fight against the axioms that are wrong, that prevent you from seeing things that are true. But there are contemporary people who try to say that they are scientists and talk about what science is: They present it as though the only polemic they have to make is against some fundamentalist evangelical, who believes that the Bible is a textbook,—so they say: "Well, science is about the fact that we use experiments to know what's true, and not just assumptions."

Well, that's kind of obvious, but where do you develop the new ideas? How do you break through axioms that blind you to things? And that is the real key to science. But if you look at what happened in 1900, with Hilbert's proposal and then Russell taking it up with relish, and saying that we are going to systematize thinking,—creativity became not breaking apart the underlying axioms; it became finding an unexpected, but deducible theorem. Creativity became finding a new formula to them. That's what they turned science into: "Follow the facts, what's the formula?"

LaRouche: Well, you have two things, you have first of all,—it was Cusa who actually gave us Leibniz. And it was through that process that this happened. So you had a definition of science with the work of Cusa, and then what Kepler proved, with the nature of physical space and time, eliminated all linear conceptions of the organization of space and time. Now, Leibniz thus represented the most typical of this kind of questioning insight, based on this understanding, exploration of this understanding, which became modern science.

But then we went to another phase, and the new phase actually came at the beginning of the next century, essentially. And then you had this evolution in process, a great tumultuous evolution, which came especially with Gauss. And then Gauss gives you, as a result, directly: the real heir of Gauss is Riemann.

I mean, the visual connection of these two is wonderful: Here's Riemann, who's a real student of the work of Gauss, actually. And Gauss is sitting, aged, in his last years of life, and he's sitting there, without reported facial expression, but sitting there, and here is his student saying everything, telling all the secrets of Gauss in his great Habilitation Dissertation,—especially the initial critique which defines that, rips everything apart! He rips them all apart, just simply, in about three paragraphs; he tears everything apart—with one statement.

You can imagine what Gauss's reaction is.

Then you get this final paragraph, which horrifies all these people: "And now, we must leave the department of mathematics, for physics..." [laughs] And that! That's the declaration which is Gauss's secret all this time! Not to explain to people *how* he had done things, but give them a finished example of how it works. All his work, like on the question of the organization of physical space, and so forth—he's hiding things! All the time, he's ducking. He says, well, I will give you an explanation of how this worked.

The Reversal in 1900

Ross: He's hiding his mind. And that's—like Riemann. One way you could look at it, is he's saying, the mind is real, the mind exists.

LaRouche: Well, then you could go through a whole group of people, from the end of that century into the beginning of the Twentieth Century, and you find a real florescence of creativity, coming in various parts of Europe and elsewhere, and also in the United States to some degree. An idea of space and time, and man's relationship in space and time,—what you get especially with Hamilton.

And most people today are incapable of understanding Hamilton. Which, of course, I'm making a big issue of. If you don't understand Hamilton's work, you're an idiot. If you think you know what the Constitution of the United States is, you're an idiot, and you don't know what it's all about anyway. Franklin understood it; he understood it in his way.

So this is the issue. So, we're stuck with people whose work is to make them stupid, which is what our school systems do. They make people stupid: By teaching Euclid. If you teach Euclid as a basis of education, going from primary into secondary school education, you are going to destroy the intellectual capabilities of nearly all of those students. I know: I went through it.

I didn't even know what Euclid was at that point, but I knew it was wrong. So I just said what it was. And you should have seen the howling and screaming that went on from that point, for three years! About me, about this issue and similar issues. The point is, they were all brainwashed. The whole school—it was considered a very good school, just north of Boston. You had two secondary schools which were notable at that point. One was the so-called classical school, and the other was the engineering school and so forth. And you had people in there who really had some ability to think. But they were polluted on this question of geometry.

Ross: It was like a monopoly: It's hard to think about physical geometry without thinking of—"Oh, you mean, Euclid?" "No—constructive geometry doesn't equal Euclid."

LaRouche: Well, that's the whole point. And so the point is, we still have the problem that most people today, most university professors for example, in sciences, are crippled. I had the biggest problem with the Fusion Energy Foundation. We had one real genius in there, who was the leader of the whole operation; a *real* genius.

Ross: Yes, Robert Moon.

LaRouche: Yes. But the others were secondary: They all had talents, developed talents, which they had acquired in the university, but unfortunately they had also been through a secondary school education, and the secondary school education had destroyed their ability to go higher. They would be able, by working with experimental approaches, to conduct specific kinds of experiments which would work, and they would make new discoveries of specific kinds of experiments which could work.

But their idea of the progress of science was entirely based on mathematics. And you saw this particularly in my age, you can imagine what has happened from 1900, from the beginning of the Twentieth Century: The Twentieth Century was the degeneration. Everything from Cusa and so forth up, was in a direction of progress. It was a fight for progress. And the fight for progress continued.

But with the 1900, with this change, and especially what happened after the end of World War I, where the German community was destroyed, and where this was done explicitly. Since that time there has been a degeneration in the educational system of universities and schools. And that's the big problem I have politically: I have people, very bright people out there, some of them. *But!* they all are soft on Bertrand Russell. And Bertrand Russell is the equivalent of the incarnate virtue of Satan.

Beets: Well, you've pointed out many times in your fights within the Fusion Energy Foundation, that it always came up around the issue of Kepler versus Newton, and that you got these very insightful scientists who would go into fits of insanity over the idea that *Newton* was the real scientist, whereas Kepler did something or other, and now we have these formulas called Kepler's laws.

But in effect, what Kepler did was revolutionize science, the same way you're referring to Riemann. Where Riemann said, "Now we leave the domain of mathematics for physics," Kepler had done that: Kepler had taken the discoveries on the basis that was put down by especially Cusa, and he had put that into practice and proven that there is no such thing as a validity of a mathematical or a geometrical language. It's physical: And what has access to the physical is the human mind.

The Greek mathematician Euclid, who worked in the Egyptian Emperor Ptolemy's Alexandria court circa 300 B.C.

Our Incompetent Scientists

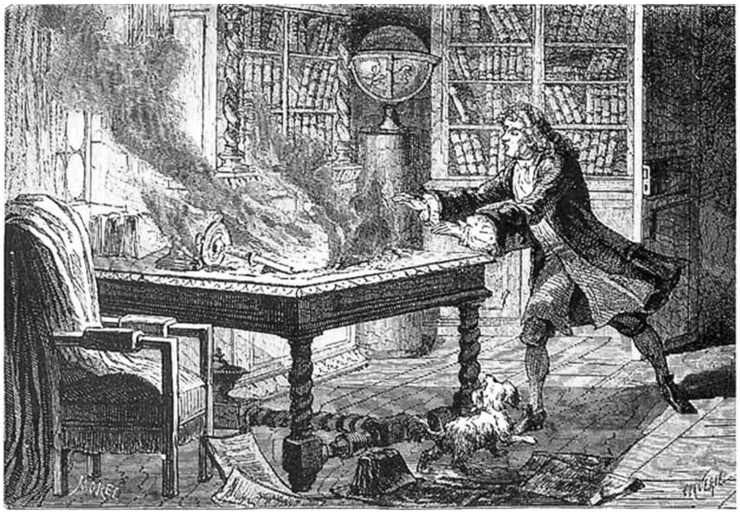
LaRouche: The most important figure after that, is actually Leibniz. Leibniz was the one who made the real breakthrough in defining what the bullshit was. And therefore, the attack on Leibniz—you know, you have also this spectacle: Leibniz is not yet dead, and they're waiting for his death before they dare go ahead into the next step—and that's what happened. That's what happened to science! They're waiting for Leibniz to die, because he was the genius who had made what Kepler had done understandable. And made it a principle.

And therefore, the educational system from that point on, from the Eighteenth Century on, the educational system was degenerating. And the minds of people were degenerating. They could make progress in specific qualified areas, but they were still using mathematics! And the one thing that you would learn from the Renaissance, was that mathematics is *not* the principle on which physics is based!

Ross: Ironically, a lot of people will say that Newton is the beginning of physics.

LaRouche: He was the death of it!

Ross: Right, yeah.



Isaac Newton (1643-1727) shown in a panic, as his writings on alchemy are burning in 1693. Legend has it "the dog did it."

Beets: And Leibniz showed very efficiently in his correspondence with Newton's proxy, Dr. Samuel Clarke, that the belief in fixed mathematics and the belief that space and time are linear and empty,—which is the mathematical description,—he ends up showing that that's Satanic. That the root of that is actually Satanism, which is exactly what is reincarnated in Bertrand Russell.

LaRouche: Exactly. And Bertrand Russell was very aware of that. That that's what it is, and that's what we're dealing with today. That's what our whole organization is dealing with, essentially, to the extent it functions at all: You're fighting against these fixed standards, where people who came out of colleges and so forth,—they may have been bright, and so forth, but they still had this attachment to what they had been trained to believe, and tried to explain everything in terms of what they had been trained to believe. And the minute they would click on that, "Well, this is what we had been trained to believe," this becomes the affirmation for them of what is truthfulness!

And that's one of our biggest problems we have with our best, leading people, politically. They're not competent! Because they have, underneath them, they have assumptions, presumptions which are false. And it's like belief in Satan; you know, no matter how smart you are, you still believe in Satan, and therefore, there's something wrong with you.

Ross: Yes. I feel as if I know what you're getting at. For me, it's really resonating with the concept of the ontological versus the methodological transfinite in your economics book, *So, You Wish To Learn All About Economics?* Because there, you had contrasted those who would still accept that there is something transfinite, or transcendental about the mind, as a method, that there are people who might say, "Yes, the mind does something that's inexplicable. But the things that it discovers should be deducible from the axioms." Versus, the true—what you called in that book the ontological transfinite,—where the way the mind works is itself reflecting something about how the universe works: that there is a coherence between them; that the *mind itself* is a part of nature.

And there's this bizarre idea that it shouldn't be. You know, that's what Gauss had to do. He had the way he thought, he had his mind, he had the way his creativity worked. But then he presented things as though he hadn't found them that way. So it can be kind of irritating to read his work, because you know he's not telling you how he came up with something!

LaRouche: If you look at his earlier mathematical works, you see it.

Ross: Yeah! In his proof of the Fundamental Theorem of Algebra, then he has a lot of raucous fun; he's polemical, he's attacking people, he does it very explicitly—well, almost explicitly,—tell you how he's thinking.

LaRouche: Until he gets to a certain point, and then he's told, "Take it easy, buddy." And thereafter, he would not explain his experimental discoveries. He would describe them. And then Riemann changed that! Riemann, with the Habilitation Dissertation, just destroyed this whole thing! It's there. You can go through it, read that; it's the most up-to-date thing you can imagine today when you're getting into a classroom. You bring Riemann into a classroom, a mathematics, physics classroom, academic level, even postgraduate level—you get a real freakout!

Ross: They say, "Go to the physics department, get outta here. You're spoiling our fun." [laughter]

LaRouche: Well, the point is, "We don't believe in shitting on our food."

Russell's Evil Doctrine

Ross: Their idea of fun is maybe not the best.

LaRouche: It's essentially that!

Beets: What you're bringing up,—this is the crucial issue we face today, because this is an oligarchical prison cell that people are willfully putting themselves in. And by clinging to the idea that the human mind does not actually have a consequence in the physical universe, that all we know and all we do is a derivative of mathematics and deduction and experience, we're submitting to what is an oligarchical system, an extinction system. Because if we don't break out of that, and if we don't return to a truly human policy structure, which is these breakthroughs in principle of human mind, implemented in a physical economic system which has been best embodied by the American System of economics,—we are facing extinction.

LaRouche: And the phenomenon is, we're dealing with a population whose standard of veracity is clinically insane. Because they believe in things that are not true. They're living in a fantasy world, where there's no understanding whatsoever of the truth of things—because *they don't want to be ostracized*! And the principle of ostracism is the key instrument of making people stupid. Tell them, "Don't do that, you'll be ostracized! Nobody will talk to you; if you start talking like that, people are going to wonder if something is wrong with you."

You say, "No, there's nothing wrong with me,—there's a lot wrong with you. But maybe your case is hopeless. Is that possible?" It's the only way you can respond to them. "I mean, you may believe that, but maybe it's just because you're insane. Or, maybe just stupid."

They don't like that—I don't know why. Giving them valid information on which their future existence may depend! But they don't like it… too bad!

So what you do, is you work in the process of history which creates points of contradiction. And you exploit the contradictory evidence to shatter the evil presumptions. You're seeing that now. You're on the edge of exactly that: that what's happening from Asia, which relative to the trans-Atlantic region, is predominantly sane. It may be imperfect, highly imperfect, but it's different!

Asia is progressing, and in the trans-Atlantic region, you have a disease called the green disease. And the green disease is pure evil! And people who believe in it will behave like evil people: They will attack viciously those who do not accept the green philosophy. But every green person is an idiot! Every person who's green should be thrown out of any department of science, in secondary schools and also higher… they're intrinsically incompetent, they are fraudulent. Their premises are wrong, have no correspondence to reality. They believe in mathematics, and mathematics has inherently no truth to it.

They believe in language in the ordinary sense, and there's no truth in language in an ordinary sense, just as Riemann says in his final paragraph of his Habilitation Dissertation: We must now leave the department of mathematics, for physics.

And that's exactly what the reaction, was against in the famous events in Paris in 1900. That's exactly what Hilbert was doing: he was setting up a counter-position to science—in mathematics! And then you had this evil Russell, who went out as a real fanatic, to spread this doctrine of evil. It was based on the British Empire, the power of the British Empire to enforce it. And World War II and the things that led into it were actually this process of *destruction of the human mind*.

And the transition from the process of—well, it actually comes from Bismarck, Bismarck's [1890] ouster was the turning point. And you have this whole series of wars and so forth which were breaking out at that point, because they recognized that the victory of Abraham Lincoln, who they assassinated as a result, had been an affirmation of the American Revolution. So he was assassinated! Just the same way that John F. Kennedy was assassinated, that his brother was assassinated. The assassination attempt against Ronald Reagan was part of the same series as the assassination of Kennedy and his brother.

Coming Breakthroughs in Science

And Reagan was a little bit tough physically; because of his whole background, he was a very physical guy. So he survived the assassination attack against him. But he was crippled and pretty much put out of action for a while in recovering from that assassination attack, and the Bushes moved in.

So what happens is, that Reagan actually comes in as the escape from the Democratic Party's stupidity of the whole thing,—the stupidity that occurred in the entirety of the 1970s. It was an era of stupidity.

And the attempted assassination of him, which didn't work out as an assassination, but it was surely an assassination attack,—was to bring in the Bushes! If he had died, there would have been a Bush Administration all the way through! And we would have had the Bush

NASA/JPL-Caltec

Man in the Solar System: A hazard avoidance camera on the rover Curiosity in one of its maneuvers over Mars.

problem then, already. Which we have now with what was done against Bill Clinton. And Bill was not prepared to deal with the shock that they were throwing at him. That was his weakness. He had also a Vice President who was better at vice than anything else. And that was not helpful.

So that's where we are! We're in a point where there are certain standards which we can know, and which you can find by tracing the history of science and history of culture the same way. You can find a track which is consistent. And you find out early, with what happened with Vernadsky's work,—how Vernadsky has made another breakthrough—he's dead now, but he's made a breakthrough which is a new conception of mankind in the universe.

Because for the first time, human life—not life as such, but human life, becomes a standard of understanding of the whole Solar System and beyond. Because it's man *in* the Solar System, which is now the standard of truth, of relative truth. It's the best we can do right now, so far. And that's why the space issue is so urgently important. We have to get beyond what Vernadsky actually achieved in the transition to the concept of life as primary, human life as primary. And that's what was happening at the turn of the Twentieth Century! And that's what they tried to head off!

And that's what the fight is now. That's what our fight is. We have now entered into a new space of history. We're now going into space; that is, we *have* to go into space, we have no way of escaping that responsibility. Which means we have to redefine everything we think in terms of just everything that's happening on Earth. It's not just happening on Earth! The threats to mankind's existence immediately beyond Earth, or affecting Earth from beyond, are the real issues. And the point is to understand mankind and understand what the human mind actually represents, from the standpoint of looking into the future, looking into—the idea, are we going to Mars? We're stupid!

Obviously, you can't live on Mars! No one yet has the capability to actually live on Mars. Or to live on asteroids. Human beings don't have that capability. A very short time, with highly specialized preconditions and followup, and then their life is at risk also, because of the effects of the little bit of strain they have. But we can put machines out there. We can put processes in action out there; we can control them from Earth; we can set up institutions that function, controlled from Earth, in nearby space, on the Moon, and beyond.

Mankind then begins to control nearby space. And that's what we must, among other things, do! Because we're going to have to change the condition of Earth; we're going to see what we can do about influencing the Sun. These are the kinds of things which are the future.

And you have minds like those of the Renaissance, those minds, and the Renaissance tradition that came out of that, until it was crushed! That's the reality. It's the only thing worth studying.

Beets: And it's the fulfillment of what Kepler did. Kepler subsumed the observed bodies of the planets out there into a single Solar System, under the principle of mind. And we have to fulfill that by subsuming the Solar System by the principle of the human mind.

LaRouche: Exactly! Precisely! This is precisely it! And people have got to get out of their smallness. And these cases,—like these cases of the Renaissance,—are a crucial point in the history of mankind. And it remains still the crucial issue for mankind, to understand what that principle is. It's the most important thing we can do.

Because this system is not going to work! It can not work. It is inherently a failure; there's no way you can civilize it; you have to change it for something better.

Ross: Into a different, totally new idea of the future. The Renaissance proved for sure that we can go way beyond what we had done in the past. That venerating antiquity was not the way to go. The future could go far beyond that, and the same thing today. You have to have a vision of the future that goes far beyond where we are today.

LaRouche: And not to recognize the fallacies of sense-perception, and to understand them: that's where our problem lies. Because when you get into the Renaissance, you get a turning point in all of human history. It's a precious turning point which is specific to that particular century. And what comes with Kepler's discovery, when Kepler defines the principle of the Solar system,—which is an ontological conception, not a formal one,—that conception changes everything! And people who don't accept that change are inherently stupid, and a threat to civilization. It's true!

Because it's like the guy who drives off the cliff, saying, "I have my rights." Pfff, boom! They're not so smart, you know.

Beets: I've noticed.

LaRouche: That's why this is so important: to get into the ontological implications of these issues, is what the issue is! Not the effect. Contrary to *Die Hauptsache ist der Effekt* ["The main thing is the effect"], it is not just effect! *Die Hauptsache* insists, there is something better. The future is the effect.

Beets: Okay, that's a good place to leave it for this week.