PANEL IV

The System We Live in Is Not Earthbound—Future Technologies and Scientific Breakthroughs

Transportation, Thermonuclear Fusion, International Cooperation in Space Research

JASON ROSS

The Economic Method of LaRouche: A Non-Scalar Approach to the Value of Science and Infrastructure

This is an edited transcript of the keynote presentation by Jason Ross for Panel IV of the Nov. 25-26 Schiller Institute conference, "Fulfilling the Dream," held at Bad Soden am Taunis, Germany.

Jason Ross

I'm very happy to be here today. My name is Jason Ross and I'm with the Schiller Institute in the United States. The subject of my presentation—frankly, the reason that we're here, and a major reason that we have a new paradigm in the world right now—is the economic discoveries and method of Lyndon LaRouche, who we are very happy to have with us today. [applause]

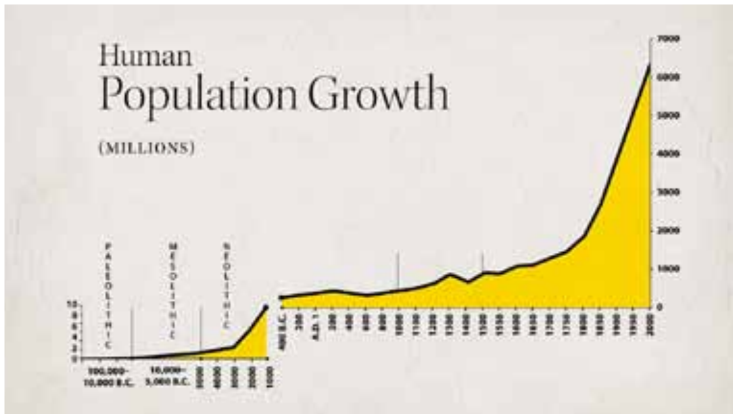
My presentation is a three-part discussion: First, I'll go over some general economic concepts from LaRouche. Then I'll take up a specific case study of the economic history of a chemical element you've probably heard of, but whose uses may surprise you. And, I'll conclude with the application of LaRouche's approach to the present world situation.

1. General Principles

Only human beings have economies. This is a very basic concept. Only human beings have a resonance between the way our minds work—between the way we create ideas—and the way the universe works, such that our ideas have a power in the universe in a way similar to the power of electro-magnetism, or something like that, except far more powerful. That’s something that is unique about human beings. Economic progress, a phenomenon unique to the human species among all known life, occurs solely by means of the discovery and social implementation of universal physical principles. This creative capability is the ultimate source of all economic growth, and of a durable basis for cooperation among peoples.

Unfortunately, economists, by and large, don’t think this way. Here is a bit of evidence for what I say. This graphic (top right) shows that economists are probably *the* most failed profession on the planet, the biggest failure, absolutely biggest failure. [applause]

Take a look. In 2007, in a survey of economists in the United States, they were all asked to predict the GDP growth that they expected in 2008. As you can see from the numbers here in the histogram, the peak is about 2-3%. Most economists said there would be a 2-3% growth in GDP in 2008. Three percent of economists said that maybe there’d be a decline. They said that there was a less than 0.2% chance of a drop of GDP in excess of 2%.



What happened in 2007-8? And why did economists only give a one-in-five hundred chance of something like that occurring? This is a failure, a *dramatic* failure. It means that the basis of economic thinking is *completely* off, for the most part. Why?

The Human Population Growth chart (on the right) is from Nate Silver, *The Signal and the Noise*, based on data from the Survey of Professional Forecasters, Nov. 13, 2007.

Population

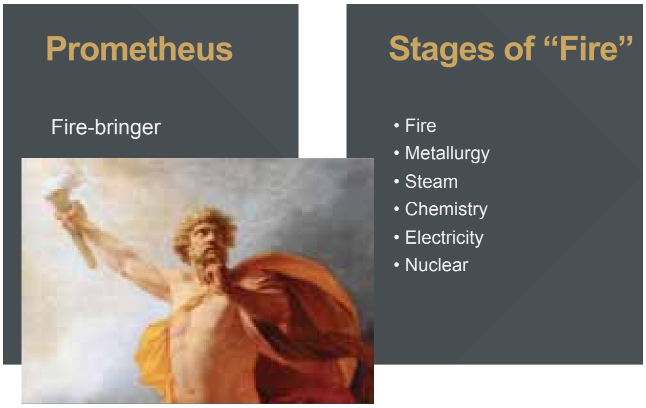
To answer that question let’s instead take a successful approach, and look at some of the metrics that Lyndon LaRouche has used. First off, let’s take a long-term look at human economy, instead of just one business cycle, or “the market” this year. Let’s look over thousands of years. Let’s consider the historical time of the human species (on the right).

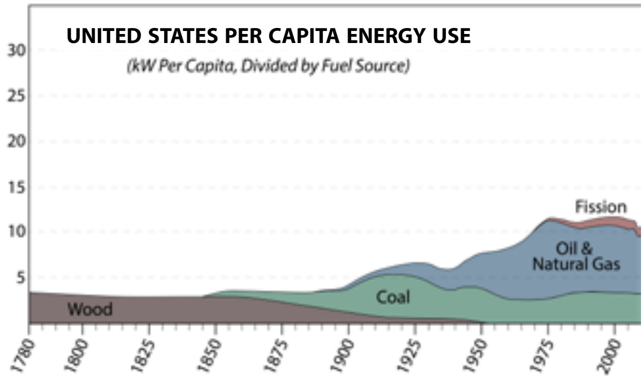
Again, we see this characteristic: that only humanity increases its population. Some of you may have heard the nostrum that “the world is overpopulated.” Has anybody here heard that we have a “population problem?” Yeah. Sometimes we hear that “Africa is overpopulated.” Has anybody heard that one? It’s not true!

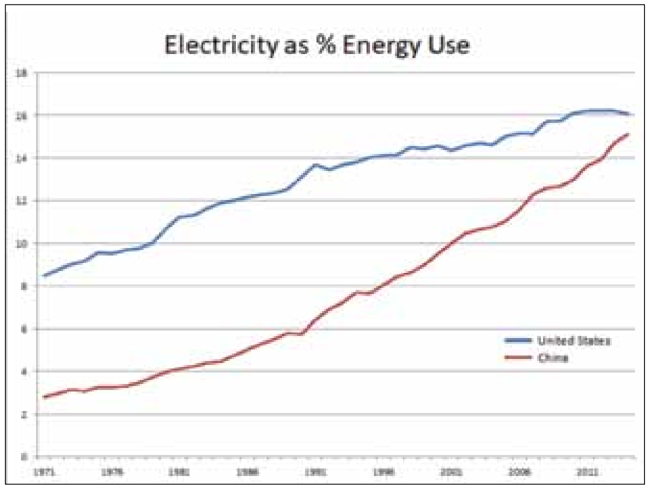
We do not have a population limit! Animals have a population limit. In a hectare of land, there’s a limit for the number of rabbits. For human beings, we *change* this limit. We change the *potential* human population, because we discover how nature works, and change our relationship to the surrounding nature and to each other. It’s pretty simple: we are not animals!

The first basic metric that LaRouche uses in his economics textbook, is **potential relative population density**. “Population density” is an easy concept to understand: how many people live per hectare, *relative* to the quality of the land, relative to the infrastructure we’ve built. What’s the *potential*, however? How many people *could* live in that area? What economic processes increase that number? Does the stock market increase that number? If you make money gambling on Wall Street or in the City of London, has the result of that meant that more people can live a more comfortable life on the planet? Of course not!

So, what’s the source of real economic growth? A very good way to look at it is the story of Prometheus.







Fire

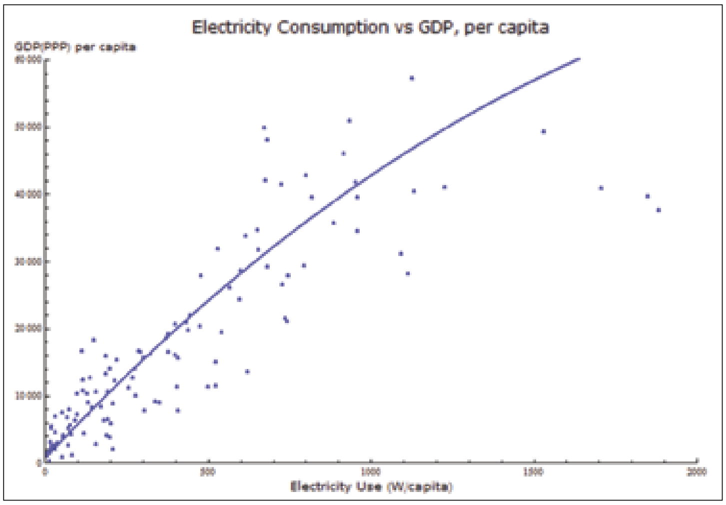
The tale of Prometheus is a Greek story about the creation of the human species. According to this story, Prometheus gives fire to human beings, who, prior to this gift, were essentially animals. We are told by Aeschylus (BC 523-456) that Prometheus created the human species as the human species, as the creative species, the beautiful species, endowed with reason. It was Prometheus who introduced us to the use of animals and agriculture, metallurgy, the calendar, language and poetry and music, astronomy, sailing ships and navigation by the stars. But the number one gift of Prometheus was fire. Our use of fire distinguishes us from the animals. If we look at the history of the human species, perhaps from cave paintings, we find depicted there musical instruments. But the earliest evidence we have of man is fire. Wherever there were humans, there we find evidence of the use of fire.

"Fire" has changed over time. First there was only wood fire. With it we can cook our food. Think about what constitutes a resource in the wild, before fire. Is rice, is wheat? Do you eat wheat without cooking it? How about rice? We *create* resources. Even with simple, basic fire. With the hotter, purer charcoal we can have metallurgy. We can produce substances that never existed on the planet: such as bronze. Bronze is made by people. It doesn't exist in the crust of the Earth. Or consider steam power from fire. We can turn a rock (coal) into motion. Wow! Chemistry. Electricity. The development of nuclear power. The idea of fire, as a concept, has definitely expanded over time.

Let's take a look an example from the United States. You can see (top right) the amount of energy used per capita over the history of the United States. Notice that there are two trends that stand out: one is that, overall, the use of energy has increased. It stopped increasing around the time of the assassination of President John Kennedy and has remained stagnant since then. Why? Energy-efficient light bulbs? No, a shift away from industry. Secondly, notice that the *source* of power has changed, with new forms superseding the use of the old ones. As new forms of energy are developed, they do much more than allow an increased ability to do what was done before.

This brings us to our second concept from Lyndon LaRouche, which is that with a new power source, it is not just more efficient. We no longer use wood for energy. Coal is not only more efficient than wood, but it lets us do new things. Petroleum holds more energy than coal does in the same volume, but can be used to power internal combustion or jet engines. You cannot use coal to power an airplane, no matter how much you have of it. Powered flight would never have "gotten off the ground," literally, with coal.

Another example is in the use of electricity, compared to just energy overall. I've pulled together some numbers from the United States and China over the past 50 years: the percent of total energy used that is in the form of electricity, for the United States (in blue) and



Satellite view of earth at night.

China (in red). You can see how it's been increasing.

Think what you can do with electricity that you couldn't do with a lower form of power. For cooking, you just need heat. For transportation and an engine, you just need heat—just explosions in an engine. What about for industry? What can you do with electricity that you can't do with a steam engine? What can you do with electricity, with a laser, with a computer-controlled machine? What can you do with translation equipment? Conference presentations? Lights? Could you have an email system powered by steam engines? Electricity is a particularly more concentrated form of energy.

This is Lyndon LaRouche's second basic metric: **energy flux density,** a measure of the concentration of energy use in the economy. We want to increase the energy used per person, but specifically, we want it to be in the most concentrated form that we can get it, because it allows us to do things that were impossible before. It's not just "*more of*," it's "*more than*."

You can't have economic development without energy. It's central in shaping our relationship to nature and to understanding economics as a science. Here is a scatter plot (upper left). In the horizontal direction is electricity use per capita. In the vertical direction is GDP per capita (admittedly not the best measure). As you can see, it's impossible to have development without energy. I don't want to use his name, but, well—Obama's Africa Power Plan was to bring in some solar panels to put on the roof of a building here and there. Pathetic. You can't have development that way. You need the highest technology. From satellite imaging, you see this when you look at the Earth at night. The brightness of an area is actually a very good proxy for its level of development. In general, the brighter the area, the longer the lifespans of the people, the better their health, the greater their economic activity. You can see some of the dark areas, to get a sense of how differently developed different regions are.

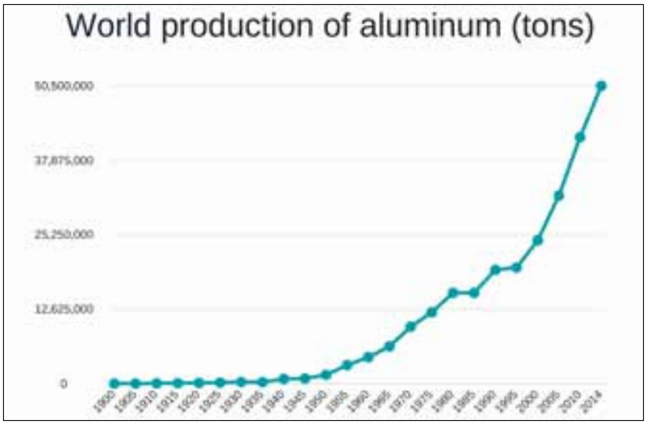
What is the value of building an infrastructure *platform*? What is the value of having an electricity grid in a nation? Is the value of energy in a society defined by the profits of power companies? By the price paid for power? A power company might look at it in terms of how much money it gets by charging people for electricity. A rail company might ask how much money it collects in ticket fares. But, the value of energy in a society is clearly not defined by the price paid by user fees or the profits of power companies. It's not. Looking at a country as a whole, it is its infrastructure platform which reflects the level of the applied power of the minds of its citizens, and thus its economic processes.

Now turn to financing. What finance mechanisms allow us to have the overall benefit? You can see the necessity for national credit, for national banking, for example, as opposed to private investment. Private investment just can't capture the value.

Materials

Resources. We humans change our relationship to our physical surroundings, by using the creativity of our minds to create resources. In the picture at the top of the next page, on the right you see a green rock. On the left, a tiny puddle of copper that was made from that rock. That rock is malachite. It's a very common ore that we use to make copper today. Six thousand years ago, it was used by the Egyptians to make green paint. With the coming of the Bronze Age, malachite ceased to be just a rock, and became a source of copper metal. We created this transformation.

So, what is a resource? Is this rock a resource? On



its own, it's a color. With the advent of metallurgy, that rock, combined with another rock, a source of tin, becomes a source of a new material, bronze, from which we can make better tools.

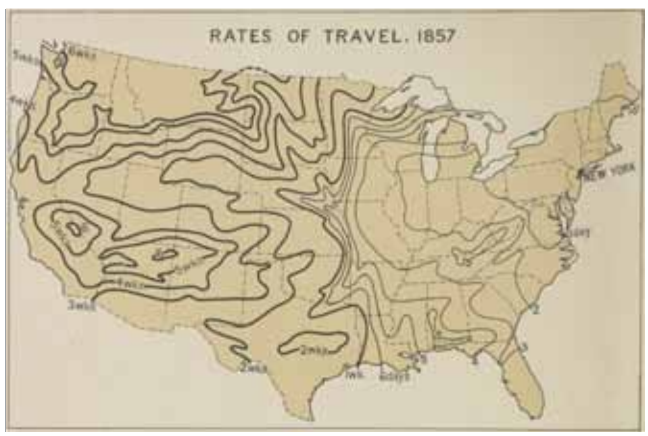
Here's another example: aluminum (chart). Before the advent of age of electricity, aluminum was very rarely used. It's very difficult to produce aluminum in a chemistry laboratory. Aluminum binds very strongly to oxygen. It doesn't want to let it go. Today, we make aluminum by the application of large amounts of electricity. As you can see, as electricity developed, the production of aluminum has skyrocketed. Nowadays (some recycling aside) we routinely throw it out, as it's no longer considered that valuable after its initial consumption. That is a change in the availability of that resource, due to our development. Resources are not limited! We create new ones all the time. That's economics.

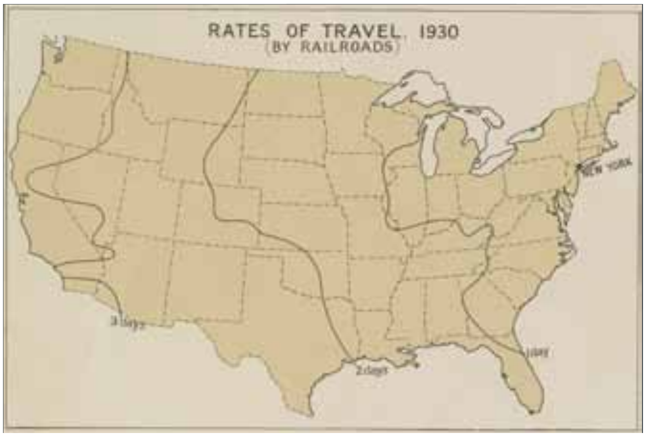
If someone should ask you about "natural resources," adding, maybe, that "we're running out of them," tell them the biggest resource we have is our minds. That is the source of *all* of our resources, except for maybe some berries that you might find out in the woods. The lesson here is that there are no truly "natural" resources. We *make* all our resources and then we use them, to better or worse effect.

Transportation

The scientific discoveries we make also change our relationship to space, time, and distance. Here are maps of the United States (below), showing, for different years, how fast someone could travel away from New York City. At first, on the left, you see the year 1800. The thick lines are initially numbers of days, then numbers of weeks—how many days and how many weeks it takes to reach a location away from New York City. By 1830, you could go much farther. Why? The building of roads and canals. Here's 1857. More canals, the beginnings of the railroads. By 1930 (see next page), you could reach across the whole country in just a few days. The railroad crosses the entire country. Roadways have been built. It's a *different country*. What's the value of building that rail system? What's the value of air flight? Is it the freight or passenger charges that the railroads and airlines collect? Of course not! It's a new type of economy. The transcontinental railroad and intercontinental flight annihilated distance and time, bringing a nation and nations closer together, culturally, economically, physically.

How do we represent such a transformation? Well, Lyndon LaRouche refers us to the "LaRouche-Riemann Method," pointing to the work of Bernhard Riemann's





laying out a basis for understanding changes that are not only numerical, or quantitative, but you might say dimensional. Having a national rail network is almost like going from a flat, two-dimensional world to a three-dimensional one. There's a new domain of possibility for us. That new domain of action made possible by the new platform of infrastructure, or a newly discovered universal physical principle, allowing for further applications of creative thought, is *itself* the value.

Increasing the rate of increase of potential relative population density is the true location of economic value.

2. Case Study: Uranium

Let's now apply this understanding to a specific resource that mankind has used for a very long time: uranium. Uranium has been a human resource for at least 2,000 years. I don't know if you knew that or not. Two thousand years ago, the Romans used uranium in their glass-making, to impart a nice yellow-green color. This use, and other physical characteristics in glass-blowing, have continued for two millennia. How much of a resource is this? How important? Well, not very important. Nice, but not really a big deal. In the 1950s, uranium was used in glass in electrical components. Here's another example of uranium glass (below). That's one thing you can do with uranium—an application of a simple *physical* property: its color and consistency.

The next big use of uranium came in the early 1900s. It played an important role in revolutionizing agriculture. One of the main components for fertilizing the soil, the nutrients that the German chemist Justus von Liebig (1803-1873) figured out that were necessary to promote healthy plant growth, is nitrogen. Nitrogen is a key component. It's the main component of fertilizers that we use today, along with potassium and other things. Where does nitrogen come from? The atmosphere all around us is 80% nitrogen. Plants can't use it directly from the air, however. For them to do so, it has to be converted, "fixed," by incorporating it into a compound, such as ammonia, nitrite, or nitrate. Lightning helps out by fixing a significant amount of nitrogen. Most fixed nitrogen is a product of bacteria living in the soil or symbiotically in the roots of legumes. Over time, farmers learned that rotating the planting of legumes—such as alfalfa, or soy—in their fields resulted in their other plants growing better. The bacteria add more nitrogen to the soil. It's a very slow process.

In the 1800s, we came up with "artificial" ways of adding nitrogen. We mined saltpeter (potassium nitrate) and applied the manure of certain animals directly to the soil. Guano—bat and bird poop—was transported all around the world from caves in such places as Chile and various islands out in the middle of the oceans, be-

Archiv der Max-Planck-Gesellschaft, Berlin

Fritz Haber (left), Albert Einstein, (right), 1914.

cause of its value as fertilizer. But there are only so many bats and birds, so the supply is limited. Faced with growing food needs for a growing world population, how did we expand the production of nitrogen?

In the photo (previous page), you see Fritz Haber (on the left) with Albert Einstein. In 1909, Haber developed a famous process named after him, the Haber-Bosch process, a technique that was scaled up to industrial levels by BASF's Carl Bosch. (They both received Nobel Prizes for this work.) The Haber-Bosch process converts nitrogen from the air into ammonia, and thus makes it usable for plants. How does it work? One of the first catalysts used by Haber to change nitrogen's chemical bonds, was uranium. In this case, uranium's *chemical* properties were called into play, to facilitate a chemical reaction, to produce the nitrogen fertilizer to feed people. Today, the modern Haber-Bosch process no longer uses uranium, but I'll tell you an amazing statistic: an astonishing one-third of the nitrogen that is entering into the soil to be used by plants, is made by the Haber-Bosch process, and of the 2-3 kg of nitrogen in our bodies, fully 40% of that comes from the Haber-Bosch process. What an amazing change in our relationship to our environment!

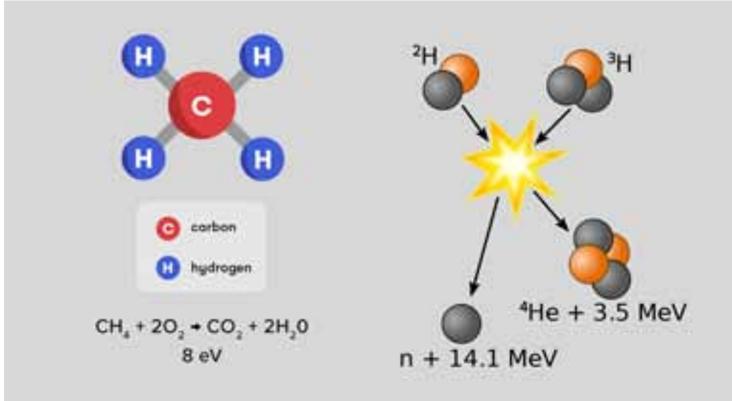
That clearly increases our potential relative population density, when we can create fertilizer from the air. This is a clear economic benefit.

As our knowledge expanded, uranium's role as a human resource changed: from its physical use (appearance of glass) to its chemical use (nitrogen fertilizer) to its nuclear use (huge amounts of power). Today, the vast majority of uranium is used in nuclear power plants, to make tremendous amounts of electricity from very little fuel, by undergoing a nuclear reaction.

Nuclear Fusion

I want to say a little bit here about why nuclear power is so excellent. Here you see two similar-looking reactions, in one case a chemical reaction, and the other a nuclear one. On the left is a molecule of methane (CH_4), otherwise known as natural gas, or cooking gas. It is a carbon with four hydrogens. When methane combines with oxygen in a chemical reaction, it burns to produce carbon dioxide and water, and the amount of energy released is 8 electron-volts. Don't worry for now about what an electron-volt is. For now, just remember the number is 8.

On the right, we have nuclear fusion. We have a combination of deuterium (^2H) and tritium (^3H), two types of hydrogen. When they combine, they make helium (^4He) and a neutron, and you can see the number: together, a whopping 17.6 *mega* electron-volts—two million times more energy in the nuclear reaction, compared to reactions in the chemical realm. This is why nuclear power plants need such a tiny amount of fuel. It is inherently a more powerful domain of knowledge. With our discovery of nuclear processes, we've potentially unleashed a million times more power for our use.

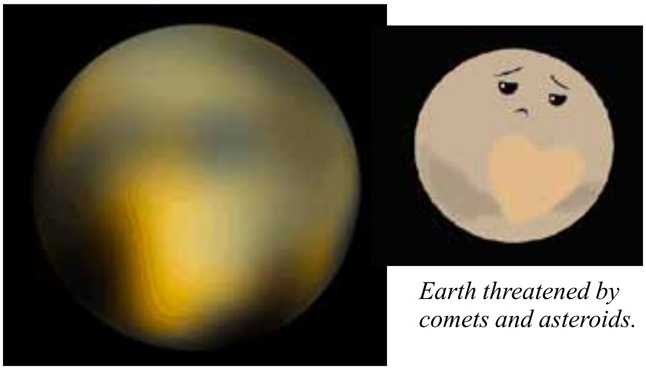


Power output from burning of methane (left) and from a Deuterium-Tritium fusion reaction.

How can we use that power? How does that increase the potential human population density? What higher densities of energy flux processes does this allow? I'll give you an example of where it would be great if we had much more nuclear power.

In 2015, the *New Horizons* spacecraft launched by NASA passed by Pluto to study it. This is the way Pluto looked before *New Horizons,* and the way it looked after. Much better. [laughter] It took ten years for *New Horizons* to reach Pluto. It flew by in about four hours. Why didn't it stop? One reason is that it's going to go farther out to research a Kuiper Belt object. But also, it *couldn't* stop. It didn't have any fuel left in its engines. For chemical rockets, you burn up all the fuel at launch and then just coast until you get to where you're going. That's called ballistic flight. To send humans to Mars this way would take nine months with chemical-fired rockets. Maybe you've seen videos of astronauts upon their return to Earth after even relatively short missions. They can't even walk. Can you imagine going to Mars and then trying to do anything there? You wouldn't even be able to stand.

With nuclear-powered rockets, on the other hand, we will go to Mars in a week or two, rather than 9



Earth threatened by comets and asteroids.

energy research in the United States today is pathetic. There are really only a couple of fusion facilities. The other two have been shut down, or are under reconstruction. It's pathetic. If you think about how much money is spent researching better wind turbines and better solar panels to try to coax out *slightly* more energy from sunshine while neglecting fusion which would be an *immense* source of power, it's completely insane. That would be one of the key trajectories to launch into: international cooperation to bring the next platform of economic development to the world.

months. We will be able to push away incoming comets and asteroids which threaten Earth and us. And with fully developed nuclear fusion, we will totally transform our relationship to energy, to materials, to water. With such an incredible source of power, water desalination is no longer a big deal. We can do it in a massive way. This is the next stage of fire, to be reached as soon as possible. It deserves the highest of funding priorities!

3. Application

Over decades of work by Lyndon and Helga LaRouche and by the Schiller Institute, we've got a new paradigm that's taking over the world, and an old paradigm that needs to be brushed aside. Very importantly, we've got the specific kinds of concepts that need to be introduced into political and economic thought, to create policies for the future, which would mean, for example, a *tremendous* research effort into fusion energy. Fusion

As my colleague Hussein Askary showed us yesterday, the greatest population growth on the planet in the future will be in Africa and Southwest Asia. The potential for economic growth in these regions is unparalleled, with the greatest potentials for gains to be accomplished by leapfrogging to the highest available technologies, and by applying mental resources to developing the great discoveries of the future. It is possible to speak of the economic value of culture, of our understanding of ourselves our relationships to each other, and the almost miraculous capability of the mind to develop thoughts that have the power to reshape the universe. The question posed by this ability remains: "What is God, that Man is in His image, that Man's thoughts resonate with universal causes?"

The human mind is the ultimate resource, and it need never be exhausted. This is the proper starting point for economic science.

Thank you for your attention! [applause]