EIR Feature

# Triple Shock: How To Think About The Global Crisis

by Jonathan Tennenbaum

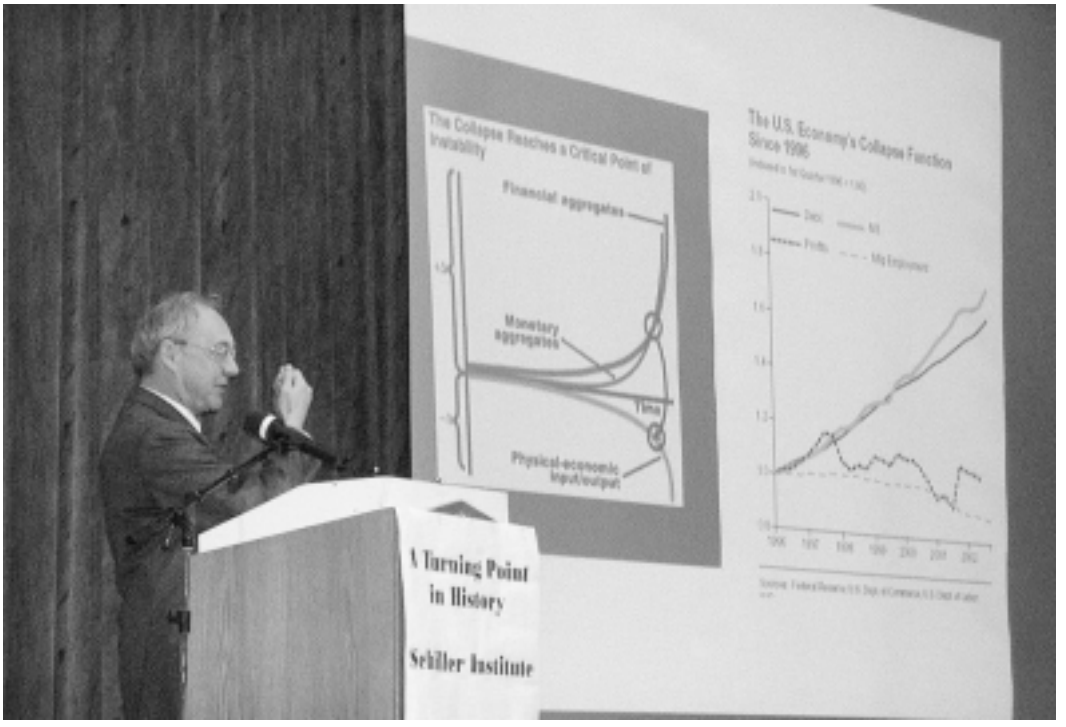
*Jonathan Tennenbaum, the Schiller Institute's science advisor, gave this presentation at the Institute's conference near Wiesbaden, Germany, on Sept. 26. The full title is "The Coming Triple Shock of the Physical Economic, Financial, and Cultural Crisis." The speech has been edited for publication, and some of the graphics used in the slide/video show have been omitted or adapted. See last week's* EIR *for a report on the conference, and the keynote speeches by Lyndon and Helga LaRouche.*

The moment is approaching at which the entire world situation, including the immediate personal situation, of practically every individual on this planet, will undergo the most rapid and drastic sorts of changes—changes beyond the imagination of all but a tiny handful of individuals. And the problem I want to address now, and for the discussion, is: How should we think about this situation?

Now, particularly because we observe around us, and sometimes in our own midst, certain fallacies, certain errors in methods of thinking, therefore also one of the efficient ways to address this question, *how* to think, is to first talk about how not to think about this situation. Or how not to react to this situation.

In particular, right now, insiders, so-called "financial insiders" in the financial markets, leading bankers and so forth, broadly agree with what Lyn [Lyndon LaRouche] has been saying, up to a point: that the world financial system, in its present form, is unsalvageable and will soon disintegrate. For informed people, the question is not whether, but when, and how? And, in fact, there are entire families and groups of speculators, financial speculators, who are speculating on a coming global financial crash of historical proportions, and hoping to somehow come out on top and benefit from it.

There are also open discussions about the perspective for a Weimar-style hyperinflationary blowout of the world economy. So-called respected financial institutions, such as the Bank for International Settlements, have groups working on computer models, computer simulations of such a hyperinflationary blowout, or a




*Jonathan Tennenbaum: "I think the key question here, is how to evoke, how to wake up, the principle of reason, this principle of reason which must act to* change *the system."*

deflationary implosion, collapse of financial markets. And, of course, as Helga [Zepp-LaRouche] was mentioning, there's already preparation for emergency (and mostly fascist) measures, or preparations to impose various kinds of emergency regimes.

Now, all of these calculations, although they reflect to a certain extent, part of the reality, they fail to grasp the essential character of the coming shock. They make the fatal mistake, for example, of assuming that the crisis is purely financial in nature, something internal to the financial system. Something that one can understand on the basis of the collapse of various bubbles in history—which, by the way, was essentially never just a question of the financial system itself.

But, in fact, as I shall go into here, what we're looking at right now is *not* a simple financial crisis, but a *collapse of the whole system.* And by system, I don't just mean certain contractual agreements, but actually the entire basis of ideas, the entire thought structure, the agreements, the institutions, the arrangements, formal or informal, that have governed the world over recent decades, and in a sense, since 1763. We're talking about the menace of a disintegration of civilization itself.

Now, as I want to develop here, the crisis—I've called it a Triple Crisis—triple shock: The ongoing crisis involves no less than *three,* interconnected dimensionalities of action; we could call it three interacting domains. Each is completely different in character from the other, and each one of them changes the interaction, or bounds the interaction of the other two. And you can't understand, or deal adequately with the situation, without grasping the nature of all three, and their interacting bounding conditions.

So, the three broadly to be identified, are:

- **The physical economy,** in the sense of the process of physical production of tangible wealth and physical investment, and the activity of the labor force (including its mental activity), which provides the physical basis for human existence on this planet, right now and in the future. That's number one. That can be conceived in a certain way as something analogous to the metabolism of a living organism, but with important distinctions that I'll mention.
- Second, is **the financial system.** The financial system, in its present form, which is intrinsically *insane,* intrinsically entropic. It is essentially an Euler-Lagrange algebraic system, in terms of its character. It consists of a lattice, a growing lattice of contracts, contractual agreements, including claims on existing and future income. Most important, the financial system in its present form is like a mental illness, which is driving the physical economy to commit suicide. However, this financial system is, of course, also not an independent existence, fully.
- The third dimension of action is what I might refer to as the **noëtic process,** that is, the process occurring within the minds of the population and leading institutions, in governing how those populations and institutions react politically to the ongoing events, including those events particularly, which are generated from within the physical economy and the financial system.

So, each of these are presently in what we call a turbulent

boundary-layer phase. They're like (as I will say in a moment), a poorly designed aircraft, which is running into the so-called sound barrier, as it is being ripped apart, by the effects of shock-like changes which are occurring, generated by this interaction.

But as I say, to get further, we have to look not at these three individual phases, but at their interaction. I'm going to talk a little bit about how to think about this kind of problem, a very special kind of problem which this poses; of how do we think about a process which involves, at one time, several different dimensionalities of action, each of which incorporates also numerous sub-principles, or things that operate like principles.

## The Domain of Triply Connected Action

So for this, I want to talk a little bit about what you could call the Riemann-Vernadsky-LaRouche domain, or the Gauss-Riemann-Vernadsky-LaRouche domain. This might appear somewhat technical, but I think it's crucially necessary, in order to permit us to form a more powerful kind of mental image of this triply connected action, which is generating these great historic events, which we are already experiencing now.

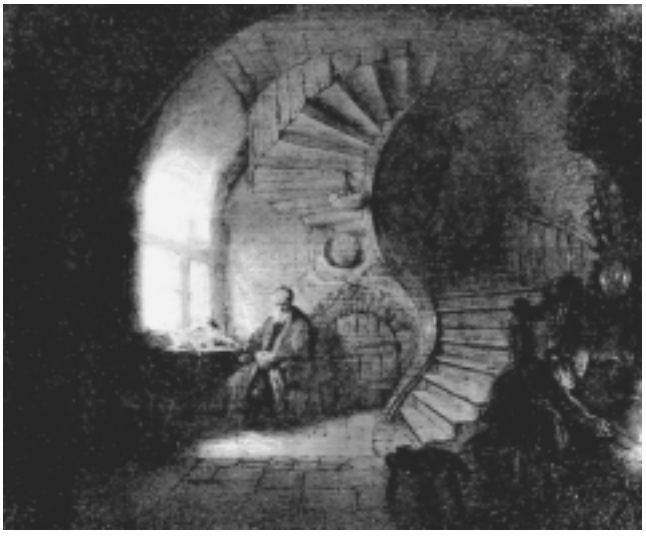
I'm going to make just three points. One, is the notion of a geometry; the second, is the concept of multiply-connected action; and the third, is the generation of what we call singularities, or discontinuities, through multiply-connected interaction, and the way in which the results of that process are integrated in the ongoing process—what's called the Dirichlet Principle.

So, first, what is a geometry? What is a geometry? Now, I have a bit of a difficulty with this, because I have a certain grasp of this concept, gained by studying Lyn and Riemann over many years, and also observing the way my own mind works. But I've continued to have great difficulties communicating this—but that's perhaps in the nature of the problem.

A geometry, to try to get at it, is not a collection of objects. It's a conception which is addressed in different ways, that are all more or less congruent: What we call "a boundary condition." That is to say, a something which determines the overall course of a process, but it's not part of the process in any visible way. Something that determines a situation, in which multiple pathways—a process that has many variants—multiple pathways inevitably, for some reason (and that's the reason) lead to one of only a certain, rather restricted set of consequences, or results.

Another expression for this, is what Vernadsky referred to when he used the Russian term *organizovanost,* "organizationicity," or so forth: the concept that there is in a process, a kind of organization. It's not an organization in the sense of systems analysis, where you say, "Okay, this is connected with this, and so forth." But, it's kind of a principle—like the principle of life—behind what appear to be the interactions of the process.

FIGURE 1



*Rembrandt's 'Philosopher in Meditation'*

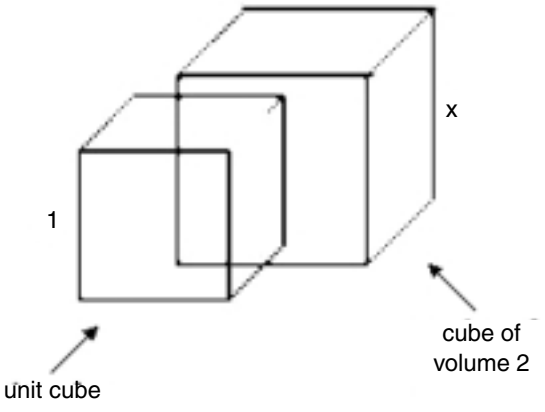
Vernadsky also spoke about the concept of a state of space-time, a local state of space-time, when, for example, he suggested that one could think about a living process, as existing within a specific state of space-time characterized by the principle of life.

And all of this is encompassed, as Lyn mentioned, by Riemann's concept of the *Geistesmassen* [thought-object], in one very important way: Namely, when we ask ourselves, "Where do these geometries come from? Where do these shaping of events come from?" That, in fact, these are generated entities, which Riemann describes, in terms of the generation of *Geistesmassen,* in the mind. The notion that the universe, and all the events within the universe, are shaped and governed for human practice, by a kind of transfinitely ordered array of intentions, that this has the quality of intention, not simply of geometries existing in some abstract way. Each such intention might be described as a kind of striving, to bring about a certain condition of the universe—not necessarily a static, fixed condition, but a certain quality of process.

Now, we can never grasp true geometries, or true intentions, from individual events per se, but only, in a sense, through the relationship, the connectivity of those events, using the creative power of the human mind, the individual human mind. Only the individual human mind can actually *see* an intention.

I use this as a metaphor (**Figure 1**), a painting of Rembrandt, where the viewer is confronted with what are the equivalent of the counterpoint in music: That is, paradoxes generated within the composition of the painting, with respect to which we're actually looking at interacting geometries—we're not looking at interacting objects. But, within our mind, geometries interact. And out of that, if we're not blocking, a

FIGURE 2
**Doubling of the Cube: The 'Delian Problem'**

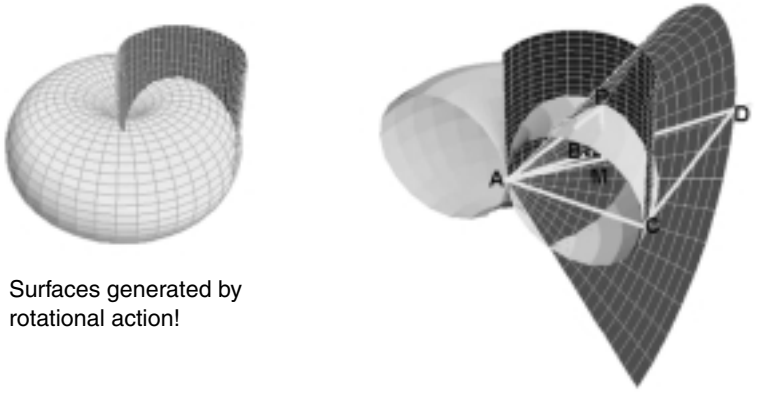



*Construct a cube whose volume is 2 times that of the given one.*

*Translated into algebra: Solve the cubic equation $X^3=2$ (X= side of cube).*

*It turns out that the methods which worked for doubling the square in plane geometry, don't work for doubling a cube. This problem evidently belongs to a higher "power." It cannot be solved using the methods of Classical Euclidean geometry (straight-edge and compass). But the Greek geometers invented a number of mechanical instruments that generate the required side length.*

FIGURE 3
**Solution by Archytas**




*Archytas (ca. 428-350 B.C.) was a collaborator of Plato.*

*The side length of the required cube is generated by the intersection of three surfaces: a torus, a cylinder, and a cone.*

concept of the intention, of the idea of the painting, will be generated in our mind.

So, that's my attempt at number 1.

Now, number 2: Action in the universe is elementarily multiply-connected. I already mentioned that. That's the subject that Riemann deals with in his "Theory of Abelian Functions," for example. Reality looks, to kind of animal-like sense-perceptions, as if you have interactions between objects. You know, a cat eats a mouse; interaction between objects. But that's not the way reality, as mankind has discovered up to now, really works. What you have, is interaction of geometries, or intentions, which are each bounding, or partly bounding and modifying the other.

The question arises: How can we think about, or represent for ourselves, this kind of an entity? How can we think about interacting geometries?

Well, a very good pedagogy, I think, for this, is the solution by Archytas of the problem of doubling the cube. I won't say too much about it, but everybody can ask the youth movement members to explain it to them. Show the next one: Here you have the famous Delian problem (**Figure 2**), of how to, given a cube—let's say 1 meter in the length of the side—how can you construct, or generate, a cube which has double the volume of the original one? And this seems to be a very simple kind of visual geometry problem. But, the method of solution by Archytas, brings out something which is not directly visible when we look at these cubes.

Here you see his famous construction, at the right (**Figure 3**). The length required, is generated, as an intersection of three surfaces: a torus, that you see in yellow; the blue cylinder; and the red is a cone. Each of these surfaces, each of these geometries we could say, embodies a form of action. All based on a universal concept of rotational action, circular action.

I want to show you, so that you're looking at the notion of, in this case, three various geometries, now represented visually, which are *co-determining* through their intersection, a kind of event. Let's look at Bruce Director's animation of this.[1] You see actually two circles: the red circle is going to be rotating in the vertical plane, at the same time that this line which is coming from the point P, vertically upward, will generate a cylinder. So, the red circle will generate, as it rotates, a torus, and the straight line will generate a cylinder. Now, I don't have the cone there, so you have to imagine now, a third process going on at the same time, which is generating a cone. And now, this double-generation process generates, at the same time, an intersection curve, which is both on the torus and on the cylinder. And in a sense, it embodies the action of both. This is a very special curve, non-algebraic curve, which is generated by this double motion.

Now, that's just a kind of metaphor. And we can now think about this notion of multiply-connected action. I want

1. The animation can be viewed at www.wlym.com/antidummies/part42.html.

to elaborate that more, where you see this beautifully developed in Kepler's conception of the principle of the Solar System, as exactly this kind of multiply-connected manifold of action. Harmonically-ordered, multiply-connected action.

Now I go to the third point, which is the way in which multiply-connected action generates singularities, events of a specific type: Namely, actual physical action generates events that *appear,* when we try to represent them in a formal mathematical way, as absolute discontinuities. That is, it takes the form of what appears to be a tear or a crack, or a kind of more or less violent action, as viewed from inside a formal description. And it also involves what appear to be very abrupt changes in the behavior of a process, of which the shock, the triple shock I'm talking about, is an example.

## Acoustical Shock Waves

So, let me illustrate this point, by telling briefly a story connected with Riemann's breakthrough on what were called "acoustical shock waves." Which is very relevant, because a very similar characteristic, we can see in the shocks building up in all three of the domains that I mentioned.

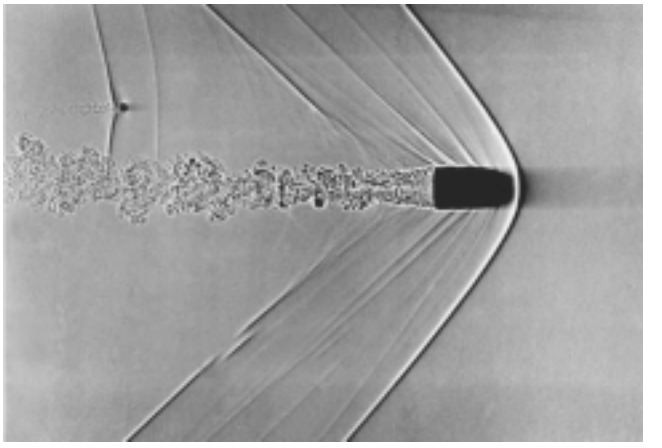
The story is this: In the 1930s and 1940s, a kind of mythical concept, or myth actually, developed, called "the sound barrier": the notion that there's a certain speed, which is somehow a maximum speed for aircraft, like a wall that you have to break through. And this myth developed in connection with a whole series of accidents, a number of them fatal accidents, involving high-speed aircraft in Britain and the United States. As these aircraft, generally in a dive, tried to get to higher speeds, and they got near to what's called the "speed of sound," they became uncontrollable, and many of the planes were actually lost. The pilots who survived, reported that the plane did not react to their control in the usual way, in fact, sometimes it was reversed. If they pulled the stick to go up, the plane went down. So, anyone attempting to fly the plane by the habits of a pilot would basically be doomed to loss.

And, in fact, the planes were torn apart by this change in the physical characteristics of the flow. The change was not occurring in the plane on all of its parts at the same time: Some parts were what we call "supersonic," other parts were "subsonic."

So now, the irony is that in 1935, German physicist Adolf Büsemann, speaking at a conference, presented a design, essentially a successful design, for an aircraft that could fly through this so-called barrier, from the subsonic to the supersonic, with no problems. And this was then the basis for many developments in Germany, including the Peenemünde rocket design.

Now, but the irony was, that there were people from the United States, and in particular von Karman, who was chosen by the synarchist crowd in the United States very literally, who was present at this conference. But, in spite of his hearing Büsemann, he continued, as did others, to propagate an *incompetent* method of design of aircraft, which actually led to *deaths* of pilots.

FIGURE 4
**A Shock Wave**



*Tennenbaum showed various examples of waves, and the shock waves that are created when a projectile "breaks the sound barrier."*

Now, what's involved in this? Büsemann was a student of Riemann, or studied Riemann, and had mastered Riemann's 1860 paper, or Riemann's work, particularly on what he called "The Propagation of Plane Airwaves of Finite Amplitude." Here we see some of these shock waves (see **Figure 4**). As the plane moves forward, if I give a very simplified picture of it, it pushes the air in front of it, and creates a series of waves that propagate. When the plane is going slower than the speed of sound, those waves move out, ahead of the plane, that's why you can also hear a plane approaching you, if it's flying below the speed of sound. However, as the plane accelerates, it actually catches up with this process of propagation of the wave, and a new type, a different type of process is generated, called a "shock wave." Riemann called it "*Vedichtungsstoße,*" at which the apparent parameters or characteristics of the wave, of the air, actually change in a *dis*continuous fashion. And Riemann actually showed that these kinds of phenomena are generated *all* the time, spontaneously in nature.

Now, the crucial feature of this that I want to come back to when I get to the economic, or triple crisis, is the role of time: Because the process of this, what appears to be "wave generating," is something which is organized, in the sense that when a wave propagates, you might see the wave, or maybe you don't see the wave, but there's what is called sometimes a "precursor." That is to say, there's a process which is actually organizing, ahead of the wave, the process. So, you have a future being prepared, in a sense, for the propagation of the wave. And then, the shock wave involves some kind of a change in the relationship of the process and its future.

Now, a key feature of this that Riemann emphasized, is

the fact that if you take the mathematics—here, we have the same thing that the youth movement is studying with Gauss; if you take the mathematics which Euler and Lagrange—the same Euler and Lagrange—devised, to describe the propagation of waves, then what happens at the point where the shock wave should form, is that the mathematics breaks down. In a sense, you get infinities and so forth; mathematics breaks down, it's destroyed, in a sense—but the wave, the process, continues to go on.

And Riemann said, "Okay. These discontinuities occur, they are real, and therefore we should study their laws, as a new domain, which is generated out of this process." And of course, this work of Riemann has to be seen in connection with this *Geistesmassen* concept. You have actually the idea of a principle of development, by which a process is lawfully carried, from one, what you call "physical geometry" to another. Actually a change in physical geometry, according to a principle which constitutes a *higher* physical geometry. And actually, in the universe, you have that happening all the time. The universe does not stop to obey a certain mathematics; but the universe will destroy the mathematics, and continue on. And man had better master that, because sometimes the way the universe solves the process is not very pleasant for man.

So, the problem that Büsemann solved, was, how do you design an aircraft in this case, which can go through this physical geometric change? It represents, in a sense, concretely, a higher principle, which can function in the two geometries, in this case.

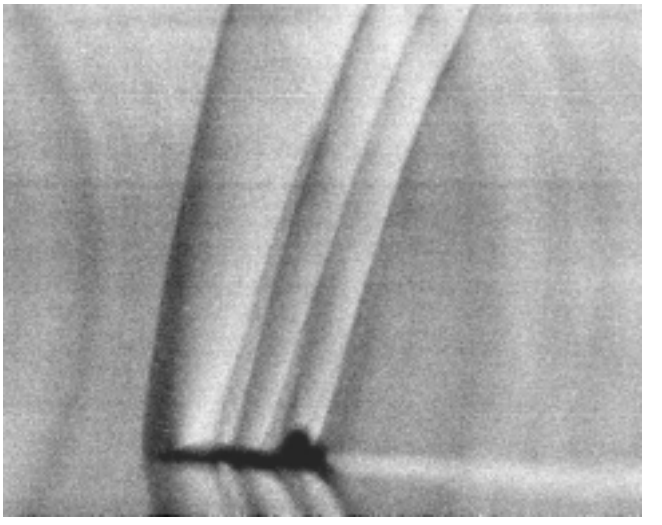
Now, the problem here, historically, is that you had a goldfish bowl mentality, embodied by von Karman and others, of mathematicians and others, who just denied that there could be such a thing. One of them was Lord Rayleigh, a British mathematician, who explicitly said: Riemann was wrong; there is no such thing as a shock wave. The same concept was developed by Boltzmann, the notion of so-called "statistical gas theory." The gas, the air just consists of these molecules interacting according to fixed laws; where's the shock wave? Where is the change? It's always the same thing, just different ways that these little balls, molecules, are moving around. Nothing new under the Sun.

So, this is actually a very characteristic form of what we experience in society, a process of denial: "No, no! There's no change, nothing's happening. It's all the same. It will always be the same." Which is maintained in the face of one shock after the other. So, this can be deadly. . . .

Here is an actual, so-called "Schlieren photograph" (**Figure 5**). But not exactly a photograph; it's a special process, which renders visible the effects of the shock waves created by a supersonic aircraft. And you notice that there's a whole array of these waves which are very far away from the aircraft, they're just not visible to the ordinary eye.

What you're now going to see now, is an actual supersonic aircraft, which is flying by an aircraft carrier. First, you won't see anything, and then you'll notice something that looks like a cloud, a white cloud formed around the aircraft (**Figure 6**). This is the result of the array of shock waves which are there. The aircraft is actually moving in and out of the speed of sound. And at a certain point, it slows down the film so you can see better, the process. [narrating] Now, that white cloud is not an ordinary cloud. This is a phenomenon which lasts only about a tenth of a second. It's at the point of this phase-change of the shock wave. You also notice, if you watch

FIGURE 5
**A 'Schlieren Photograph' of Shock Waves**



*The plane generates T-38 shock waves at Mach 1.1, at 13,000 feet.*

FIGURE 6
**Supersonic Aircraft Breaks the Sound Barrier**

*Tennenbaum showed a film of the momentary generation of a shock-wave "cloud" around the aircraft, as it breaks the sound barrier. This photograph of a U.S. Navy F/A-18 Hornet shows a moment in the process.*

FIGURE 7
**Infrastructure for the Future**

*The Transrapid magnetically levitated train, which is now a functioning commercial system in Shanghai, China; and nuclear power: essential for the future, despite the lies of the environmentalist lobby. Tennenbaum alsow showed other examples of infrastructure, including Franklin D. Roosevelt's Tennessee Valley Authority, the development of Paris, and a view of Los Angeles at night.*

carefully, the plane dips rapidly at a certain point, when this shock is formed.

## What Is 'Physical Economy'?

Now I want to go to the triple shock, and let's see how these concepts help us to think about the reality that we're in right now. I'm going to look now at these three domains, the physical economy, the financial system, and this noëtic domain at the very end. First, sort of separately, and then, briefly, in terms of their interaction.

Now the key, I think, for the purposes of our thinking right now, a key concept to look at, a key feature to look at, is that each of these different domains has a very different, or very specific underlying concept of the relationship of past, present, and future, and particularly of man to his future. And I might refer to those who are interested in a discussion on this, that, in the *Confessions* of St. Augustine, there is a very beautiful and very important discussion of the question of time, and the fallacies associated with the wrong way of thinking about this relationship of man to the future.

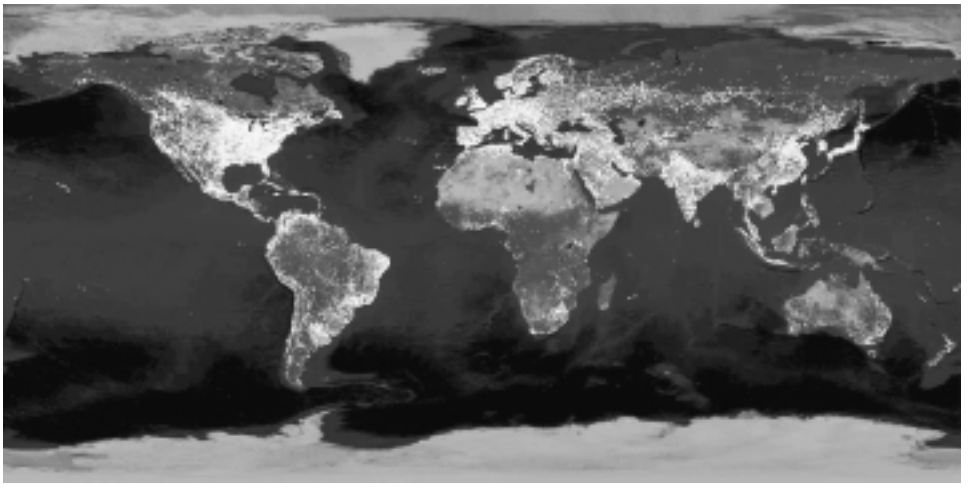
So: Let's look at physical economy, particularly the sense of the tangible side of physical economy. And to try to remind you of some things which existentialists either never learned or tend to forget about, people who think that they were just dropped into this world, that has no connection with them. The key thing is, that our existence, and human existence, depend on certain material preconditions, that have to be produced, have to be maintained. These are changes in nature. They include not only food, water, shelter, but also many things that are far beyond what you might call "basic biological needs," but are no less essential to the ability of society to provide what the human population needs. And this occurs in such a way, that the *power to sustain the human population on the Earth, today, depends decisively on the accumulated effect of past human activity:* human activity that was directed, at that time, toward the future. So, we're living in the future that was created by our predecessors, in that sense.

And, as soon as mankind, the human population, exceeds the small population that would be possible of bands of existentialist apes, we need not only *things,* but we need *changes* in the environment. We need overall changes in the environment, expressed most clearly by the concept of infrastructure, by the kinds of what's called "development of the territory," development of land associated with modern agriculture, the building of towns and cities, water infrastructure, and so forth (**Figure 7**). . . .

And finally: Here you see Eurasia, at night (**Figure 8**)—well, not all of Eurasia can be at night at the same time, but these are actual satellite photos of the various areas of Eurasia at night, showing the effect of human infrastructure, in this case, lighting. And you can see the Trans-Siberian Railroad; you can see, if you know well our Eurasian Land-Bridge maps, you can see the traces of a very long development of Eurasian society, or Eurasian civilization over hundreds and thousands of years, and also the population concentrations.

So, we have not only an accumulation of changes in the physical environment of man, which are necessary to our existence today, but also, we have the development of the labor force, of productive power, which is embodied in the *people,* in their minds, in their education; which is also the result accumulated of a very large number of changes, of discoveries, and elaborated mental acts of generations and

FIGURE 8
**Earth's City Lights**



*This composite image of the Earth's city lights shows clearly where the infrastructure is—and where it is urgently needed (look at Africa!). Tennenbaum showed a similar satellite photo of Eurasia, to highlight the Eurasian Land-Bridge.*

generations of human beings; which are embodied in the skills, and the knowledge, and the insight of the workers, of the scientists, and so forth, that produce what we require, today. That includes also language, and these kinds of elementary wisdom which should be passed on from parent to child: difference between right and wrong, and so forth: culture.

So here we see this paradoxical role of *time,* that everything society does today, depends on pre-existing labor power, infrastructure, production facilities, stocks of materials and goods that were produced by the past activity of society. And, the future of the whole population depends on our expending *today,* a large portion of our labor and resources on things that are not necessary, strictly, to our momentary survival. And Lyn has mentioned, as the example, the education of the young, a 25-year investment, which is, at first, a burden. We have also large-scale infrastructure. But we have also have shorter cycles: For example, the farmer that plants wheat seeds in the land, is preparing the future of the sprouting of this food.

So, we have actually a kind of an array of cycles, of investment cycles, in an economy, of this relationship of the present economy to its future.

Now, none of this has anything to do with money—except in the sense of an administrative, generally poor, instrument. Because it's not money, but it's teachers, who teach young people; it's not money, but it's machine tools and the people who operate them, that produce things. And similarly, there is *no* intrinsic relationship between the actual gain, the actual value of what society is doing in its physical investments, and the financial gain associated with it, particularly in our present system.

So, the result out of this is, a healthy physical economy *lives* almost entirely in the future. Only an ever smaller part of actual activity of the physical economy is associated with what you need *now.* And most is associated with what you'll need for the future.

So, you could compare a physical economy with a locomotive of a train, which is moving along a track, and ahead of the locomotive are teams of workers who are building the track: They're knocking down the trees; they're leveling the mountains, and they're building the track ahead of the locomotive. Only a small part of the labor force is sitting in the locomotive. They have to shovel the coal and keep the locomotive moving. Most of the activity is ahead of the locomotive.

And you can develop that (I can't go into that, now, for time reasons): a kind of a spectrum of cycles of activity, of this investment of society in the future, with this 25-year generational cycle, as the sort of central one. And like the Solar System, you have the inner cycles that are faster, such as the electrical power plant, that has to maintain the electrical potential on a second-to-second basis; and on the other side, you have the outer planets, which are cycles that go beyond, even many times beyond, a single lifetime.

Actually, a physical economy doesn't just accumulate its capital, but it goes through a series of changes of geometry, in such a way—it's like an animal—that lives in shells, it builds houses for itself, in a sense. But, at any time it's actually building its next shell—these are technological in the case of the human being, actually technological geometries of the existence of humanity in the future.

Let's say, we're now. . . if we were in a healthy economy, we would have research projects, we would have prototypes and so forth, we would be working now, and most of us would be working now on the economy, the economic geometry of the future. So the animal, so to speak, is building its next

house all the time.

It's the same thing we see in Vernadskyian evolution, where you see, that the activity of the Biosphere, in evolution, could never be understood in terms of its just simple existence; but it was always working to bring about the precondition for the next stage of evolution.

Okay, that's just to underline this nonlinear character.

## Economic 'Cannibalization'

Now what we have, of course, now—now we get to the shock wave. You can look at, actually, this spectrum of investment, relative to the time scale as a kind of a wave, where most of the wave in a healthy economy, is ahead of what you call the present. It's a precursor. And then you can see the changes in this, and particularly the problem that we're facing right now: Namely, what happens if people stop laying the tracks out in front of the locomotive? What happens if the locomotive starts to catch up with the lack of investment in its own future? What happens when the workers on some financial interests, start to tear up and sell the tracks ahead of the locomotive? What happens, when that process becomes the main source of *profit,* or nominal profit, in an economy?

You have what Lyn used to call "the cannibalization" of the economy, particularly—and that's my main point—the cannibalization of the future, which some people don't see so clearly, because it doesn't seem to affect, right away, the momentary existence of society.

Now this cannibalization process is so pervasive, actually, that once you grasp its essential character, you see it everywhere, right down to personal relations between people, which reflect that. Just a couple points on this: We already mentioned the question of the looting of infrastructure (I think I have a picture of that).

This (**Figure 9**) just shows the fact that infrastructure, long term, even bridges and so forth: They *corrode.* They don't last forever. And so, if you don't do anything, they will eventually collapse. So, a standard method of looting, which is now massive in most parts of the world, is, imagine you privatize infrastructure; you privatize a railroad or so forth. The speculator buys this infrastructure, and simply says, "Oh, wait a minute! I have certain running costs that I have to pay. I have to have the fuel for my locomotive, and so on. But, there are longer-term investments, like repairing the bridges and so forth, that I don't have to make right away. So I just don't pay them. And I take that amount of my income, which would normally correspond to covering those costs, and I pay it out as profits. And the stocks of my company become profitable, its stocks become more valuable, and I can build a bubble on that. And finally, I sell the railroad after a while, just in time for the whole thing to collapse." So that kind of principle is already showing the interaction with the financial system I want to talk about.

Another one, which Lyn went into, free-market competition, so-called, as the means of a massive and pervasive looting of the physical capital of the world, by paying prices which are below the actual cost of production.

FIGURE 9
**Infrastructure in Collapse**

*The failure to maintain infrastructure is a form of looting the physical economy which can be disguised—up to a point.*

Right now, by the way, and Rosa [Tennenbaum] can tell you more about that, milk is in many stores, cheaper than mineral water. But you don't have to feed a cow, and take care of a cow, in order to produce mineral water. You're looting the agriculture by this.

Another point: The role of outsourcing. Somebody says, "Well, wait a minute, if we move our production to China, aren't we employing people? Aren't we developing factories?" True. But, what are you *losing* when you shut down factories here? What is the cost of developing that labor power, which you're now destroying? What would be the cost of *replacing* that labor power? Now, substract that away from the apparent profit of cheap labor. And secondly, look at what it really costs China, to maintain that production, costs which are generally not included in the apparent cheap production.

Okay, one more point: The in-depth destruction of in-depth technological capability. This is, again, not so visible. But I mentioned this process of nonlinear development of the economy. If you have the kind of activities in society, which are associated with living in the future, for example *Mittelstand* companies; companies like MBB, the German aerospace company, which was just partly a production company, but it had, together with the production, probably over half of its actual activity, was working on all kinds of new things, including the Transrapid, including new types of space planes, including even thinking about anti-gravity, how to make flying saucers or something like that. They had people thinking about these things.

Now what happens? They're taken over by Daimler Benz, and the managers come in and they say, "Wait a minute! What're all these people doing? We don't need them, for

producing our helicopter. What're they doing here? Fire them!"

Those are the people who are working on the future. Those are the people, and the activities, which were maintaining the capability to produce technology in the future.

So, that's the way in which the future is cannibalized—one way.

A final point, on this, is the replacement of labor power by computers. In the famous blackout on Aug. 14, 2003, about 50 million people lost their electricity, in the northern United States and Ontario. The way this happened was—it's a very interesting study for anyone to look at; there's a report on how this happened—for 15 years, there was no investment in high-power lines, in electrical transmission lines, and almost none in power plant production. Instead they shut down power plants. And replaced that by computerized systems that would move electricity from one place to the other, very rapidly, on the basis of so-called "real time computer monitoring." So, when there's a hole developing, a lack of electricity, which maybe in earlier times, would have led to a small blackout or brownout, electricity was mobilized from all around the country, to move it into that area. Well, this nice solution then created the precondition for a chain-reaction collapse of the electrical system, which could have actually, if not for some accidents, could have spread to a much larger area; where, in trying to fill the hole, other holes were created, and you got a chain-reaction and the whole system came down.

I say that, because we're moving into that with the so-called "derivatives," which are a comparable "clever idea" in the financial domain.

Educational reform, to mention another form of looting. The creation of a generation of people, who basically as a group cannot run a modern industrial economy, at least in their present state.

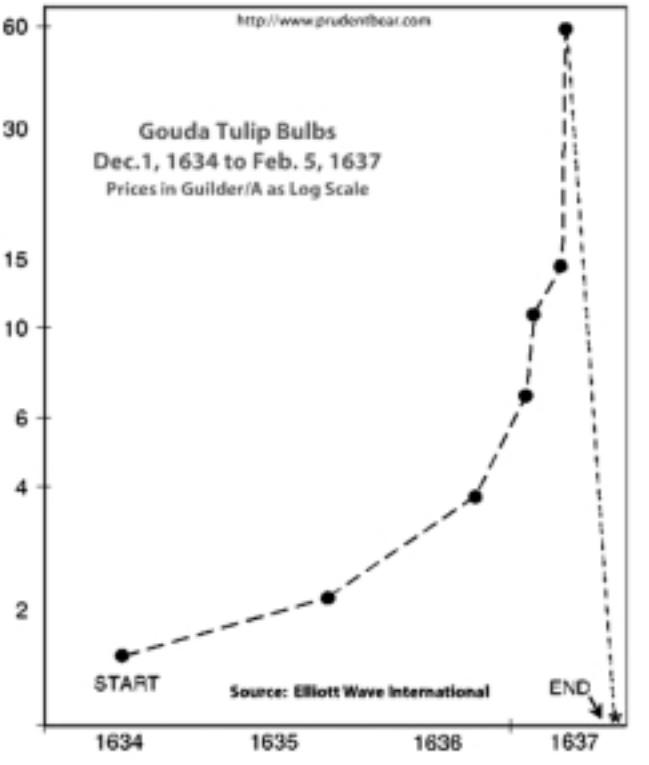
And the spread of mass psychosis, through the media. The Baby-Boomer phenomenon is a key aspect, in the sense that, you have a cultural matrix (this gets to my third point), which allowed people to permit, to tolerate, the massive cannibalization of their own future. The so-called "Now Generation," you live only in the "now," don't worry about the future.

## An Economic Shock Wave

So, where is this taking us? We're moving, actually, on a world level, toward a physical shock wave. In fact, it's occurring all the time, actually, the precursors in certain aspects of it, in terms of breakdowns like the one I was referring to—infrastructure breakdowns. But what makes this all the more fatal, and dangerous, is the interconnection between this physical economic process and the buildup and coming collapse of the largest speculative bubble in history.

So, let me now show a couple of things on that. In the financial system, per se, you have a very different relationship between the past, present, and future, than you have in a physical economy. On the one hand, what do you have? You have a kind of analogue of an Euler-Lagrange system. You have a gigantic lattice of rules and contractual relations, pieces of paper that say, "I pay you" or "You pay me," or "This gives you the right to loot a certain asset in the future." And the characteristic of this is, particularly, a *gigantic* accumulation of claims, financial claims on the future: "You must pay debt."

FIGURE 10
**The Tulip Bubble of the 17th Century**




And this takes a kind of cult form. In the United States, you have, officially, living out the derivatives, a debt of about $130,000 per man, woman, and child. Children are born already, in a sense, with more debt on them, than they could ever pay. There's no relationship between the actual generation of wealth in the economy, which is actually shrinking, and the claims which are propagated into the future by this financial wave, which has this *mountain of debt,* in the future. It *cannot* be paid.

Connected with this is the bubble mentality. That is to say, there is no relationship between the value associated, even with physical objects, and their actual value for the future of the economy. Here you see (**Figure 10**) an example, the famous Tulip Bubble in Holland in the 17th Century, where one single tulip bulb would supposedly sell at a price that was far beyond an entire lifetime's earnings of an average worker.

Now, this is again showing you the fact that this is not a

FIGURE 11
**The Roaring Twenties**


financial question, per se, it's associated with a *mentality:* Here you see the famous Roaring Twenties, the mass insanity which preceded the Crash of 1929 (**Figure 11**).

Here you see the stock market crash (**Figure 12**). . . .

You see, now, the stock market bubble which developed in the late '90s (**Figure 13**), and the *Titanic* (**Figure 14**), with the people on it saying, on the part that's coming up, "See, look at it! I've never seen the Dow so high!"

This is just a metaphor for the insanity which you see in the United States (**Figure 15**): These are the Beanie Babies. These are little dolls or teddy bears, which developed into a market, a speculative craze at the end of the '90s, by a fellow named Ty Warner; where these little dolls were selling for $600 or $1,000, as people *speculated* on them. And actually, there were people who collected these things, in the expectation they would become more valuable, in order to finance the college education of their children!

Finally then, another aspect of the financial system is the derivatives. I won't go into that, except to mention that the mathematical basis of derivatives, is the *same* as the Euler-Lagrange tradition, the Boltzmann tradition, the von Neumann; Merton-Scholes developed these so-called "methods" for stabilizing the financial system: By attempting to prevent local events to compensate for local problems, and thereby creating situation in which the whole system can go.

## The Financial Breakdown Crisis

So, we have this mutually accelerating interaction between the financial system and the physical economy, which is characterized by the fact that our physical economy is presently entropic. We're not actually producing net wealth, and therefore, there is no basis for any payment, there is no basis for the claims of the financial system of the future.

So, you have a mutual relationship. On the one hand, if you try to meet the requirements of the financial claims of the financial system, you can only do that on the basis of one of two things: accelerating the looting of the physical economy—but that accelerates the collapse, the shock-wave collapse of the economy; or you print money, which leads to a hyperinflationary blowout, particularly now, because as a result of the looting of the economy, of the physical economy, of its future capabilities, the running costs, the short-term costs, start to explode. Because, as you've actually weakened the infrastructure and the other long-term capabilities of soci-

FIGURE 12
**The Stock Market Crash of 1929-32**


FIGURE 13
**The Bubble of the 1990s**


*The bubble popped, of course, beginning with the crash of the NASDAQ in Spring of 2000, wiping out the savings and pensions of many thousands of people.*

ety, it becomes more and more expensive in real terms, to maintain society at any given level. So you have an actual cost explosion, *real physical* cost explosion, to the extent that you want to keep a certain level of the physical economy, which is pushing toward a hyperinflation.

So you have a situation which is building up where, actually, all pathways within that given interaction between the physical economy and the financial system—all pathways lead to disaster. They can lead to disaster in somewhat different ways, but they lead to disaster.

Let me give you just one last metaphor for this (**Figure 16**): That is, the way in which a breaker, which is somewhat analogous to a shock wave, is generated. This is from work done by Dino [de Paoli], in showing also that Leonardo da Vinci understood this quite well, very long before Riemann. You see da Vinci's drawing, showing a normal wave, at the right; that is to say, apparently, a sine wave-type wave, at the right of Leonardo da Vinci's upper left drawing. Apparently what you might call "conjunctural cycles" as the economists would say. But now, you have an interaction with the *real* economy, which I represent by the changing of the shore, the marginally increasing real costs of maintaining society, which is interacting and causing the financial system to break. Alternatively, the attempt to save the financial system causes the physical economy to break. . . .

## The Noëtic Process

So, the only way out of this is, we must introduce a new principle. In other words, human reason must intervene, to introduce a radical change in both the physical economy and the financial system, the way the two interact, and above all in the governing principles or axioms of society. That change is what Lyndon LaRouche and his movement have been fighting for, as embodied variously in the policies of the "New Bretton Woods," the "Eurasian Land-Bridge" and "Super-TVA," and the launching of LaRouche's unique International Youth Movement.

This brings us to the third and last of the three, multiply-connected interacting dimensionalities of action, I mentioned at the outset: the noëtic process. What we're looking at here, is what's going on in the human mind—the reaction in the minds of individual members of society, including in its leading institutions, to the combined physical-economic and financial breakdown crisis—that crisis being in turn the prod-

uct of the imposition of certain false policies and associated cultural axioms, upon the economic process. What do we mean by noëtic? We have current history, not in the so-called objective sense of a series of discrete events per se, but as history is experienced by the people making it and involved in it, as the content of processes of judgment, by which human beings select courses of action. This is the material of Classical tragedy.

The human mind is this very complicated—and I'm thinking about this, to get a better hold on this complexity of the human mind. The human mind is full of impulses, of intentions, impulses of various kinds for action. And there's a question that Plato talks about, how to govern the mind, how must the mind be governed? Now, animals are also guided by intention; the Solar System is guided by intention, as Kepler showed most clearly. But, except for the human being, these processes, or these living beings, cannot become aware of, *cannot see* the actual content, and the cause of the intentions which they are fulfilling. So, you have instinctive behavior of an animal. The animal does this behavior, it expresses an intention, but it does not have an insight into the source and content of the intention.

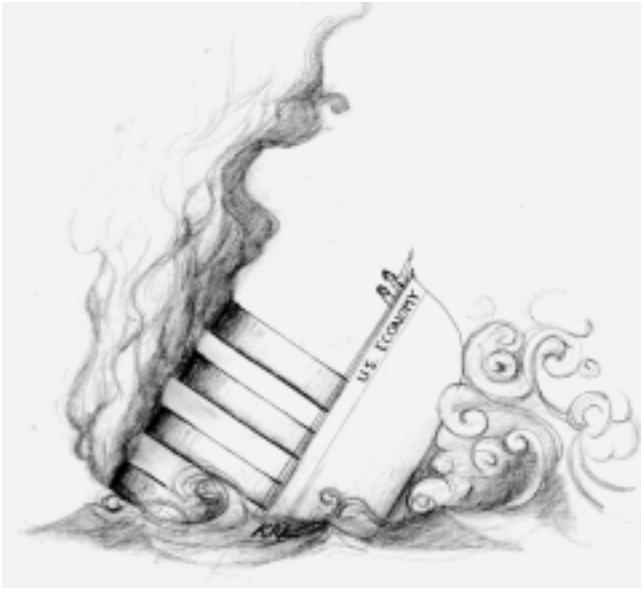
So, you have human beings today, being governed, almost like an invisible hand, by certain intentions which they did not themselves create. It did not originate in a sovereign act of mind, by themselves, and by virtue of which they are self-*doomed,* and they don't even often recognize the intentionality which is dooming them. Also, this term, which seems to be prominent with the youth, of the "lemmings": People are marching off, by some kind of semi-instinctual behavior, into their self-doom.

So, you have these—we already spoke of them—this consumerism, environmentalism, and the fact that the present geometry, the fishbowl geometry *in* people's minds, in the masses of the population and its institutions, is such, that they would reject, and fight against, exactly those kinds of changes that are needed to save them! And this is associated with a very special kind of blindness, which I think is very important: the inability, or at least momentary failure or defect in the ability to recognize a geometry, of the mind to see a geometry. Also a lack of training in doing that.

I give one example pedagogically, often, that's a very simple one: Imagine you have three dots, three circles, near to each other. And somebody looks at that, and you ask them, "What do you see?" "Well, I see three." Okay. Another person, who has a kind of blindness, says, "I see dot, dot, dot."

You say, "But no. There are three."

FIGURE 14




*"Look at that! I've never seen the Dow so high!"*

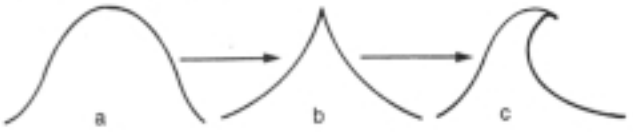
FIGURE 15

**The 'Beanie Baby' Bubble**

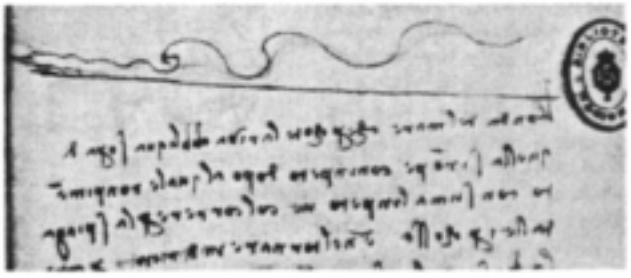
FIGURE 16

A) Simple sine-wave with underlying parabolic geometry

B) Formation of a breaker: schematic

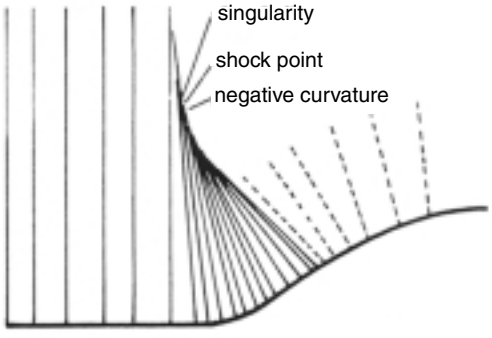



C) Leonardo's drawing of wave with breakers forming



D) Breaker with surf-rider

E) Theory of characteristics




*What Riemann called "geometric characteristics" and Leonardo called "cross waves," are represented by perpendicular lines when the speed is constant, and bent right or left when the speed increases or decreases, for example due to enlarging or narrowing the passage through which a fluid is flowing. Thus it will appear that the characteristics touch. Riemann used this to represent a* **shock wave**. *It is also a* **singularity**. *It is also, clearly,* **negative curvature**, *which therefore appears in connection with the formation of a singularity.*

"Well, where? I only see one dot, another dot, the other dot. I don't see three. Where is the three? I don't see it."

On another level, when you talk about the Anglo-Dutch system, and what Lyn means (as I understand what he means about the system), he's not just talking about some kind of a formal thing. He's talking about a geometry, which is actually everywhere! It's acting everywhere, essentially everywhere. It embodies an intention. And that intention is effectively controlling the behavior, to a large extent, of a large part of the world—and yet, people don't see it. They act as if it weren't there. They say, "Yes. Well, we see this problem, we see that problem." They see this or that dot, but they don't see the geometry behind it, the intention behind it. They acknowledge symptoms, but they refuse to acknowledge the disease.

So, we have the equivalent of a kind of bubble in the noëtic, in the mental domain. You also have mental bubbles. You have somebody who has certain fixed conceptions, although the evidence builds up that these conceptions are wrong, but instead of saying, "Wait a minute. There's something wrong with my way of thinking," they start to develop a lattice of wrong explanations and reactions, which becomes a bubble. That is our society, actually. They're in a state of denial.

So, where does this go? It goes to what you might call a noëtic shock. Similar to a shock wave, where there's a confrontation between the reality, which is imposing itself, and this bubble generated by false axioms. You can get, then, one of several outcomes: One is, people go literally crazy. They become psychotic, which is a real danger in the population we're dealing with.

## Awaken the Principle of Reason

Or, fortunately there is another possibility, which we see the beginnings of in populations and institutions, and in which we ourselves are the key catalytic factor: that a *Gestalt* comes together in people's minds, of the utter rottenness of the system as a whole. Most often, some event, sometimes even a relatively minor one, per se, becomes, so to speak, a kind of name for the *Gestalt,* as we have seen with the "Hartz IV" revolt in Germany. People say, "Wait a minute! This whole system is rotten! Let's *change* it." There's a recognition of that, and the beginning awakening, at least implicitly, of the higher principle of reason.

And the principle of reason, well, there *does* exist, unique to the human mind, a power to recognize intentions; to recognize the intentions embodied in a process, including in our

own mind; to recognize their origin, and their content, also the historical content. What was the act of generation of these intentions? When, and where, and under what conditions, were these intentions generated? "How did I come to think the way I think?" And then, to deliberately *change* the intentions, to act upon those intentions, from the standpoint of what you might call the "adduced intention of God." The concept of the Good.

A power of moving to correct a fundamental injustice, to supply something crucial—whether a scientific discovery of principle, or an analogous change in the principles of society—which the universe has lacked up to now, and which has become necessary.

Great music *speaks* to this power in the human mind. It's there. It's always there, but it's not always powerful enough. Sometimes, it seems not to be there. But, it's there—it must be evoked.

Therefore, to conclude with all of this: I think the key question here, is how to evoke, how to wake up, the principle of reason, this principle of reason, which must act to *change* the system.

There was, at a certain time, when we were having a hard time in our work, when there was a discussion of a kind of a theory, which is partly true, but I was always uneasy with it, called in German, "*der brennende Kittel,*" the "burning robe." You know, somebody, when their own clothing is burning, then they're going to move. Before that happens, you often have people who won't move, because they say, "Well, everything's okay," right? But once their clothes are burning, they move.

The problem is, of course, what direction are they going to move in? The "burning robe" does not necessarily bring about a rational reaction. Sometimes the opposite.

And in such a situation, it's also not enough to simply propose a solution. Generally, not enough to just propose a solution—it won't be recognized; or it may be rejected.

But one must pose, I believe, at this crucial moment of crisis, the *principle of reason itself* must be presented. We're doing that in music, and in other ways, because we have to awaken these higher human powers. We must sound the trumpet of reason. We have an individual among us, physically, now, who embodies the principle of reason, to the highest degree of any living person. And, in a consubstantial way, that is, it's not an abstract principle: It's something which is historically specific. It's individual. It's something that defines the identity of an individual.

So, this brings us to the question of the youth movement, and now, we see, actually, a true "future shock." Not in this crazy way that was sometimes mentioned: But you have a generation of people, who, for specific reasons, *do* see the concept that this is a bunch of nonsense, this is a bunch of crap, this society is *doomed*—has a clear conception of that. Why? I think because young people have an inner experience of their own development, the process of development of their own mental and physical powers. They have experience of what development means, and they compare that as a reference point, for the character of society, the geometry of society.

But: That has to be combined, that recognition, with a knowledge of how to change society. We're creating a youth movement, that's not just enthusiastic, hubristic—as it happily is—but also, it's self-educated to actually *embody* and radiate the principle of human reason, in a historically specific manner, but also universally.

So, let's get Bach to the principle of Classical art, of great music in particular, which is a key to our movement, to our ability to radiate the principle of reason.

So, I say let's move forward, and let the trumpet of reason sound out!

Thank you [as the trumpet sounds the "Gloria" from Bach's *B Minor Mass*].

## Dialogue With Tennenbaum and LaRouche

*Here are excerpts from the discussion which continued for some three hours following Jonathan Tennenbaum's presentation.*

### On Geometry and Sense-Perception

**Q:** [Tina Rank] Hey, Jonathan! I have a couple questions. The first one is: I did not understand what you said in the beginning, when you talked about geometry, and you said: Geometry is something where you have to have an intention, or turning an intention towards something. And you said something about *Geistesmassen,* and I did not understand.

My second question is about crossing the sound barrier: We heard much about the sound barrier breaking and so on, but if one sees these videos and actually sees the plane crossing the sound barrier, why is it the object which is breaking the sound barrier? Why is it not something else? Why can't we recognize the sound barrier differently?

No, it's just something you can't see, but with one second you can see it, and this is what I don't understand.

**Tennenbaum:** Yes. Well, there are many things in physics that we don't see. We see certain effects. Like, for example, when you look at this plane, you say, "Okay, here's a plane moving." But suddenly you see things that seem to come from outside the plane, whatever this cloud is—which informed you that actually the universe is not that way; the universe is not just that there are objects moving, but there's actually a process which in a sense is moving the objects, and the process embraces the whole universe.

So, the shock wave is not actually in the plane. The shock wave is actually a change associated with the movement of the plane. Does that make sense? You get the idea?

Let me give one other metaphor, and then maybe Lyn can help me here—or he can wait, and help when there's a certain accumulation of problems.

On the question of geometry and intention, I'll try this metaphor: I used to play with these dominoes. Does everybody know what a domino is? These little pieces of wood? And the fun thing is, you put them in very complicated chains, you can make them with splitting and all kinds of things: And when you push the first one over, it falls, and you get a wave, which can be very beautiful, or nice.

So now: If somebody comes and says, "All right. At the end of this chain of dominoes, the last domino fell, it went over." And you ask, "Why did it fall?" Then the physicist Newton comes, and he says, "Well, it fell because the domino before it fell, and pushed it." And you say, "Why did that domino fall?" And Newton says, "Because the one before it, pushed it, and then that one pushed that one."

And then you try to follow the chain back, and you finally ask yourself, "Well, wait a minute. I'm being fooled somehow, by these explanations. *Who* set up the dominoes, so that they would work that way? Who arranged the system, in such a way that certain types of phenomena occur in the system?" That is a very different way of thinking, than the person who looks at the dominoes individually. It's like, who is determining the rules? Who has set this up? But, when you say, "set *this* up," what is "*this*"? "This" is not an individual domino, it is what I was calling a geometry.

And in physics, we have to do with that. You take a magnet, for example. Ludwig wants to do something like this: Take a magnet; see how the magnet changes the interaction of other magnets. Was it the magnet that did it? Or has something changed in the whole way the system is acting?

And human ideas work that way. An idea actually changes the way you act. All your reactions will be changed. Certain kinds of ideas will change the way you are; not only something particular about you, but will change everything. That's what I'm trying to get at with the concept of geometry, but with the particular point, like with the dominoes, that a geometry is always something that expresses an intention. It's not just there. It doesn't just somehow exist. But you have an actual process of creation in the universe, so that the things that exist, exist by an intention.

So, this is something we have to experiment with, to get a sense of.

## What Is Reason, Really?

**Lyndon LaRouche:** What has happened is, the first question, the second part, with which Jonathan was just wrestling, takes us immediately to the conclusion of his presentation, on the notion of the principle of reason itself.

Now the significance of Riemann, first of all, is that he was the first in modern times, to explicitly state that *there is no self-evident principle, definition, axiom, or postulate, in the real universe.* That all assumedly self-evident such definitions, axioms, and postulates, are frauds.

Now what does that leave you? That leaves you, in a sense, apparently, at first blush, with the assumption of where do you start? And Riemann answers very clearly, even in the first paragraph of his habilitation dissertation, that nothing exists as knowledge in the universe, except as that which are experimentally demonstrable, as universal principles.

Now, in modern society, we know a lot of that, and there are two categories of such principles. In order to define completeness in our knowledge, we have to divide the classes of principles, into two principal types: One, the relationship of the individual human mind, to the physical universe around us, on which we act. Secondly, the way in which we, as human beings, are able to willfully *interact,* to utilize discovered universal physical principles.

And these two, which are the principles of Classical artistic composition—and *only of Classical artistic composition;* there is no other form of valid art, except those things which enable mankind to cooperate efficiently, to utilize discoverable universal physical principles.

Now, put that aside, and come back to the question of just the individual mind's relationship—a social individual mind, of course—to the universe. Now, what the idiot tells you, is that at the blackboard, by accepted mathematics—that is, one which is inherently defective, because it depends upon so-called self-evident axiomatic assumptions—that you measure everything in the universe as a "connect-the-dots" form of action.

But that is not the real universe. What Riemann did, was essentially to free mankind from slavery to that kind of thinking.

## The Discovery of Universal Physical Principles

But it's interesting what happens then, when you start to look at, what are the principles which we have proven, physical principles we have proven? First of all, every discovery of a physical principle, adds something to the universe of our knowledge, which is not an object of sense perception. So that in the real universe, sense-perceptions are not primary; they are not the obvious existence. The idiocy and primitiveness of society, is that we are in a society which still believes in sense-certainty, as the basis for reality. Whereas in science, it is our ability to *change* the ordering of sense-perceived events, which is knowledge of the universe; the changes we make by discovery and application of a proven universal physical principle.

Now this gets fun: Because we had a little session some years ago, up north of here, where some people met and we had several weeks together, at which Michael Liebig concluded by doing a de-brainwashing of one of our associates, who had just returned from Berlin. One of Michael's first real achievements, was a de-brainwashing session of a dear friend, at the time.

But at that point, I presented, especially in a discussion which was provoked in part by Helga, who was being very angry with me at the time, of what is the meaning of my reference to the work of Georg Cantor? And I indicated then, as some will recall, when I drew these diagrams, that you have hierarchies of principles: that you take certain groups of

physical principles—and we know this very well. For example, we have the known category of inorganic, or non-living, processes—that's a category of physical principles. Ah! But then: as Vernadsky points out, we have another category, a higher category, which subsumes the non-living principle-category: living processes, which are quite different than non-living processes, and are a *higher order* of principle. Then we have, since we exist in the universe, and are active, as Vernadsky instructs us, a still-higher order of principles, superior to living processes: the process of noësis, right?

What about the universe, then? Well, first of all, we now have three orders of universal principles, which are immediately obviously to us, from experimental physics: the non-living, or the so-called inorganic; the living processes; and noëtic processes, which exist only in man and God.

Now, what does this tell us about the universe? First of all, what is important human action? All important human action, taking the analogue of only physical action as such, first, is an ordering of successively higher orders of orders of universal principle. That's reality. Now, the question is: What's this mean? Well, first of all, we discover these principles, and we discover how to use them; to use them to change the way perceived events occur, in a way which is to our advantage, a manifest advantage; which increases man's power, in the universe, per capita and per square kilometer of the Earth's surface.

So it was an increase in power, which is ordered by a succession of discoveries. The first level of discoveries, or the lowest level, are the so-called non-living processes. The next higher order are living processes, which are more powerful than non-living processes. You have a third one, a third order, which are noëtic processes, which we know only in man.

Now, what happens as a result of our doing this? By using these discoveries, we increase man's power in the universe. How does that occur? We discover a principle, a principle provided by the Creator, but we discover its existence. Now having discovered its existence, we now change the universe, by applying a principle which already existed, provided by the Creator. Therefore, our power is increased, our power to exist, our power to develop ourselves.

## The Universe Is a Developing Process

Now we say, "Wait a minute: This, we know, is the nature of creation, or at least an aspect of the nature of creation." So, what is creation? Is creation a fixed scheme of things? An Aristotelean scheme? By no means! It is not fixed! It is a developing process. The universe is a developing process, not a fixed one.

For example: We take a simple case, the Sun, the Solar System. Now, according to Kepler's discoveries, and their implications for modern science, the Sun was sitting all by its lonesome, a young Sun, with no immediate neighbors, apparently, all by its lonesome. And spinning. It was just sitting there, spinning—like a Yippie, huh? And, it spun, very rapidly according to Kepler's laws. And it began to spin off material. Initially the Sun was largely confined to a few chemicals, such as hydrogen, simple elements like hydrogen and so forth. But, as it spun, it began to produce this material, which lay in a kind of—like Saturn's rings, around the Sun. And this Sun, which is very fast-spinning, was spinning off this material. And the Sun irradiated this material, such that the temperature equivalent in the material surrounding the Sun, was at a higher temperature, than is possible inside the Sun itself.

Now it was this process, a polarized process, which made possible the so-called 92 elements or so of the so-called first known Solar System. This material was then dispensed, according to Kepler's laws, in orbital pathways, like a distillation machine, where you distill petroleum to get various petroleum products, the cracking system. At first, it was spread uniformly along the orbital pathway, like a distillation process. But as Gauss pointed out, because the orbit was elliptical in this form, it set up a shock wave inside it. And therefore, you have the generation of a planet, from a uniformly distributed piece of material.

So, when we look at the stars, and so forth, we see similar processes. The Crab Nebula is a nice anomaly, which poses questions of this type.

So, look at the universe as a whole in that way. The universe is developing! It's a system of creation, whose characteristic is self-development. Our knowledge is of a self-developing universe. Thus, when we are mature, when we become truly human and understand what humanity is, we think of the universe in those terms, instead of the simple, naive sense of self-evident sense-experience.

So, what we take as knowledge, is developing the knowledge of these higher orders of principles, and how we should use them. And how, for the defense of the universe, we're required to use them.

For example: According to conventional theory, the Sun is going to die on us one day, or become a very inhospitable neighborhood to live in, before it blows up! What're we going to do about that? Right now, we don't know what to do. But we know what we have to do, anyway. We have time. Not too much time, but time enough to learn to master that problem.

This will carry us, indefinitely, to more and more extents, of understanding the universe.

And therefore, who are we? What are we? We are what we are becoming. We are what the universe is becoming, partly through the instrumentality of our action upon it.

The mysteries that come up from people, of the type that Tina asked, come, because this acceptance of this very obvious—or, what is to me, very obvious, nature of the universe and of knowledge, is not grasped, is not accepted; is not felt to be "real." Until people come back to the "real universe," they think, of the touchy-feely universe. And they try to explain everything in touchy-feely terms.

The problem is not the lack of knowledge; the problem is our backwardness, our stubborn clinging to our intellectual backwardness, makes us cling, with desperation, to dirty money, and other dirty objects of sense-perception. We're so fascinated with these objects, that we don't see what the mind should instruct us to see, if we take a different view.

## The Spiritual Aspect

And the more beautiful thing about it, is this wonderful thing about relations among human beings. Which is called "Classical art," which is one of the things that was on the table this weekend, the question of singing, the question of Bach. What is this? This art is expressed simply by such things as *Jesu Meine Freude,* when properly understood by the singers, singing within a hearing of the chorus of which they're part, rather than just like a competitive horse-race, or something. It actually goes to the essence of the nature of man. It goes to the question of development. And it's the interaction among human beings for a directed purpose, for the benefit of humanity, and for the benefit of the mission which the Creator set as a scientist in the universe; it's when we perceive cooperation among ourselves with that consciousness of ourselves and what humanity is, that we achieve what I described before, as the "pursuit of happiness."

We are not happy, merely because we are recognized by future generations. We are happy, because *we are something important, in the development of the universe, in a necessary way, a predetermined as necessary way.* And this Cantor image, of these orders of transfiniteness, as typified by the ordering of the non-living, living, and noëtic processes, and what that means to the universe as a whole: This is the concept of beauty. This is the concept of *being, really knowing you're human.* This is the concept of sovereignty. This is the concept that you need, to have the leader of a nation, of a troubled nation, to get it out of trouble. Because people are clinging to trying to "fix up" the system, and to make it work, when what is needed is an innovation of the system, something new that was not dreamed of before. And someone who has the sovereign confidence, to pull the society to the next place it must go to, rather than trying to cling, to fix up the old wreck that's breaking down. Hmm?

So that's the importance of it.

So, the problem is the psychological importance. It's a deeply spiritual problem, obviously, for these reasons. But this is the problem! Mankind is still very much in its infancy, morally and intellectually.

I've spent most of my life on this question, and I enjoy the question very much. I never have the complete answer, but I keep getting a better understanding of the question. And that's the answer to Tina's question.

## True and False Axioms

**Q:** Okay, Jonathan this is Patrick. I've got two questions. The first one is very short, I think. You said that it's very important to have a right idea of what is time. Because if you think of it like a fourth dimension in a Euclidean geometry, you really get into trouble. But, when we look into the paper of Riemann, about this supersonic movement, we do not learn so much about a real idea of time. So, can you give some other papers of maybe some other scientists, where we do learn about this idea of time?

*St. Augustine, in his* Confessions, *grapples in a Socratic manner with the question of how to understand the conception of time.*

The second question: You talked about false axioms. And if you talk about false axioms, the questions arise, if these are right axioms? So, when I thought about this question, I figured out that when we do science, and we take the German word "*Wissenschaft*"—for the English-speaking people, this is a connection between two words, "knowledge" and "creation." So science is about creation of knowledge. But, if you make some axioms, then the system is already ready, it's finished. There's nothing to do, other than to have a computer digitize, and add some new sentence or something like that.

So, I want to ask you, isn't it the case that we have to not only find the right axioms, but to overcome the thinking of needing such axioms?

**Tennenbaum:** I think, firstly—I propose not to try to learn about time by reading some papers, because you're not going to find—. It's also what Lyn was saying: How do you discover something about time, yourself? Instead of saying, am I going to believe what Riemann said, or am I going to believe what this person said?

What I referred to in the *Confessions* of Augustine: His writing has a very, very useful and provocative struggle with this question, of a real Socratic sort. And which is focussing exactly on getting to the reality of it, as opposed to different representations—four-dimensional—. Because usually, when you try to make a representation, you're representing something that's wrong. Or what happens is, the representation takes you over. Instead of having an idea that you want to represent, as a great artist would do, you tend to get caught

in the means that you're using to make the representation.

So, I think that what I would propose is the notion which St. Augustine also discusses, the notion of what Lyn calls the "simultaneity of eternity," if you think of the future and the past as something, somehow abstract or outside reality, then you get into a problem. If you think of the future and the past as features of the world today, then you get to something very interesting. But then you have to look at the world today, from the standpoint of the human mind existing in that world.

In terms of Riemann, where he's struggling with this question, in his papers, the posthumous papers—he didn't publish them, but they were notes that he wrote, about the *Geistesmassen*—but also Riemann was struggling with the notion of evolution, where he very explicitly poses this paradox: How can it be, that in an evolutionary process, the earlier forms seem to be preparing the future ones, as if they would know, as if they would have a notion of the future?

So in terms of axioms, I think the difference between false and right axioms, is not the axiom itself, but the nature of the process that took you to the axiom; or, let's say, took you to a certain insight, or apparent knowledge of a principle. The question is, where did it come from? I think that you don't really have a right statement and a false statement. What you have is a truthful thinking, and a not truthful thinking.

Maybe just to give an example of what I mean: Lyn was referring to this concept of Riemann, that you want to have no arbitrary axioms. That is, that you don't accept anything which is not experimentally proven. But now you say, "But if I say that now I have a proof of X, Y, Z, does it mean that X, Y, Z is absolutely true? Maybe the next experiment will show that it isn't exactly true."

So, you get into an absurdity, when you think of true and false in terms of some kind of a formal statement.

Rather, you'd say: "Is a hypothesis that I have actually—did I discover it, a truthful process of the application of my powers of reason? Or, for example, has it gotten into my head, because I believe something that I read, or because of some kind of corruption, something I didn't want to see? To try to avoid something, I formed in my mind a wrong idea? Or something like that." Many so-called axioms are *sneaking through* even in the way language is used. For instance, part of the so-called "arts" of the oligarchy: How do you get people to accept axioms, like the environmentalist axiom? How do you get it into people's minds, in a sense, putting to sleep the powers of reason, the critical powers of reason, in order to get the axiom, when the person does not recognize where it came from?

And one last remark on this, which I find useful: When Brahms was talking to Jenner, his student, and he brought up—in Jenner's book about Brahms's teaching, he doesn't say it quite this way, but he poses the question of truth in music. What does it mean for a piece of music to be true? Very challenging idea, because a piece of music does not make any statement, it doesn't say "time is this way," or "shock waves are that way." But what Brahms criticizes in his student Jenner, is the mode of thinking: Is the thinking truthful? Is the thinking honest, which led to the composition of a piece of music?

Just like, I sometimes use the example, somebody, which often happens in society—say, a person falls in love with a girl: terribly in love with this person; marries the person. And then, after—sometimes it's one year, sometimes it's five years—finally, actually gets to know the person they married, and finds out that the person was very different from the person they fell in love with. Or they discovered they fell in love with a fantasy, not with the actual person. So, that's an example of a thinking process which is false, which is defective.

So Brahms is saying, in a sense, that the judgment of truth and falsity is a judgment on a process of judgment; on a degree of reality of the method used to produce a certain judgment. That's how I'd respond to that.

## Organizing the Future

**Q:** I wanted to ask you about something that was all over your presentation. You said, at some point that the future is being prepared for the propagation of the wave. That's probably a pretty axiom-challenging idea. I just want you to say more on this, for future work that we're going to do. It just seems to be very key.

**Tennenbaum:** When we were doing work on the SDI, and we had our scientific seminars, we were actually looking more carefully at what are these processes, like a laser light. How does a laser work? And we were looking at Riemann's work, also, on electrodynamics, because we have the problem that physics was more or less taken over, in the 19th Century, particularly by the end of the 19th Century, by an essentially British group around Lord Kelvin—Sir William Thompson, Lord Kelvin; Helmholtz, who was in Germany; Maxwell. There was a group—it was sometimes associated with a funny organization, called the X Club, which may or may not be the most important thing—but it was a very deliberate thing, to take over physical science, and it goes back to Galileo, Newton; it's a long-term thing.

But one of the areas they focussed on was the area of electrodynamics. And essentially, the progress of physics until today, has been sabotaged to a large extent, by the fallacious nature of the so-called "textbook electrodynamics." There were two conceptions of electrodynamics, electromagnetism. One was the school of Gauss and Riemann; and the other was the Maxwell/Helmholtz, which is now the textbook physics. Most students don't even *know* that in the second half of the 19th Century, there was a *huge* fight over electromagnetism and other areas of physics, between this Gauss/Riemann school and the Maxwell/Helmholtz school.

Now, why I go into that, is—just to make it concrete—this question of actually how physical action works. How a wave propagation works. You could see, for example, very

fun and shocking phenomena: that, for example, you can produce certain kinds of laser pulses which will actually go through a thick book, or other material. They won't destroy the material. The material will be like a glass; the pulse will simply go through with no interference, if it has the right shape.

And other experiences which are very shocking from the standpoint of the ordinary, again, push-pull idea of how action occurs in the universe. And, Huyghens was on to this; of course, Bernoulli, the question of the principle of least action. That actually physical processes are not organized on the basis of going, let's say, from one step to the next step. That there's an intervening—let's say you're in the complex domain—intervening process, that all physical action involves an organization, is organized action, organized as a whole. So, just as you say, the orbit exists before the planet moving in the orbit, so, let's say the process of the propagation of the laser pulse, what appears to be the pulse itself, is organized, in a sense, ahead of it, and by anticipation, by a process. And that everything works that way.

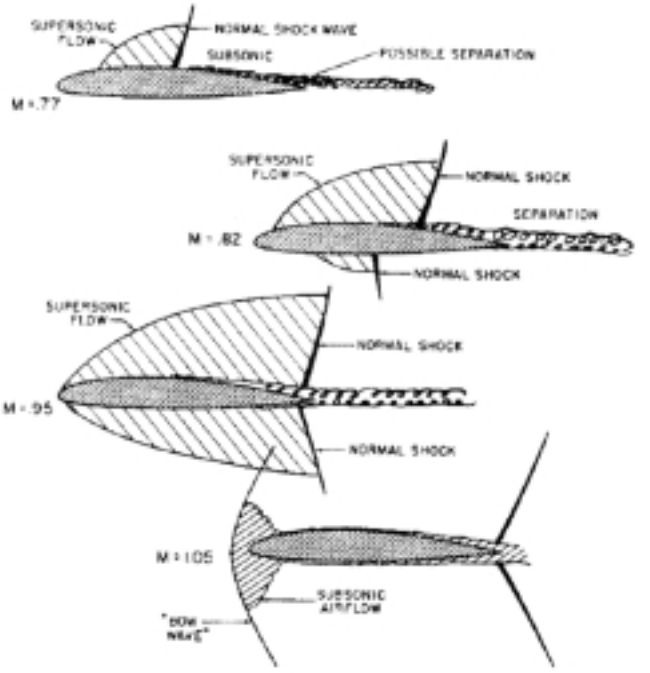
It's just like in musical composition. Or, Nicholas of Cusa referred to this in terms of evolution, as he wrote to the effect, that the idea of man existed before, just as an intention always precedes the effects of carrying out that intention, the idea of the human being exists in the universe, prior to what appears to be the evolution process, leading to the emergence of man as a biological entity.

And Vernadsky was looking at that also, what he called the "cephalization," which is the concept of an American geologist named [James] Dana, who observed the directionality, particularly in the latter part of evolution, which focusses on the development of the nervous system, the higher nervous system; evidently moving in a very directed way, toward the kind of nervous system which is adequate to support the activity of the human mind. So, you're always seeing an organizing activity, in a sense, indefinitely into the future. It's called, in the study of waves, a "precursor"; that's just a metaphorical expression of that, which I tried to indicate with the tracks being built in front of the locomotive. That's only the visible effect of something else. Why *are* they building the tracks in front of the locomotive? What kind of people are those? What is the concept which leads people to do that?

## The Machine-Tool Principle

**Q:** Jonathan, can you explain the principle behind the design of Büsemann's supersonic aircraft, and how that relates, or is analogous, to physical-economic processes?

**Tennenbaum:** Well, I can do that better, to my knowledge, from the standpoint of physical economy, than from Büsemann. For example, for physical economy, look at the question of education: Are we educating people to have certain skills, that are required for the productive process, the various processes, the technological processes which exist today? For example, there's a big problem: Are we educating




*Adolf Büsemann's portrayal of flow patterns around an airplane wing, showing different geometries at subsonic and supersonic speeds.*

engineers simply to competently be able to apply known principles of technology? Is that wise, to do that? Or, as opposed to, starting with the Humboldt education, where one educates *everybody,* irregardless of what professional they would go in, in the replication of great acts of discovery, as the reference point for everything else. Where that comes out, as I mentioned the case of MBB, the design, in the sense of an effective *Mittelstand* industrial operation, or even a larger one, as MBB was: that actually, you have built into the design of the organizational conception, that you're organizing a company, not for a given domain of technology, but from the standpoint of the propagation into new technologies.

It's what Lyn was also calling the "machine-tool principle." It's like you're organizing a flow, you're not organizing a thing. You're organizing something for the *purpose* of most efficiently undergoing, or pushing forward, technological change.

So, in the case of Büsemann, the problem associated with Büsemann's design is: Here you have two apparently distinct domains. You have the subsonic domain, which has one set of apparent laws, you might say, or behavior of aerodynamic processes. And you could see in the picture—I couldn't go into it—showing the form of flow, of hydrodynamic flow around the airplane in the subsonic domain; then you have another one, which is the supersonic one. And then, you have a transition area.

So if you want to design a plane that would work in one, and would work in another, you get two different designs. So,

you have a paradox.

So, Büsemann's insight, as far as I've understood it, is to focus on something else: Focus on what is the process, what is the nature of the change as you're going from one to the other, and saying, "Wait a minute: If I build the airplane on the basis of the characteristic of the change in behavior, then I will have an airplane which will be able to negotiate this transition." It took the form of this so-called "swept wing," but that was only one aspect of it. He had to free himself from certain assumptions, of the long experience of aircraft design on the basis of subsonic aerodynamics; and actually create a new set, actually a new aerodynamics, which no engineer who had been badly educated could do. Right? It's what you call "transonic aerodynamics."

And we're now getting to a similar problem, with the so-called hypersonic aircraft, where you have an aircraft which is designed, in a certain sense, not for one domain, but for the transition across the domains.

## How Can Russia's Economy Be Developed?

**Q:** Hello, I am Dmitri from Russia, and first of all, I would thank Mr. LaRouche and the Schiller Institute for giving us the possibility of coming here and and participating. We've seen in the photo presented by Dr. Tennenbaum, the photo of Eurasia, that Russia needs really some infrastructure projects. That's why I am so attracted by the idea of the Eurasian Land-Bridge. But, I would ask you, by whom would these projects be initiated, and which political or economical actors would be interested in the realization of these projects? Because, in the situation of crisis you depicted, we need to know on whom we could rely, to realize this project.

**Tennenbaum:** I think there are very competent people in Russia itself. I think it's very interesting to look at the history of Russia, even going back to the 17th Century, and then into Peter the Great, of the settling of Siberia all the way to the Pacific Coast; and then, the change which came with Peter the Great, and the development of a conception of this vast territory; and then, going into the Soviet period, and the fights that were going on there. And I think, if the lessons would be learned from the arguments about this question of how do we develop Siberia, then there could be sufficient expertise, with cooperation from Europe and so forth, to carry out a very effective development of this area.

But I think the Russians know it much better than the Europeans, for example. There are people in east Germany who know a lot about this, too.

But there were some fundamental issues of economics, which entered into the question of what strategy to adopt. What kind of infrastructural technology should be adopted? What kind of a mentality, what kind of education do people require who are going to live in those kinds of areas? And the conclusion, at least the best orientation that I found, from my standpoint, was among those in the Soviet Union who understood that the infrastructural development of Siberia would be only possible on the basis of the most advanced technologies. And it could only be economically sustainable, on the basis of the most advanced technologies: Because only the increase in productivity, the vast expense, particularly in developing infrastructure in areas that are very thinly populated, and therefore, you have a very high capital cost, per unit per person, much higher in Siberia, than you would have, for example, in Central Europe, where you have a higher population-density. Because you have low population-density, you want to develop populations. You have actually very high capital cost. And therefore, you could only compensate that high capital cost, by very high efficiency, and by very high technological benefit, overall, to the economy.

So, these were ideas around this idea of the Novosibirsk science city, that these had to be science cities, along the infrastructure corridors, not simple infrastructure. And you had to look at it, implicitly, from a Vernadsky standpoint, that you are actually making a change in the Biosphere environment of Siberia. Of course, that's exactly what was sabotaged under Gorbachov, when under Gorbachov—I don't know the whole back history of it, but there was this attack on, for example, the project of moving water from Northern Siberia, which has a great excess, in a sense, or great reserves of water, down to Central Asia; which is a project which actually would have a major impact on the Biosphere. And it was objected, "No! You can't do that! Because you're changing the natural environment."

And then around that came, I think, this fight between those who were more oriented toward the raw materials—in the sense that the raw materials are the wealth—and those that understood that it's the development which is actually the wealth—the development process, which is the real source of wealth in Siberia.

## We Need a Science-Driver

**LaRouche:** Jonathan covered most of the essential points that I would have made, except one, which is in the question, how would we get the projects started?

What we have to do, is, first of all, have international understanding of the need for this project. And the definition of understanding the need for the project could come right from the best, from the people we spoke to at a recent conference, which we co-sponsored with the Vernadsky Geological Museum in Moscow. People associated with that institution have the knowledge, essential knowledge, to define the objectives of mineral development.

Now the question is then, the feasibility of getting a project going for that purpose. Once we have agreement, that there is a global strategic importance in this development of Central and North Asia, and that we plan the replenishment and so forth of the central mineral materials of the region, we can proceed. We don't need to get the minerals out, as some people are, and exploit what is called "the natural patrimony of Russia." Don't do that; that's a mistake! We don't need to rush in that direction, just to rape the soil, to get the minerals. That would be stupid.

*Russia's Novosibirsk science city is an example of the approach required to develop Siberia: not just infrastructure development, but high-technology corridors with science cities along the way.*

What we have to do is, say: We have a long-range responsibility for the human race, to get a competent management of what might be called "the natural resources of the planet," because they *are* finite. They're enormous, but finite. But they're enormous enough so we don't have to do something crazy. But they also have to be dealt with.

So what you have to do is, you start with a project, like he said, the projects which were the science-driver projects along the route of development to Siberia. A perfect start. But what you have to do is start from the top down. What we need are essentially, highest-quality science-driver projects, at the very top of science. It's a project of the type you would associate with space science, because space science today, and this kind of project, are one and the same. What we're looking at on Mars, or other parts outside Earth, these problems of exploring and understanding the Solar System and attacking this, and designing systems to deal with exploration of the Solar System, are one and the same thing. We're trying to manage the Solar System, now, or getting into that phase.

So, a science-driver program. We take Russia's science-driver program, and decide you're going to accelerate it, revive and turn it loose, as a true science-driver program, not a limited mission-oriented program. Not a so-called "practical" program.

Now because of the situation in Russia today, you would set this program up, where its primary objective is research and development of new engineers and scientists. Because the scientists who have these capabilities inside Russia today, are largely old! They're almost as old as I am, or older. Therefore, we better get some replacements online. And we need a broad-based replacement, because the future of Russia, for example, will depend upon not being a backward nation, but being one of the science-driver nations of the planet, because we have to develop, among the nations which have the potential for developing a science-driver orientation, to meet the needs of large parts of the world that don't have that.

So therefore, we need to re-create Russia's labor force, on a science-driver orientation. So, we will pick a space program, which has a feature of the Central and North Asia minerals development and management, along with the question of developing ocean resources, and ocean-based resources of minerals, as part of the same project.

We're going to have to manage this planet. You can't just go around looting it; we've got to manage it. All right. So, you get that.

## A Two-Generation Approach

Now, on this, you take a two-generation approach. The first generation is to develop a whole base of new cadres, and get new industries out of it, as a byproduct of scientific progress generated in these programs, with the idea that in the second generation, we will have developed the technology *and* the cadres needed, to go directly at the question of managing and transforming North and Central Asia.

In the meantime, projects like the Ob River diversion project, for the Central Asia development, should be going ahead immediately. Because you have to take this area, which is now a neglected part of the planet, that the synarchists intend to destroy for future generations' use—raping—we now have to start to get man on top of this again. We need to have settlements sitting in Siberia. And they should be science-driver settlements, which Russia has some experience

with: science-driver settlements in the secret cities. All right, but that should be done.

But the main thing is, we've got to develop a Russian labor force, a science labor force, to replenish the diminishing stock of Russian scientists who have these qualifications.

So therefore, you would have to say, we have an international cooperative program. Everybody knows we have this problem, or everybody who's intelligent. Say: Okay, now the nations of the world are going to cooperate. We're going to create a credit mechanism, for credit assigned to this specific category of human need. Russia will have programs under this credit program; China will have programs; India will have programs; Europe itself will participate, because Europe is vitally concerned with its own mineral resources. And therefore, we have a cooperative system of different nation-states, each having their participation in what is really an expanded space program.

We take the space program, which includes all of your technologies, implicitly. Putting man in space is a high-technology operation, very high. You take the space exploration, the exploration of the Solar System, and its management; use that as the concept. Build a materials management component on Earth, in each area, with each country which should be involved in this as a special project.

Use this, in the case of Russia, for a science-driver labor-development program, to create a new generation in the next 25 years, of a whole new generation of scientific and related cadres. Map out the project, of which we have some preliminaries today. Do preliminary exploration. And prepare the second generation to go full-steam with large-scale projects which will actually begin to develop in North and Central Asia, a system of mineral management, and other kinds of management.

You know, this mastery of the tundra area, life on the tundra area, is a big project. Developing oceans. What're you going to do with the Arctic regions? This is a whole area of development which involves advanced technology.

The feasibility of the thing, economically, is to have a political objective, which is also a material objective for the planet. Have agreement among nations, to create a level of credit for this development, a two-generation development program, for the objective at the end of the second generation, we will then be moving into actual materials management. On that basis, it becomes practical.

## What Is 'Space-Time' Geometry?

**Q:** Hello, I am Sylvain from France. I have two questions. The first is about something you developed and Vernadsky developed also, when he talks about abiotic, the biotic, and the noëtic, which has three different states of space-time. And you talked about this, also when you defined the three different parts in geometry. Can you explain more, what is the different state of space-time?

And the other thing, is about geometry and something we try to do in France, with the pedagogicals in the street, doing simple pedagogicals in geometry, as doubling the square, finding out about Pythagoras. And it happens, as with the music, your pedagogical is as a magnet, and you have in one minute, ten people around your table, trying to have a discussion and find out what is the solution. And maybe it's the same kind of waking up the reason of the people, through this kind of process. But, the thing is, how do you manage to do this pedagogical, not as something in itself, but as a way to get the people acting in the world?

**Tennenbaum:** Well, I had in mind actually Vernadsky's struggle with this conception. Not so much his solution in a sense, because I don't think he gave a solution really. But he saw the *need*—and I was discussing it with Nina and some other people, because we're on the edge of a total revolution in biology and medicine, in the sense that *it can be made*. Lyn saw that in the early '80s, that we actually have a situation where such a revolution is not only possible, but it's actually necessary: If you look at the AIDS question and everything that's connected with that. And also the enormous costs to the world economy associated with the spread of disease and the evolution of disease, which has taken really dangerous proportions.

But as I've been looking at this, together with [Fritz] Popp and others, we came to something that Vernadsky was—I think Vernadsky saw this also, not just as a question of medi-

cine and biology per se. Vernadsky was a science organizer, and he had to realize that to do science, one has to master the history of ideas, the internal history of ideas. So he did a lot of work with groups of people to try to understand better, what is the mind which generates scientific breakthroughs, scientific revolutions. And particularly, following on Pasteur and Curie, Vernadsky became conscious, of the need for a new conception, perhaps not entirely new, but in experimental science, it would have to be realized. I think you need a generation of biologists and physicists to actually do this.

The problem is this: Evidently, there was a fight in the 19th Century about, how do we understand these living cells and living organisms? Is there something different *in them,* like a life force, or some different kind of stuff, some different kind of material there? And Justus Liebig, for example, and others, made a polemical intervention, and said, "No. It's not that there's some special kind of stuff, so to speak, some special molecules, or something, in the living process. You find the same ones that are outside. And we know that, because living processes in the Biosphere, are a process of transformation of so-called non-organic, inorganic, into living material, in this process." So the answer to the question won't be found in that direction.

So then, Pasteur and Curie and their allies said, "Wait a minute, let's look at the geometry." Now, we get to the question, "Well, what is this geometry?" And, Vernadsky, reacting in some ways to Einstein, and so forth, conceived of what he called—it came from Curie—the notion of a state of space-time.

The problem came in, as far as I can see: Vernadsky called on some mathematicians and others, to elaborate this conception for experimental work. Because you have, for example, in the living cell, it's not just a question of whether the cell is living; but we also want to know, is it healthy? Or, if it's not healthy, in what way is it not healthy? Because living processes have, just like human beings, different moods: Sometimes they're depressed; sometimes they're exuberant. They change, in what appear to be very subtle ways. Even plants, have a more lively mental life, than Joschka Fischer.

But so: How do you deal with that experimentally? How can you tell when a living process is happy or not, or whatever? So, you're talking here about some kind of a characteristic. Not about whether there's so much of this molecule, or another molecule or something.

And for Vernadsky, we find at least in his public writings, he referred to Riemann, but there he didn't have a mastery himself of Riemann. What we do find in Vernadsky's *unpublished* work—one of our friends at the Vernadsky Museum actually published notes that Vernadsky made in the '20s, or a little earlier, when he was formulating his conception of the Biosphere. And you see, he's copying out poems, and talking about music! It's full of poetry. And this couldn't be published in the Soviet era, because it would make him look like an "idealist." And there's a different Vernadsky, who's in a sense in his own mental laboratory, *Werkstatt;* he's trying to put himself into the creative process—poetry and so forth.

And I think the difficulty is, to really get the work going, on this question of what do you really mean by a space-time geometry—you couldn't do it without referring to Classical art. It actually would not really be possible to communicate this notion, and to get groups of scientists to actually develop this notion as the basis of a revolution in biology and medicine.

So, that's what I would say. And the same thing, in terms of the pedagogy; maybe others could say more. I think, the biggest problem I can see is, or challenge is, which we're facing right now, is once you've got a certain process started, you can't continue with the same method, but you have to somehow escalate it. And I think we succeeded in Saxony in doing that in a remarkable way; but, at the same time, we put the next challenge in front of us: What do we do now?

And so, you're completely right: The character of people struggling with a geometrical problem *is* musical. I believe human thought is intrinsically musical. But then, at a certain point, it demands that there actually also be music. Otherwise, there's a certain lack felt. Anyway, that's as much as I can say on that.

## New Dimensions

**Q:** We had a discussion in Leipzig a couple of weeks ago, where we were talking about universal physical principles. And we were talking about, whether these principles actually change, since the universe is a developing process, are they fixed, and the universe sort of comes up with new ones? Or, do they change?

**LaRouche:** Well, no, the principles don't necessarily change in and of themselves. What happens is, new principles are discovered, and then they interact with the old principles.

What happens is, you imagine a geometry in which you keep adding new dimensions, just in the imagination. And as you add new dimensions, then the characteristic of action, in that universe, changes. For example: Just take the development of electricity, the use of electricity. What that did, is it sped up the economy, even in areas where there was no other change. For example, even the development of the individual electric motor, to power a machine, produced an advantage of technology (which involved some discoveries), which improved the factory operation, over a central electric motor to drive a whole bunch of machines.

So, the addition of new principles, as Riemann deals with this, in the last phases of his habilitation dissertation, changes the physical environment in which the action occurs, by the mere *addition* of a new principle, which gives the whole process a new geometry. The effect is to speed up the process, so that you do have a change, but you don't have a change in each individual principle as such. But you have a change, which is by adding a new interaction among principles to the whole repertoire.