The Twentieth Century Was a Failure Because It Substituted Mathematics for Morality

This exchange between long-time Lyndon LaRouche associates Gerald Rose and Philip Rubinstein was recorded on Oct. 11.

Rose: So, Phil, the question comes up in the most dramatic way possible, with the fact that you now have within the trans-Atlantic system, the combination of what Putin has done, in terms of an actual fight against terrorism in Syria,—a serious fight on the basis of the reality of terrorism,—and his own moral commitments to Russia and the defense of the whole of humanity, which he himself learned personally through his family commitments, during the Nazi siege of Leningrad [now St Petersburg]. And he will not be deterred. And the Obama reaction, as we know, has been completely insane, in terms of a spiralling out-of-control of the kinds of provocations that he's capable of and committed to.

But on the whole, as LaRouche identified, you compare the U.S. leadership, which is disgusting, even to the morality which has come forth in Germany in response to the refugee crisis. You have a certain reaction by Merkel to just a fundamental moral question of whether you're just going to murder people, and throw them onto the scrapheap; and her response, and the German people's response, is: We're not going to do that. But you could not get such a response within the United States as it is now currently existing.

And what LaRouche put on the table is the problem is that the ideology of the Twentieth Century doesn't function. The Twentieth Century has replaced morality by mathematics, and what we want to discuss, and what I want you to elaborate, is: what do you think that means? How do we go at such a question?

Rubinstein: Well, I think we have to get to a fairly

creative commons/ Richard Drew

The frenzy of the New York Stock Exchange, and the sophisticated mathematical models of competitive advantage go together more intimately than you know. The market scene is from Sept. 17, 2008.

Theoretical option price = $pN(d_1) - se^{-rt}N(d_2)$

where $d_1 = \dfrac{\ln\left(\frac{p}{s}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$

$d_2 = d_1 - v\sqrt{t}$

The variables are:

- p = stock price
- s = striking price
- t = time remaining until expiration, expressed as a percent of a year
- r = current risk-free interest rate
- v = volatility measured by annual standard deviation
- ln = natural logarithm
- $N(x)$ = cumulative normal density function

deep level. First of all, I think most people will immediately respond, why mathematics? Because to a large extent people don't understand what runs their lives, and they have been dumbed down to the point that they don't even ask the question any more.

Indeed, look at Wall Street! Wall Street is essentially based—and we may come back to this—they talk about free market theory, but it's basically a mathematical game. Game theory. A zero sum game, and the idea is to come up with some advantage out of it, and that's what most of the investments, and the investment strategies and the direction that people get, is based on.

Mathematical game theory: what moves gain you a little bit versus what somebody else loses: what raises the prices; what do people like; how do they feel about things. It has nothing to do with economics. It's a mathematical construct really of the Twentieth Century.

Hilbert's 1900 Project

You had free market theory with Adam Smith before, but the idea that you could mathematically express the value, the monetary value, the paper value, because of what people's likes and dislikes are, is largely a Twentieth Century addition. And that's what the whole derivatives flow out of Wall Street is based on. You know: Can I get somebody to place a bet on the value of a financial instrument, and how can I rig the game so that I make something off of the bet? And how can I then bet upon the bet? You say that and people get all freaked out, but that's what's going on.

This is the nature of—Take health care: You notice now that most of these doctors, or paramedics, walk around with little tablets or versions of computers, and you tell them you've got a pain on your left side, and they punch in some things on the computer with your medical record, and they come up with some kind of evaluation of whether or not you should be treated, or how much you should be treated. And this is all based on actuarial charts that the insurance companies utilize.

So, this whole idea that you could numerically evaluate and express scientific knowledge, reached an apex in the Twentieth Century, and this was done quite consciously at the end of the Nineteenth Century, as has been identified, by David Hilbert and Bertrand Russell. And in some ways—the background of these men to start with: for the purposes of this, I want to emphasize Hilbert's role. Russell is an evil character; he hates human beings, and so on.

But Hilbert put forward the project that you could axiomatize science—physics, chemistry. But I'll tell you the axiomatization project—you know, he had 23 propositions to be solved, some of them technical, mathematical, that in and of themselves would not make that much of an impact, but the idea was that the *truth*, science, was to be achieved through simply mathematics.

And then Hilbert's own version of this—whether he was the kind of character Russell was, I don't know, but he was the spokesman for this—even his idea of mathematics was a degraded version. It was pure formalism: it was the idea that really the content of events,—the content of the real Universe,—doesn't matter, because the only way you can reach certain truth is by the formal relations, the logical relations, within whatever idea you have.

So, he says, for example, that he could take Euclidean geometry, which is problematic anyway, and in effect, he wanted to do with geometry at that point what Euclid did to ancient geometry, which was constructive, which was a kind of truthful practice—Euclid turned it into an axiomatic system. At the end of the Nineteenth Century, it was known that Euclidean geometry was *not* the geometry of the Universe—and we can come back to that a little bit later.

But what does Hilbert attempt to do? He says, we can axiomatize in a purely formal sense any version of geometry. And he says, for example: I can replace point, line, and plane with coffee, cup, and sugar, and I could replace them for point, line, and plane, and give you a completely consistent formal system. And that's the way we ought to effectively do everything.

From that standpoint, he laid out the project later on of proving that mathematics—arithmetic as a basis of all mathematics—could be axiomatized, and then proven to be perfectly consistent in the sense of never proving a contradiction, and complete. And so the foundations of our knowledge would be secure.

Now, this completely leaves out any fundamental new ideas. It rules out human creativity. It rules out the human mind. And that's what really plays itself out in physics: not so much with simply some of the perplexing features of physics, but the idea that once you have the math, you don't need to get reality. You don't need

to get what's really out there. This is what Einstein opposed, contrary to the way he's often described. It wasn't determinism; it was the idea that you couldn't discover reality, and then act on it for the betterment of the human species.

When you take creativity out, in a very precise way—not just any arbitrary innovation—because what LaRouche did in his physical economics, and that's what I think we mean by reality here, what LaRouche demonstrated is that the human species depends on creativity—that is, progress in our knowledge of the Universe. That's what makes us unique as a species. We evolve ourselves through the creative development of our relationship to the Universe in the form of knowledge that gets us deeper into the Universe. But that's necessary to human existence. It gives meaning to human life.

Philosopher in Meditation, painted by Rembrandt in 1632. Just where does the hypothesis come from?

Creativity is Knowable

Because human beings live with the reality that they're going to die, which can be a bit of an unsettling sense. But we also live with the knowledge, or should, that we can contribute to what is an eternal, effectively, future for the human species, because we are creators, as the Creator of the Universe, the Composer, if you want to express it that way. But I really want to leave it, that we know how to create within this Universe, relations to the Universe that expand our ability as a species.

If you rule real science out, that kind of development, you have no morality. You have no ability to organize the human species to a common purpose that's going to improve future species, in which each generation of youth can look forward to a deeper and more profound future for the generations that follow them, and to improve upon and develop those that preceded them.

So the human species has the capability of being what Schiller called sublime: facing the mortality of every creature—human beings being conscious of that reality, but we can overcome it.

Hilbert's program,—of course, Russell picked it up—basically made the effort to axiomatize arithmetic as the basis for all science, because of the idea that science bases its truth on its mathematical precision. One of the things that you'll get is that: what is science? It's induction, experience, then you run into problems; you do more, and you come up with a hypothesis, and then you test the hypothesis.

Well, one of the real problems in this is, where does the hypothesis come from? Most of these guys just skip over it. In fact, it's a mystery. Some of them are actually quite mystical, despite being positivists, as Russell was. They say, well, that's just completely unknown; it just happens. It's just arbitrary. Whereas the others, including people like Einstein and Planck, and others before them—Leibniz and Lyn [Lyndon LaRouche] and people today, if they're very advanced, will say, "No. Creativity is something that is intelligible, even if it's not easily expressed. It can't be expressed in any formal way, but it is something that is knowable, and can be done with a certain sense of intention, at least from a social standpoint."

So, what happened at the end of the Nineteenth Century then played itself out in the destruction of the breakthroughs that were made. We had the development of nuclear physics at the end of the Nineteenth Century. We had the expansion of our knowledge of the Universe through Einstein's development of special and general relativity, and the beginning of knowledge about galactic relationships. Greater universal develop-

ments. All of this in front of us approximately in 1900.

By the 1920s and '30s, this was not only under attack, but had been largely undermined with the idea—and these were followers of Russell. People like Max Born, and Heisenberg. Heisenberg, for example, says that there's only the observations, when indeed Planck and Einstein had demonstrated that the observations were completely inadequate. This is what Born says. And these were followers of Russell. Neils Bohr was one.

Then you had the development of computers, artificial intelligence, which I think is a whole other story. A lot of what we see today as the collapse of morality, is the fact that we educate people on computers; we babysit them with computers; we consider computers to be intelligent, when they represent nothing but a formalism that can be put to good use, and is capable of doing rather remarkable things in aid of human knowledge, but it is *not* intelligence; it's not human; it's not creativity, and we've dumbed down the population by effectively giving them the idea that they are inferior, except perhaps in some expressions of emotion, to computers.

One of Bertrand Russell's arch-enemies, German scientist and philosopher Gottfried Leibniz, shown in his statue on the exterior of the Royal Academy of Arts in London.

What LaRouche has fought since the end of World War II is this idea of artificial intelligence, information theory, game theory, and presented an entirely different morality, which can be in some way expressed in what he calls increased energy flux density, which itself depends on discovery of new universal principles, and expressed in relative potential population density. So you have a certain forecast, but it's expressed in a qualitative development of the human species.

Russell as a Young Beast-Man

Rose: Well, Phil, you know, the question is how much was this Russell-Hilbert program a reaction in fact to the breakout of science in terms of Riemann, Pasteur, the whole ferment at the end of the Nineteenth Century?

Rubinstein: Certainly in Russell's case, he absolutely—and in fact, there's a simple proof of it—picking up your point. Because really, you had Gauss and Riemann—let's just take those two in the early and mid-Nineteenth Century. And they made enormous breakthroughs. And in fact, I'll say ironically, breakthroughs that expressed themselves in an entirely expanded new capability to express a mathematical language that's far superior to what existed before.

They developed the complex domain. They developed Riemann's conception of Riemann surfaces, and anti-Euclidean geometry, as he expresses in his famous Habilitation paper, where he ended by saying, I think, for 1700 years we haven't understood the basis of our geometry. Now we're going to express that, and he concludes by saying, ultimately you have to go to the realm of real physical science to answer what is the geometry of the physical Universe.

And he developed the conception of Riemann surfaces, which is a conception of ongoing, in a way, ongoing development. It has a certain technical mathematical side, but it's a way of expressing ideas that could never before be expressed in mathematics. And in fact, Riemann is often accused of not being rigorous enough, but he proves, by being a scientist, everything that he says. In many ways, the same goes for Gauss, who was a little bit less open about what he was doing.

Now these breakthroughs allowed us to expand the development of electro-magnetism, the development of nuclear physics, and so on and so forth. People like Planck and Einstein depended—Planck in his own way; Einstein had to sort of go to Riemann to find a mathematics strong enough to express his ideas. And of course, this brought us—as you say, at the end of the

Nineteenth Century, here there was an entirely new Universe, a new Universe of quantum physics, of nuclear physics, understanding the continuum and the discreteness was open to us. We had breakthroughs in health, as you pointed out, by Pasteur, but also the beginnings of knowledge about biology. People like Vernadsky are working in Russia, later the Soviet Union, on these same areas.

This is what LaRouche built his whole conception of economics off of. It goes back further, but we don't have time to go into everything: Leibniz, and so on, and Kepler, and so forth. But let's just focus on this. So, what happens is Russell, as a relatively young guy, but a member of the aristocracy, and a person who hated human beings—his whole life was dedicated to hating. He hated scientific development. He hated industry. He hated the United States. He hated the industrial development of the Soviet Union; he promoted the backwardness that he saw in China.

But as a young man in the 1890s, two of the things that he does before the infamous *Principia Mathematica*, is he wrote *A History of Western Philosophy*, and he basically attacks Leibniz. He says that Leibniz was really a logician. Don't take seriously his metaphysical side, his idea of the best of all possible worlds, his idea of the monad—this is all B.S. to get him in good with oligarchy, and he's basically a logician.

And of course, in his *Foundation for Geometry*, Russell also mocks Riemannian geometry. He says you can't really have anything but Euclidean geometry in the actual physical Universe. So, he's deployed against human progress. His whole idea in the *Principia* is to prove that there is no real purpose in the human mind. It can all be axiomatized, and everything else is pure feelings, pure sensory experience.

Now, Hilbert—I'm less clear on Hilbert as a personality—he's clearly weak on a lot of things. Actually I think what you have is, in Göttingen, you have this whole mathematizing school: Felix Klein. Related to it, Minkowsky, who does some perhaps useful things, but is not a valid expression of special relativity. Weierstrass, who's not a good one, but they all attack Riemann for not being formal enough.

For example, his whole idea of Riemann surfaces is rejected. The Dirichlet principle is rejected. They insist on various forms of algebraic formulations that Riemann had superseded. So you have a clear attack on these potential breakthroughs. And in fact, Göttingen and other people related to Göttingen play a very big role in the mathematizing of quantum theory. Born, in particular; Sommerfeld wasn't there, but he's working with these guys. And by the late 1920s, they're basically arguing that we have no way of expressing reality. We have the mathematical formulas. And really, a lot of physics since then has been not unlike the Ptolemaic or Copernican theory, where you can add an epicycle to make the mathematics work, and cover the data, but you can never know what's real. It's only the mathematics.

This is what came out of the 1927 and 1930 Solvay conferences that Einstein fought so valiantly against, and maybe I can come back to that.

Riemann

So, I think that Lyn's point, that Russell was evil, the most evil man of the Twentieth Century—this is a guy who on at least a dozen different occasions after World War II, raised the issue of pre-emptive nuclear bombing of the Soviet Union. Later on he tried to claim that he hadn't said that, but in 1953, a letter was produced in which he says, we want to h-bomb the Soviet Union. And his own biographer said, look, there were at least a dozen times—in various interviews, letters—where Russell expressed this. He only became anti-nuclear, a peacenik again, after the Soviet Union got the hydrogen bomb. He'd been a pacifist for World War I, but that was really part of a whole orientation of the British oligarchy to reorganize the Empire.

So, he was a creature of the British Empire to the marrow of his bones, and to the inside of every cell of his being.

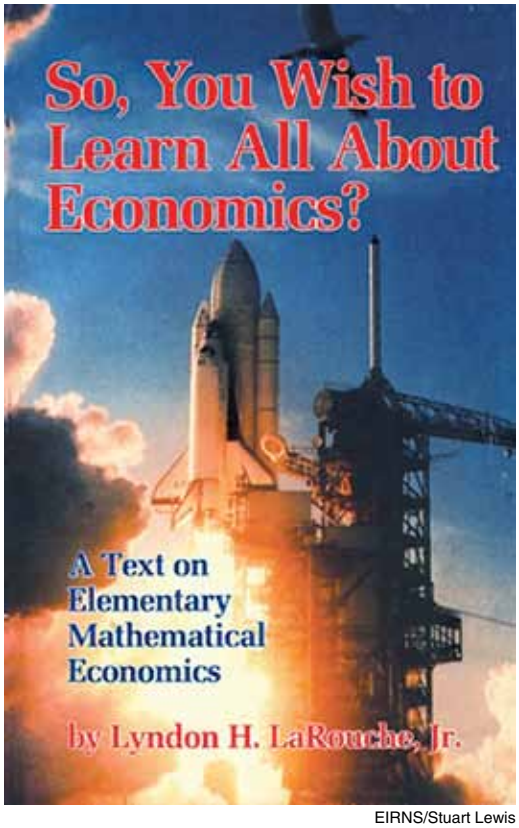
Rose: Let me ask you, Phil. The reason I asked the Riemann question is because when Lyn describes his own breakthrough, this fundamental scientific discovery,—which is really one of the dominant revolutions going on in the BRICS, expressed in many different ways,—he describes it as "LaRouche-Riemann," really going back to before the whole mathematical formalism which dominated the Twentieth Century.

Why did Lyn say "LaRouche-Riemann?"

Rubinstein: I think Riemann really makes the breakthrough that takes geometry, mathematics, outside of this formal realm. Because what does he say in his *Habilitation* paper? And you see it in some of what Riemann discovered: his work on tensor analysis,

which is basically, to put it in—I don't know every technical detail, but the idea is that you're dealing with a multiple changing set of dimensions, or principles, really. A multiple set of interacting principles. Not a three-dimensional Pythagorean system. You're dealing with all kinds of potential universal principles—gravity, electromagnetism, stresses, shearing factors, electrical circuits, and so forth and so on, and you can develop an idea of how to, in effect, act on things that have multiple dimensions. Not dimensions really, but multiple principles acting.

So, this is a totally different language. It's probably the closest thing to poetry that—this is why you need poetry to supercede mathematics. Because you have to think poetically to have this kind of an idea.



EIRNS/Stuart Lewis

Lyndon LaRouche's seminal economic textbook, published in 1984.

Now Riemann surfaces have the same character. But the way he expresses this is by saying, we don't know the geometry that we think we know, because Euclidean axioms have never been demonstrated. They're just accepted.

What's the real science, what's the real Universe that we live in? And it's this kind of constant sense of development that Lyn sees—as I said, this is the morality of the human species when it's being truly human. Science and morality are intimately bound together, contrary to what people believe now. What do they believe today? There's reality, which we have no real way of knowing, and then we have these mathematical expressions that allow us to utilize things we otherwise don't understand.

And morality is not expressed in mathematics. Morality is not expressed in a formal system. Truth there, is merely the ability to manipulate symbols.

So you have a dichotomy in the Universe. You have a human being and his feelings, which are effectively outside the Universe. Lyn says the human species is part of what the Universe has created. The Universe has created a creative species, and our existence depends on that creativity. That's the morality that we express to other members of the human species, and in our relationship to the Universe.

So I think that Riemann is the culmination of the work of people like Gauss, Leibniz, and Kepler, and so in part, we point to him as in many ways the last full representative of that. And Lyn himself is using that to go beyond it. You had some developments by Planck and Einstein and Vernadsky, but ultimately in the Twentieth Century, Einstein stands alone as the one figure who says, "I don't accept this reign of mathematics, formalism, positivism. We as human beings, need to know that we can know the Universe."

So-Called Artificial Intelligence

As I said, Einstein's often accused of wanting to be a Classical scientist, in promoting determinism—that we have no freedom, no creativity. That's not true. He says over and over again that science is based on creativity. What he's saying, is what's Classical is that the human species can know the Universe. And what we have so far, as an interpretation of quantum theory and certain other problems, is not a knowledge of reality. It's the use of a mathematical formalism and substituting that for reality.

That's why science has stopped. No one is creating a real new science, new breakthroughs based on what we've done through the Nineteenth Century. They'll talk about a new physics, but all they mean is adding an epicycle to what's going on now.

However, I do think these concerns to create even that, reflect the problems in the science—the stagnation of it.

Rose: This comes up very dramatically on this question of "can computers think." Anyone who says that, or who thinks that, is falling into the horror of the Twentieth Century. Because the question—and I'd like you

to elaborate a little more—this question of the super-Turing machine, this idea that von Neumann and others have come up with, is this question of game theory. And the idea that the future is somehow projectable from the present—it seems to me that that's the horror and the absolute entropy and destruction that they impose upon the human species. Can you comment on that?

Rubinstein: Well, I think it's an interesting case. I mean, human beings are not like any animal, and they're not like any machine. And Lyn has discussed this extensively. What animal even knows that it's going to die? You get a lot of this approximation. You know, they do this, they do that. They don't come close! You look at what the human species has developed,—even with all its problems,—the genuine progress of the human species, and there's nothing in the animal world that touches it, even an infinite approximation.

British computer scientist and mathematician Alan Turing (1912-1954).

Now, you had this phenomenon in the Twentieth Century of machines, artificial intelligence, computers. Now people have sometimes tried to run calculator machines in the past—fine. Actually, one of the things that generated this fascination with computers is a lot of technology developed off the scientific breakthroughs of over 100 years ago. Nuclear physics, atomic physics, electro-magnetism, and so on and so forth. So we're able to do things at a very high speed with new materials and so forth.

But what really, what the core of this is—there's an interesting case, and they made a movie about this guy Alan Turing, "The Imitation Game." And partly he helped to break the German codes in World War II, and then he had this thing called the Turing test: Could you distinguish between the machine and a human being—could you create a machine that imitated a human being sufficiently so that you couldn't tell the difference?

Now, I won't go into the craziness of that, but I will say one thing. First of all, the idea that they make him into some kind of a hero who saved—this is how the British saved the world, basically. He comes from a family of British civil servants, who served mainly in India; he didn't, but that is somewhat his education and his background. So the idea that he saved everybody from World War II is an absurdity, but it's the kind of thing that people get fascinated by,—he broke the code.

Now, the second thing about him, which made him somewhat of a hero, because he was a homosexual who was certainly undoubtedly persecuted at the end of his life, and it may have been partly because he was the bearer of certain secrets. But anyway, he basically took upon himself part of the project that Hilbert had put forward; that is, he wanted to answer some of these questions about the foundations of mathematics after Gödel.

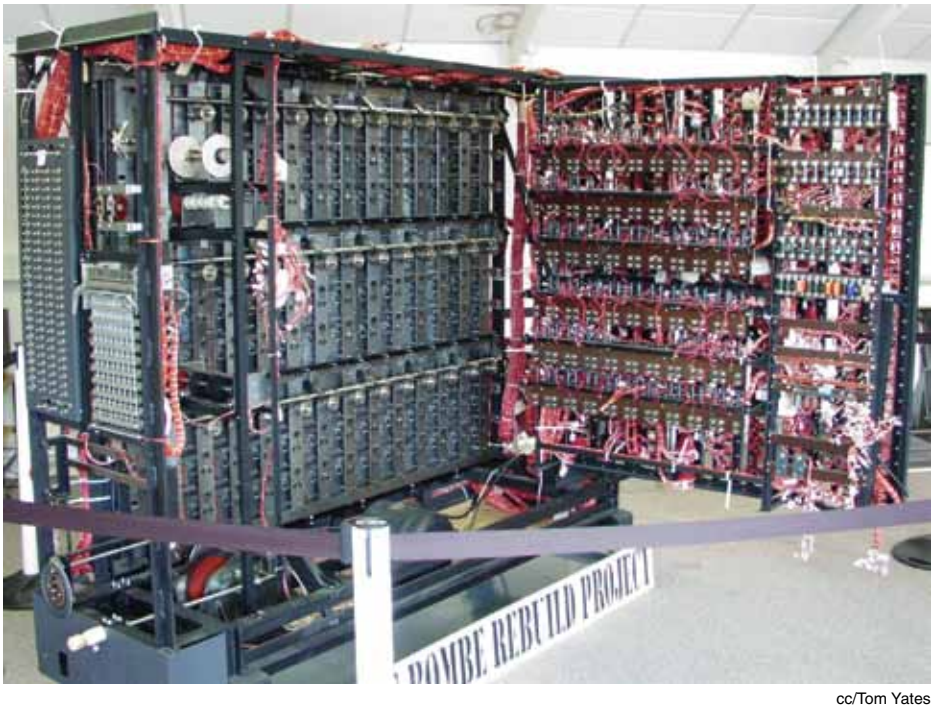
Gödel had proven that Russell's system was neither consistent, nor complete—or, if you tried to make it consistent, there would be truths that you couldn't prove. And if you tried to make complete, it would be inconsistent. But there was another question that Hilbert raised, which was: Can you tell, given a given formula, can you decide by some mechanical finite means, some mechanism, something mechanical step-by-step, approaching what they call a recursive function of some kind,—can you decide with a finite number of steps whether it's true or not?

Now, ironically enough, Turing proved that,—just like the Gödel's proof,—no! In other words, the machine might go on forever. If you gave it a certain problem, and it just kept going, you couldn't tell whether it would solve it or not. So you could run into that kind of serious problem, a limitation on any mechanical system.

Computer Religion

But in the course of doing that, he came up with an idea called the "universal Turing machine." Now what's the principle that he uses in this?

His principle is: it's not in the content. In other words, you can run a problem through the machine, and the machine has instructions on how to deal with the problem, how to deal with the calculation. And be-



cc/Tom Yates

A complete and working replica of the Turing machine at the National Codes Centre at Bletchley Park, site of the UK's Government Code and Cypher School during World War II.

cause you can vary the instructions, you can put anything through the machine. And if it's calculable by mechanical means, the machine can do it. Therefore, it's a universal Turing machine. It's an idea. Nobody would ever build such a thing, because it would be massively cumbersome—it only has a huge number of steps—but every computer can be reduced, so to speak, to a Turing machine. It can be broken down into a Turing machine.

Now, Turing was also certainly a very funny guy. Now they say he might have been autistic. I think he just had certain social limitations. And his view was, he would refer to the machine, looking at the tape going through it, he would refer to that as a state of mind. From his standpoint, the machine was equivalent to human intelligence, or even a mind. He was particularly far gone on some of this. But this is the basic outlook.

John von Neumann. A very strange personality, but the same point. They were both sort of these kinds of *idiots savant*—in certain areas they could solve problems very easily, but they were socially limited. But anyway, I think even if they weren't socially limited, Turing's whole view was everything was in the instructions. Everything was in the operating system, and you could change the instructions, and he even had some idea that the machine could learn, because you could have some algorithm that told you when to change the instructions.

Basically, it's the software. So for Turing, and all these people, what's the software? It's formal logical systems. It's a simple binary code with a kind of "if-then" system of logic built into it. The reason it's binary is that you can make it "yes" or "no." It's basically truth tables, or truth trees. And the idea he had,—he didn't argue that that was the human brain, but he said that it could do everything that human intelligence could do.

Now with the added velocities of these machines in the ensuing 70 years… And these guys talk about this—Claude Shannon at Bell Labs with his information theory,—somebody that LaRouche polemicized against,—John von Neumann, Norbert Wiener—in various ways they all believed that this logical system was a system that could carry out all mathematical functions,—that this was human intelligence, which is the measure of truth.

And that's really where it comes in. Yes, human beings can have feelings. They can be conscious. But where is truth? Truth is in this kind of mechanical system.

I'll give you one funny story. When Turing met Shannon, one of the things that they discussed was what they could do with their machinery. Turing went on to point out that he imagined feeding in facts on prices of commodities and stock, while asking the machine the question, should I buy or sell? This is in 1940 or so when Turing is in the United States. So, you get an idea of the way these guys think. And this is exactly what has demoralized and degraded the population.

And I personally think that it's not just that it's the stock market, but that it's the way science is treated—most science students today, they don't do science. They do computer modeling. But beyond that, if you

A young child glued to the internet.

take 15, 14 year olds, 16 year olds, and they're glued to a digital system, and they're communicating through digital systems, with all the limitations and the restrictions and the way you have to go through the loops, you're destroying their mind. You're destroying their emotions; you're destroying their personality; you're destroying their minds.

And it's very interesting. The UN had a report which referred to some work that Helga and others have done on the fact that many of these shooters, so-called—I think almost all of them (I haven't seen the report)—are video game players, or computer game players. Now, the argument is,—not everybody on a computer becomes a killer. Fine, that may be true, but it may also up the likelihood. But I think it's a good insight into what computers do to the human minds of children going through the process of development of their creative capabilities.

Math vs. Morality

Rose: Just finally, because I think what you've painted is a devastating picture of what's happened in the Twentieth Century—even more fleshed out as a result of Hilbert and Russell. We've discussed this often with Lyn on the question of what is morality. The question of morality is the commitment to the future. Now most people think of the future in absolute space-time, right? As a projection of the present, and making it a little better, or something.

The real breakthrough of Lyn, but also very dramatically Einstein, is that—and I want your comment on this—is this question of, where exactly is the future? It is the basis for morality. Everything else is somewhat romantic.

Rubinstein: I would say, to utilize somewhat what LaRouche has put forward—it might not be up to the standard but—let's put it this way. Morality, creativity, and the future are really equivalent. Once you take the future out, from a mathematical standpoint, everything is a tautology. Then what you get in the Twentieth Century also, some other things like this guy Wittgenstein, who ultimately says, well, everything is a tautology. There's no content in the formalisms, and then he says, everything is a game, a language. In fact, there are other forms of this.

But morality, real creativity, is the creation of the future. You're creating something that doesn't exist today. The human species does things that never happened in the Universe before, at least in any part of the Universe that we've had contact with.

So we develop nuclear physics. We're doing things at the nuclear level that don't happen in nature by itself; we do it in densities, or we do it in transformations. There are the ultra-uranic elements of the periodic table. We've done with electricity and electromagnetism things that open up the Universe, leading us to discover more of it. And we find out that there's ever more, and ever more to discover.

Because we're changing our relationship to the Universe, we're changing our experiences, we're changing what happens in the Universe. So, we're minimally changing the future, in a sense, as an addition to the creation that the Universe has produced thus far. And that's the basis upon which the human species distinguishes itself; the way in which—we don't survive by doing the same thing over and over again. We survive by reproducing a higher level of knowledge that gives us greater power in the Universe, and makes each individual more valuable.

We reject monetarism. That's Lyn's morality. That's the morality of the American System at its best, of Hamilton, that we've pointed to. So, creativity, morality, science—and what you also see, is something else.

NASA, ESA, Hubble Heritage Team

A Hubble telescope image of the Veil Nebula, released on Sept. 24, 2015.

The place where we can express creativity in a more direct way, is in the so-called Classical arts. Classical composition that bases itself on expressing creativity—and that's the morality of art.

You also saw the change at the end of the Nineteenth Century in music. Brahms died in 1897. And what do you have in the Twentieth Century? A mathematization of what's supposed to be the new Classical music. Serial music, atonal music. What is this? It's a mathematical formula for composing music. And then you get, of course, in the wildness—I'm not talking about popular music *per se*, but that gets worse and worse. And then, of course, you get wild stuff like John Cage—4 minutes and 33 seconds of noise, which is of the trash man playing in the background.

But this is the same thing. It's all one piece.

So, creativity is not arbitrary. In other words, we face certain problems; we know certain things that we have to improve our knowledge of and expand; we know things that we have to do, like go out into the Solar System; we know that we have to know more about the Galaxy, because that's where we're situated. And indeed it's the processes of development of the Universe as a whole that are even reflected in the small.

So, we know we have sorts of tests for the imagination. We develop our skills at looking at the way in which ideas evolve and develop, the ways in which paradoxes occurred that have to be subsumed. This idea of the *coincidentia oppositorum*. This isn't just bridging contradictions; it's demonstrating that there are two apparently anomalous and contradictory things in the existing Universe, which are in one Universe. They have to be resolved, and there's a higher level resolution.

Where do all our ideas about the infinite come from?

So, one of the things that Lyn is saying, when he says morality has been replaced by mathematics,—because if you destroy science, and you destroy the future, you've destroyed morality. You're immoral.