Dynatropy: The Creative Universe and Mankind's Unending Progress

The following is an edited transcript of the August 6 discussion between LaRouche PAC Science Team members Bruce Director and Megan Beets. The video of the interview is available here.

Megan Beets: Welcome, everyone. Thank you for watching. My name is Megan Beets, and I am a member of the LaRouche PAC Science Team. I'm joined here by my colleague Bruce Director, who is a 45-year collaborator of Lyndon LaRouche, and author of numerous articles on science and the history of science, including one on how Gauss determined the orbit of Ceres, and the "Riemann for Anti-Dummies" series.

What Bruce and I want to do today is initiate a discussion on Lyndon LaRouche's idea that the universe is fundamentally creative. That it is a fundamentally creative, developing system, as opposed to the Second Law of Thermodynamics, which states that the universe is running down and is fundamentally entropic.

LaRouche shaped his entire life's work around this concept. This is centered in his early discovery of the principles of the science of physical economy. Bruce, in the notes you prepared for this discussion, you commented on this. You said, "The general implication of LaRouche's concept is that human creativity, as manifest in physical economy, is fundamentally anti-entropic. The question implied thereby is, is this merely a characteristic of human nature? Or is this a characteristic of the universe as a whole?" So, could you start us off by talking more about that. Why do you assert that as the most important question?

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Lascaux cave paintings in southern France, which were created about 18,000 years ago.

Bruce Director: I think the best way to look at that is to just make a brief summary of the main point LaRouche made with respect to economics. Of course, it's always very dangerous to try and summarize the work of someone who developed a concept over a 60-70-year period into just a small little bit. But I think LaRouche, over the decades, made a fundamental discovery of the nature of creativity in the universe, and how creativity is expressed in the science of physical economy—which is certainly not what people consider to be economics today. Physical economy has nothing to do with money or finance, or even production and distribution of goods and services; it is really the science of how man interacts with the universe and the science of human development.

There is empirical evidence to show that mankind, over its history as far back as we have accurate records, but even where our records get very sparse beyond, say, 10,000 years ago, but over what we assume to be about a 2 million-year history of human beings on this planet, you see a secular increase in man's power over nature. There is an increase of the human population, which you don't see in any other species, and also an increase in other defining characteristics, such as what LaRouche called "potential relative population density," or the number of people that can exist and prosper relative to a certain level of technology, per unit area of the Earth's surface.

That's always been increasing, at least over the long term. There might be periods in which you have a decrease, such as the Black Plague period of the 14th Century; but generally, it's been increasing. You don't see this in any other species.

You also have effects like the increase of the energy-flux density of the level of technology available to mankind. That is, the amount of power available per operative has dramatically increased over time from basic, crude tool-making, to the ability of man to deploy the power of the atom.

Beets: LaRouche referred to this in more recent years as man's increasing use of fire.

Director: Man's increasing use of fire is a very good way to actually judge that. These are all indications of a certain characteristic of mankind; something that mankind has the ability to do that you don't see in any other species. LaRouche identified that as being the creative power of the human mind to discover principles of nature, and also to apply those principles of nature to changing nature. We see that in the development of mankind. The creation of new materials, the creation of new organization of the Earth itself.

But also, man has demonstrated a capability of discovering principles about his own creativity. This really is the province of man; and this is also very unique to mankind, and is also ancient. In fact, we cannot think of human beings without art. You have all these examples, in many of the ancient cave paintings. These are not just playthings, although they are a type of play. But they really indicate man's investigation of his own thinking, his own creativity.

By making these kinds of discoveries in both science and art, mankind deploys a power, an actual physical power to transform his surroundings, the environment. As we grow and expand, we deploy this power even beyond the Earth itself. In fact, even ancient man who didn't have space flight capability, in a certain sense deployed the heavens for his benefit, through his mastery of the motions of the planets and the stars, which was essential to navigation and calendars and other types of things.

So this is a power that man has, and if you just look at the experimental evidence of that, of man's action in and over the universe over the millennia, it's characterized by an increase in what LaRouche called the anti-entropy of the universe. It is contrary to the idea of the Second Law of Thermodynamics, which has been stated in many different ways, but fundamentally says that the universe as a whole is transforming itself from states of higher organization to states of lower organization. It's always tending towards equilibrium, or it's running down.

You see this Second Law idea in the case of just a simple thermodynamic example, that heat always flows from hot to cold. It tends to go towards equilibrium. If you put a hot piece of iron into a bath of cold water, the water gets warmer, the iron gets cooler, and eventually both reach the same temperature. Now to make a long story short, from a scientific standpoint, there really is no causal reason that can explain that, other than that equilibrium is a more probable state than disequilibrium.

Beets: Wait, can you say more? What do you mean there's no reason to explain that?

Director: There's no causal reason, if you were to put a hot piece of iron into a bath of cold water, why the iron wouldn't get hotter and the water colder. That is, what heat there was in the water would be transferred to the iron, and the iron would get hotter, and the water would get colder. But that never happens; we don't see that happening. We don't have any evidence of that happening. But when you ask the question, why is that the case? For reasons that are beyond the scope of this brief discussion, it can only be stated from a mathematical or formal standpoint that the state of equilibrium is a more probable condition; and that's why it happens. The likelihood of the opposite happening is so remote, that it just never happens.

From this sort of crude summary of this thermodynamic process, Rudolf Clausius, who was the first to originally discuss this in these terms, stated that there was a property of matter and energy, a property of the universe, which he called entropy, which he formulated from the Greek preface *en* which is internal, and *tropē* which is a Germanized version of the Greek word for change. That, in addition to energy flowing from the hot to the cold, you also have an internal change which represents the potential for change.

If you have a hot piece of iron and a cold bath of water, there's a big potential for change; because there's a big differential in the temperatures or heat content. After the iron has cooled, and the water has warmed, it's all the same, the potential for change is almost zero; you can't really get—maybe you could have local fluctuations on the microscopic level—but you can't get more lukewarm than lukewarm; you can't get more equal than equilibrium.

Beets: The potential for change is also the potential for work.

Director: Yes, that's another way to put it. I use the idea of the potential for change to express a more general point, because this phenomenon has now been expressed not only in the case of thermodynamics, but in all kinds of other situations, like information theory and that kind of stuff.

On the other hand, if you look at the economy, and you look at what man does, and the development of mankind, you see exactly the opposite process. The potential for change is actually increasing. Clausius measured entropy inversely. In other words, if the potential for change is decreasing, the entropy is increasing. So, an increase of entropy means a decrease in potential for change. And an increase in potential for change means a decrease in entropy.

But if you look at the economy, you see that it goes the other way. Mankind's activity and behavior and power to discover principles of science and art, actually increase the potential for change. We, as individuals today, in society as a whole, have a much greater potential to change ourselves, to change the nature of man; as is happening right now with the idea of organizing our economy around the space program.

President Trump's proposal for a Moon-Mars mission is an old proposal; LaRouche proposed such a mission a long time ago. But even before LaRouche did, going to the Moon and Mars was the policy of the U.S.

government. Now it's been joined by other countries—China, Russia, India, Japan, many nations are getting in on this. So, we have a huge potential for change as we reach out into space and beyond. This is, as LaRouche pointed out, an increase in the potential for change; that is the nature of physical economy.

LaRouche also emphasized that this is not simply the reverse of an increase in entropy. It's not as if the cold water would be getting colder and the hot piece of iron getting hotter. It's actually a different process altogether, in which something other than entropy is happening. LaRouche called this anti-entropy, to distinguish it from the term negative entropy, which is just the reverse of entropy. I have coined the term "Dynatropy" from the Greek word *dynamis* and *tropē*, meaning the power to change.

Beets: Let's get back to what you just said, that anti-entropy, at least as we study it in the human economy, is not just the reverse of entropy. But first I want to bring something else up. You gave the example of a hot piece of iron in a bath of cold water, but the first thing that occurred to me was that when someone says "entropy"—that the universe is running down—it is a reference to the very widespread assumption today that we're running out of resources; and the faster we develop and use resources, even though we might improve, really we're making the universe we're operating in run down faster.

Director: This is the stupidest idea that anybody can have. It's kind of funny, because it really isn't that well accepted, except with the force of very big financial institutions and political powers like the British monarchy and the Club of Rome and so forth. In some parts of the world, the idea of running out of resources has really taken a strong popular root in the population, rooted in a lot of pessimism.

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Resource shortages are often faked. Here, a gas rationing system announced in a newspaper. A sign in the background reads "Sorry, no gasoline." January 1974.

In the United States you see a somewhat different situation: While this is taught in the schools a lot and people are brainwashed to believe we're running out of resources, I don't think it's really that widely accepted as a principle in the population. Just look at what we do. What are resources? At one time, horses were our resource for transportation, and oil was something you didn't want to run into when you were drilling a water well. Now, uranium—which at one time only had a real purpose to color glass yellow in making glasses and dishes and ceramics—is now a major source of energy.

If we develop fusion power—which I'm confident will be done very soon—even an element like helium-3, which is rare on Earth but abundant on the surface of the Moon, will become a resource. So, there's no such thing as running out of resources. We invent new resources and we learn how to use the resources we have more efficiently. So, that's another expression of anti-entropy. Not only is the energy-flux density of mankind increasing, but also our ability to organize matter and energy is increasing in such a way that we can now count as resources things which previously were not even known.

Beets: Right; things that couldn't have been included in enumerating resources.

Director: Correct.

Beets: So, how did an idea that stemmed from studying closed thermodynamic systems become extended to the entire universe?

Director: It's basically through brainwashing and stupidity; but it's not really new. It didn't come about in the middle of the 19th Century. It's very similar to the kind of mass hysteria that occurred around the time of the murder of Archimedes by the Romans and the collapse of Greek society in the aftermath of the Peloponnesian Wars. Actually the degeneration of Greek society started long before that. The high point of Greece probably was even before Socrates, back in the time of the Pythagoreans—and their later followers like Archytas and so forth.

But the Greeks and the Egyptians and probably other ancient cultures understood, based on their astronomical observations, that the Earth moved around the Sun—at least they had some idea of it—in non-uniform orbits. They had at least some conception of a Solar System which was a heliocentric Solar System. But from around the time of the murder of Archimedes, for the next 1800 years, this idea of the Earth at the center of the Solar System was dominant. In fact, it was a heresy to suggest anything else.

You may say, isn't that just sort of an esoteric thing? Most people were just trying to eke out a living as peasants or farmers. Why would that matter, whether they thought the Earth was at the center, or the Sun? But it really implied a theological false belief, which was essential for maintaining the kind of evil that was the Roman Empire and this imperial system.

The argument went as follows: If the Earth is at the center, unmoving, and the Earth is full of change; the further away you get from the Earth, the less things change. You looked at the planets, you looked at the stars, they change less. So, the more perfect part of the universe is as far away from the Earth as you can possibly get. This sort of false belief became the theological justification for an imperial system; that God is out there, in the perfect, unchanging part of the universe, while you're down here; you're as far from God as you can possibly be. And you have to obey the Emperor because he's the only thing that brings stability; he's the only thing that prevents change. The purpose of an imperial system is to prevent change; to prevent development.

So, that all crumbled in the time of the Renaissance and with Kepler. So, the Earth-centered view was just sort of a new version of that—that no change is preferred by the universe. It prefers equilibrium. Anything that causes change is anti-universal. Therefore, what man does, his essential nature, is at odds with the overall characteristic of the universe. And that's how it actually came about. In fact, one of the predecessors or contemporaries of Clausius, Lord Kelvin, actually wrote a whole treatise on this, about the heat death of the universe. He said that ultimately this is what everybody has to accept; that the universe is ultimately going to run down and go to nothing. Therefore, everything that man does is completely antithetical to what the universe otherwise wants to do. That's sort of the prevailing view today, and has been ever since that time.

Beets: This is what LaRouche intervened in, with his paper called "On LaRouche's Discovery," in which he wrote about his own encounter in the 1940s with Norbert Wiener and the assertion that statistical entropy is the characteristic of the universe, and that it also characterizes human communication. Wiener also asserts that a statistical reversal of entropy is the nature of local anti-entropy. To LaRouche, his gut reaction was that this was completely wrong. He thus launched his investigation into anti-entropy, as he investigated it in the realm of human economics and the realm of human art. This leads me back to what you are now calling dynatropy, which is anti-entropy; not as the opposite of entropy, but as a different kind of process.

Director: Exactly! It is a completely different type of process that actually characterizes the universe. Instead of talking about the universe as not being what it's not, let's talk about what it actually is, which is what LaRouche gives us the tools to do. The universe is creative.

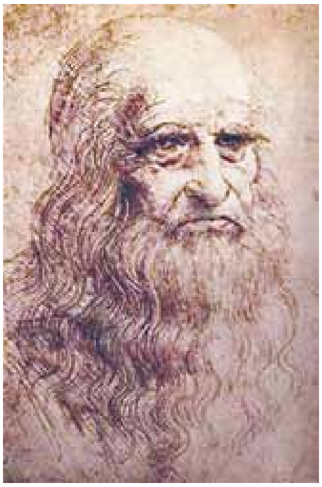
Now the question for us here today, going forward, is seeing that when you look at what LaRouche says is expressed by human activity—and he asserted, and I think made very strong proofs and compelling arguments—that it is a universal characteristic. The reason why man can exhibit this characteristic of anti-entropy is because it is the characteristic of the universe itself. But then the question is: Can we show that?

Can we show that it's a characteristic of the universe itself and not just something man is doing, as the opposing argument goes? Or is it that man is anti-entropic, but he's doing this at the expense of increasing the entropy of the rest of the universe? That argument, just from an empirical, scientific standpoint is pretty absurd; because to make the assumption that what we're doing in this little corner of the universe is somehow increasing the entropy of the whole universe is a little bit presumptuous. Rather,—as LaRouche pointed out—man can do this because the universe actually is creative; it's ontologically creative, not just humanity. There are different degrees of this, but it's not just humanity; it's the universe as whole. It's an ontological characteristic.

LaRouche made a lot of very important discoveries over the course of his life; including himself looking at the works of the great scientists—the Greeks, the Renaissance scientists, Leonardo, Pacioli, Cusa, Leibniz, and others—and inspiring others to do this work. You can see when you look at the work of the great scientists of the past, the ones really responsible for making fundamental discoveries, that these discoveries flow from a belief and commitment that the universe is fundamentally creative. You see this in the works of Kepler, you see it in Cusa, you see it in Leibniz and Einstein, Planck and so forth.

The question moving forward for science is, can we adopt this again as the standard of scientific investigation? I think that's what we really have to fight for; especially if we're going to accomplish what we really need to accomplish in terms of space and fusion and other frontiers of science; also, with life.

Beets: So, you're saying that this assumption that the universe is characterized by entropy has not only held back our social organization, but it's fundamentally held back science itself.



Leonardo da Vinci

Luca Pacioli

Gottfried Leibniz

Director: Yes. In my "Notes on the Legacy of Lyndon LaRouche and the Future of Science," I reference a paper that Max Planck wrote in the 1930s, "Where Is Science Going?" For people who don't know, Max Planck was a leading scientist at the end of the 19th Century into the first half the 20th. He was a collaborator of Einstein. He was a Classical pianist, and he was really the dean of science for the first half of the 20th Century.

He made a decision early in his life to continue to play the piano, but he abandoned his pursuit of a career as a Classical pianist and took up the study of physics. He was advised by his professors and advisors that this was a waste of time, because with the discovery of the Second Law of Thermodynamics, everything had been discovered. The only thing left to do was work out the details.

In "Where Is Science Going?" he referred back to the state of science in 1880 before the discovery of what we now identify as atomic science and quantum effects. There, Planck says that at that time, science had come to the conclusion that there are basically two types of processes in physics.

One was processes which he called reversible, which are deterministic processes, like the motion of a planet or the swinging of a pendulum. Something which, if you have the equations and the initial conditions, you can mathematically describe every aspect of the motion.

Then there are things like heat transfer, which do not obey that. You cannot write an equation for how it happens. You can only use statistical methods. That was fine, except that science progressed, especially as a result of the development of technology. Particularly when people began to investigate the interaction of the immaterial with the material, such as the interaction between matter and energy.

Look at the famous experiment of the black body: It was like an oven. You heat up the oven, and the walls of the oven start to glow because it gets hot, so it's emitting light. The light then gets re-absorbed by the walls of the oven, but they're also radiating into the cavity of the oven. So, you have an interaction between this immaterial thing—light and heat, which are really two versions of the same thing—and the material substance of the walls. You find that all kinds of new paradoxes arise out of this Planck discovery. Such as the relationship between the color of the light and the temperature of the oven. Things are not as simple as they seem in this regard.

And all these kinds of paradoxes that we now call quantum physics emerge out of this. Phenomena like the so-called wave-particle duality, or non-locality, super-position—all these things that people hear from quantum physics. These are things that scientists don't really understand at all. Yet, we're able to use them; we're able to master these phenomena quite dramatically. The development of computers and all kinds of other things; yet we cannot explain how they occur. Planck says the reason why we can't explain how they occur, is because we're still locked into these two foundations: dynamical and statistical. We need to get to something higher. He doesn't say what that is, but he was convinced that it must lie somewhere in the nature of the human mind.

This is where I think LaRouche made a very important contribution to science that has to be promoted and taken much more seriously. Which is, yes, the place to start, is how does the mind work? How does the mind create new things? As you investigate this aspect, which LaRouche called creativity *per se*, you gain insights into the nature of creativity, and thus, the universe itself. Then, if you approach some of these paradoxes that present themselves in scientific investigation, from the standpoint of the universe being ontologically creative, a whole new potential for discovery occurs. That's what I think is a real challenge for science.

Planck posed the question, in his time, "Where is science going?" For us, that would be "Where *was* science going?" And the question for us now is, "Where is science going now?" Right now, that's at a crossroads, and I really think that the insights that LaRouche provided us really point in a fruitful direction to answer that question.

Beets: I want to leave our discussion there, except for one concluding question, picking up on what you just said, which is incredibly provocative. We, by investigating our own creative powers—which are developing, they're not fixed—by investigating our own powers to create and discover, we can discover something about the universe as a whole. Why is this so critical right now, given everything we know about the political fight unfolding on the world stage, and about the fact that man is facing the choice between a collapsing old paradigm of war, geopolitics, empire; and the emerging New Paradigm in the world? Given the economic conditions people are swamped with today, they have a lot on their plates. So, why should they consider what you just brought up?

Director: Well, I think they have to consider that we're at a revolutionary period in human history—we're coming out of a Dark Age period. Look at the 20th Century; it was a pretty pessimistic century. It had the worst wars and genocide in the history of mankind. And at the same time, during that period there were tremendous advances in technology, despite all the bad things that happened. Now we're at a point where mankind is coming together to launch explorations in space.

Bernhard Riemann, the great mathematical physicist and science philosopher, whom LaRouche refers to a lot, talked about how science makes discoveries by looking into the very large and the very small. We're doing that; we're able to do that now at a level we never could before. We keep confronting new questions; we keep raising new questions. Most of those questions are avoided by just trying to tinker with mathematical equations to come up with some explanation for these questions. We have to get beyond the mathematical equations and look at what is actually causing this.

Let me give you a paradox, or an example of where I think this comes about. We have made a lot of advances in medical technology and understanding of life and living systems and so forth. But we miss one single question that we can't answer: What is life? The prevailing view in science—and I don't say the only view, because there is a growing number of scientists who are looking into this from their own standpoint—but the prevailing view is to try and explain life and living things, and how living things behave, as an epiphenomenon of non-living processes. That somehow the complexities of even a single-celled organism can be explained by the laws of physics. But in a living organism, the non-living laws of physics don't apply.

No one has been able to create life from non-life. You can't explain life from the standpoint of the physics of non-life. In fact, when you look at it, you increasingly find that life does things "normally" under its ordinary conditions that only happen in the abiotic domain under extreme conditions, or not at all.

Beets: Extreme temperatures, pressures.

Director: Extreme pressures like explosions of stars and so on and so forth. Yet living organisms create complex molecules and utilize energy and transform themselves. And as Vernadsky shows, living organisms transform the non-living parts of the Earth. The way, for example, living organisms change rocks into soil. And the way the action of man controlling life—say in agriculture—furthers that process even more.

LaRouche emphasized this quite a bit. You can't understand science from the bottom up, which is the way most science goes. We start with physics and we say, "What in physics can explain life? What in life can explain man?" You can't go that way. Turn it around, and it becomes much simpler.

Start with, what does man do? And what is this power of creativity that man has? Then you look at how that exhibits itself in life, even in living organisms that are not human, like plants. There's still a type of consciousness within the plant. The roots are communicating with the leaves in an organized way. The plant, from the plant's standpoint, has a certain understanding of itself. Not the way human beings do, but as no abiotic process does. And the plant interacts with the world around it. It takes up water and takes in carbon dioxide—all that wonderful carbon dioxide that man is making.

Beets: And shapes its body to respond to light.

Director: Right! It shapes its body to respond to light, and it loves carbon dioxide. If we want to be kind to the plants, we should make sure we make more carbon dioxide. I don't think we should support these plant killers out there who are trying to limit the carbon dioxide. Plant genocidalists, they must be.

There's still a type of consciousness within the plant. The roots are communicating with the leaves in an organized way. The plant, from the plant's standpoint, has a certain understanding of itself.

So, if you look at it this way, you see that there is something completely different going on. I used the example of a plant, because it's a rather extreme example, but you see this also in other animals and man's ability to domesticate animals and so forth. This way of actually exploring these questions of the way man's creative powers in and over the universe change the universe itself, is really the future of science. I think people have a certain instinctive idea that that's the way you have to go.

It's very funny; if you talk to a lot of scientists, you find that when they try to explain the creative work they do, they become completely incomprehensible. But yet, they never make the discoveries in the way they try to explain them, with mathematical equations, or this logical theory, or this deductive theory. The creative scientist uses his or her mind and makes a discovery based purely on this creative power.

So, LaRouche taught us we should focus on that; focus on understanding that creative power. And then look at how that creative power expresses itself in the other parts of the universe. I think we will create a lot more potential if we do that.