Jason Ross

Lunar Helium-3 for a Fusion-Powered Future

Jason Ross works in the United States with the LaRouchePAC Science Team, known as "the Basement." The full title of his speech was "A Promethean Approach to Developing New Forms of Fire: Lunar Helium-3 for a Fusion-Powered Mankind."

Jason Ross: "I will use the specific, and necessary, prospect of developing fusion power, and exploiting the most useful fuel for this, helium-3, to express the truest identify of the human individual: a creative, Promethean identity."

…The Basement has been working with Lyndon LaRouche for nearly a decade, and its role has changed over the years. Initially created to work on economic animations, the Basement was tasked with animating the most essential feature of economy: the discoveries that drive it forward. A "narrow path" of discoveries was focused on, from Kepler, to Gauss, to Riemann. After this work on scientific practice itself, LaRouche has assigned the Basement projects on scientific and economic policy, from space exploration to large-scale infrastructure, from planetary defense to fusion, from metaphor to well-tempered musical tuning.

His most recent assignment to us has been to develop mankind as the measure of the universe, by a fuller understanding of creativity as a force of nature—of creativity as a natural principle, like gravitation, electricity, or any of the others—and to do this from the standpoint of the Russian-Ukrainian scientist Vladimir Vernadsky.

I will use the specific, and necessary, prospect of developing fusion power, and exploiting the most useful fuel for this, helium-3, to express the truest identity of the human individual: a creative, Promethean identity. Among all life, it is only human beings that willfully change their mode of existence from one generation to the next, and this is done uniquely by discovering and implementing new principles.

Although this is the natural condition of man, this is not what always happens. Today, we see the BRICS nations developing in a very positive direction (as we've seen throughout this conference), while the British Empire is seeking to derail this and prevent such development. This is oligarchism.

The Story of Prometheus

The ancient story of Prometheus is the most compact statement of the fight between humanism and oligarchy. Aeschylus tells this history in his play *Prometheus Bound*. After Zeus (the chief of the Olympian gods) denied mankind the use of fire, Prometheus brought fire down from Heaven (from the oligarchy) and gave it to humanity. For this he was punished by Zeus, with the torment of being bound to a rock, to have an eagle (Zeus) eat out his organs every day.

Yet Prometheus knew that he was the victor, and he didn't regret what he had done. He couldn't have taken from him the fact that he had done the right thing. This use of fire—Prometheus giving man fire—this was the first technology. This was the first existence of the human species. With the use of fire, we are no longer a biological species; we are uniquely the cognitive species. Let's take a look at what Prometheus thought of mankind before the gift of fire.

Prometheus says:

> First of all, though they had eyes to see, they saw to no avail; they had ears, but they did not understand; but, just as shapes in dreams, throughout their length of days, without pur-

FIGURE 1

Malachite (left) and a rock less significant for metallurgical purposes.

> pose they wrought all things in confusion. They had neither knowledge of houses built of bricks and turned to face the Sun, nor yet of work in wood; but dwelt beneath the ground like swarming ants, in sunless caves. They had no sign either of Winter or of flowery Spring or of fruitful Summer, on which they could depend but managed everything without judgment, until I taught them to discern the risings of the stars and their settings, which are difficult to distinguish.
>
> Yes, and numbers, too, chiefest of sciences, I invented for them, and the combining of letters, creative mother of the Muses' arts, with which to hold all things in memory. I, too, first brought brute beasts beneath the yoke to be subject to the collar and the pack-saddle, so that they might bear in men's stead their heaviest burdens; and to the chariot I harnessed horses and made them obedient to the rein.

Think of all these changes—the calendar to know when to plant crops, dwellings for health, animals to help with manual labor, wheeled vehicles pulled by beasts, music, numbers, and understanding—thought. Think of this condition: "though they had eyes to see, they saw to no avail." How many people today does that describe?

From this gift of fire, Prometheus says that man "will learn many arts," from fire, and indeed "fire" is the basis of developing technology. With basic wood fire, we could cook food, heat our dwellings, provide light and safety at night, and change some materials, such as hardening some rocks and bending wood by boiling it first. Then, a new kind of "fire" opened a whole new domain of potential.

Metallurgy: A New Fire

This new form of fire was charcoal, created by burning wood without air, in a pile covered by earth. Charcoal, wood freed of water and impurities, burns hotter and is very pure. With charcoal, we made the first new machine, the first chemical machine: metallurgy. The Bronze Age began.

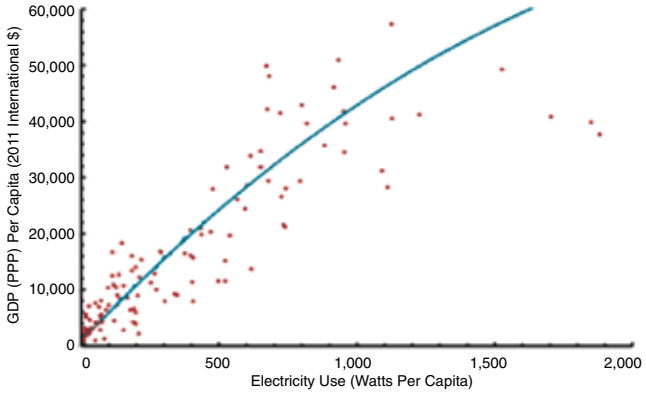
Let's take a look at an example of this (**Figure 1**). Here you see two stones: one gray and one green. There are physical differences: The colors are different; the densities are different. Maybe one is sharper than the other. Maybe one is heavier. Perhaps one can be used for drawing—perhaps you could crush the green stone and paint with it. But the real importance of this green stone comes only with charcoal. For this example, we are using an acetylene torch rather than charcoal, so you can watch the transformation. The gray stone became hot and glows, but it remains a rock. On the left, the green stone transforms into metal! This is copper.

Without charcoal, without the chemical power of charcoal, you could never make this change. You cannot just beat the rock, you can't yell at it, you can't step on it: You need charcoal, a new form of power. This is the beginning of making new materials. If you add tin to copper, you create bronze.

So if somebody is studying what's in the Earth, and they find bronze, this is a material that never existed before human beings. It's a newly created substance. Humanity became a geological force, changing the crust of the planet.

In order to make these metals, large swaths of forests were cut down and burned to make charcoal, and one of the first environmental regulations was made several hundred years ago to protect forests from charcoal-burners. But do you know what saved the trees? Coal did! Coal saved the trees! With the use of coal,

FIGURE 2
Electricity Consumption vs. GDP, Per Capita



higher temperatures and greater energy densities could be acquired much more easily and quickly than with trees, and we saved the forests. Wood could be better used for building a house or making furniture instead of burning it, and with coal, we could make the first powered engine—the steam engine.

Remember that Prometheus explains his gift of the knowledge of using animals for labor. Now we have rocks that can help us do our work! Unlike trees, coal can power a factory to save tremendous labor, or transport people and goods by steam-powered trains, letting horses and oxen take a rest from their loads, and allowing laborers to develop more skilled occupations and pursuits.

Later, petroleum was developed as a new source of fire. With the higher energy of petroleum (and its fluid form), the internal combustion engine was possible. Without wings, mankind now had the power required to fly. We did not make airplanes with coal. Distances shrank, time shortened, and humanity became more connected.

The discovery of the principles of electromagnetism allowed power to be transmitted by thin wires, rather than mechanical motion or transporting large amounts of coal, and electric motors dramatically transformed production techniques.

Jumping ahead to the present day, let's look at the use of electromagnetism. Here you see a chart (**Figure 2**) showing the correlation between per-capita electricity use and per-capita GDP (PPP). Although GDP is not an accurate measure of economic wealth creation, this image makes it absolutely clear that a nation without electricity will be poor. While some disgusting people propose "appropriate technologies" for African nations, such as solar panels and small windmills for water pumping, China is investing billions in real infrastructure!

Back to our train of development: breakthroughs in chemistry allowed for new processes, such as refrigeration and the creation of artificial fertilizers. This latter discovery, by Fritz Haber, increased the potential human population on the planet by billions.

Think about how powerful one discovery can be! Petroleum could be transformed into new materials. (Plastics are made from petroleum, in case you didn't know.)

Just as forests were saved by the development of coal, we will save our petroleum resources from being burned up, by the development of a new, higher form of fire. This is the power of the nucleus. Far more powerful than the ancient machines of the lever and the screw, far more powerful than the power of chemical changes and combustion, is the potential of the atomic nucleus, the most powerful form of "fire" that we know of.

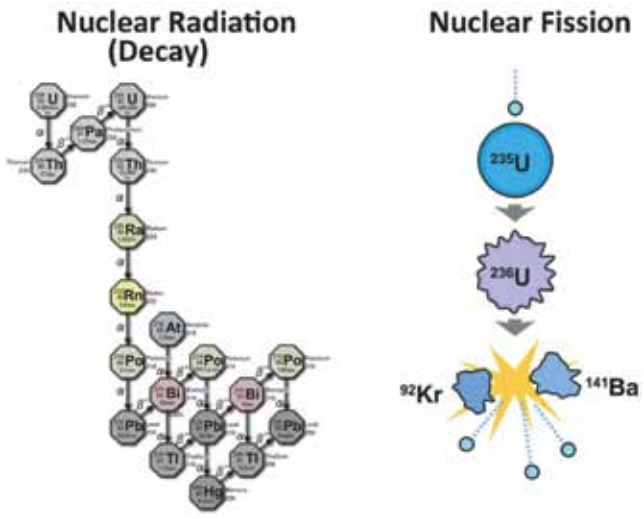
Although nuclear science began over a hundred years ago with the work of Henri Becquerel and Marie Curie, this domain has neither been adequately explored, nor cultivated. And its remaining mysteries and promise provoke fear in a superstitious and foolish population, rather than marveling at our own might. Why has nuclear power not been developed? And what is it, really?

What Is Nuclear Power?

Radiation was found to be a mysterious new source of power, emanating from certain materials. In addition to the radioactive uranium and thorium known to them, the Curies isolated polonium and radium, which are much more radioactive. Yet, even radium, which is quite radioactive, is not powerful as an energy source. You would need over 100 kilograms of radioactively decaying radium per household to provide the needed power. This is not how we make power. Nuclear power plants are not based on radiation; radiation's no good for producing power.

Nuclear science provided fire not from radiation, but by the different process of fission, which is the dividing of an atomic nucleus, rather than spontaneously emitting small bits of radiation from it. By organizing certain nuclear isotopes, mankind was able to create chain reactions of fissions causing other fissions, allowing for the release of absolutely tremendous, inconceiv-

FIGURE 3



able amounts of power. The first atomic scientists were so shocked by the amount of energy involved, that they thought the law of conservation of energy did not apply to this stunning process—and, in fact, it doesn't.

On the left (**Figure 3**), you see a chain of decay from uranium to lead. Each step in the chain happens spontaneously, and releases a small amount of energy. On the right, a neutron coming from the top of the screen hits uranium, causing it to break into pieces, and releasing more neutrons, each of which can strike another uranium nucleus. If you make the fissions occur very, very rapidly, you have an explosive device. If you make them occur at a controlled rate, you have a nuclear power plant.

Today, a few grams of uranium provide as much power as tons of coal or barrel upon barrel of oil, and a nuclear economy provides many other benefits as well, such as food irradiation, nuclear medical tests and life-saving scans, and cancer treatments, as well as smoke detectors, which use a small amount of man-made nuclear material for their smoke sensor. Why has nuclear science not been fully developed? What happened?

The answer is: Zeus.

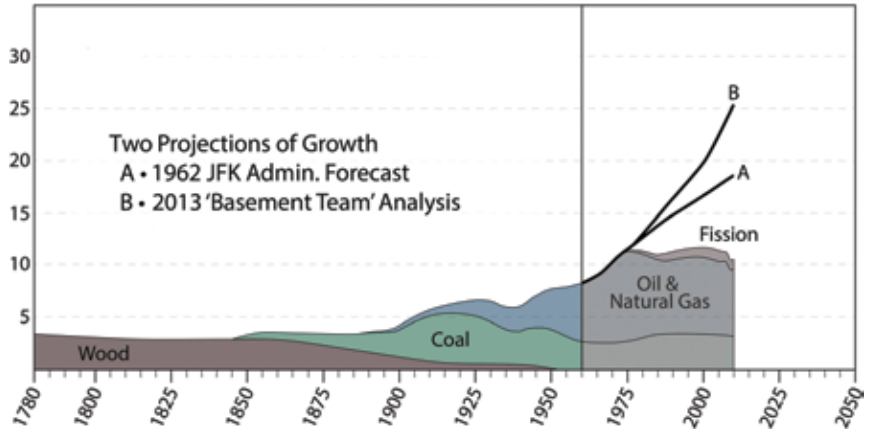
Let's look at a chart of this process (**Figure 4**), a chart of power use per person, over the time of the United States. There are two immediate observations to make: First of all, per-capita energy use increases over time, and, second, the type of energy changes over time, moving to the higher forms of fire we have discussed. That's the general trend.

But, look at the time from 1960 to today. What's different? We see two changes from the long-term trend: first, that power is no longer increasing; and, second, that the newest form of fire, nuclear, did not become a dominant source. This is unusual. Coal almost completely replaced wood, for example. But this did not happen with nuclear. Why are we still burning coal, when we could be using nuclear power?

The answers are false environmentalism, and true colonialism. By and large, developing nations were denied credit and technology to join the nuclear age, despite efforts of U.S. President Eisenhower, for example. The "environmentalist" movement, a ridiculous concoction created by such people as the Nazi Prince Bernhard and the disgusting oligarch Prince Philip, who wants to reduce the world population by billions—environmentalism has declared anything uniquely human to be "unnatural" by definition. If we do something that nature does not do on its own, it's somehow "bad," they say. Isn't the power of the human mind a force of nature? Where does this come from? Why were nuclear plants targeted in particular, by well-funded media campaigns? Why are we still using coal?

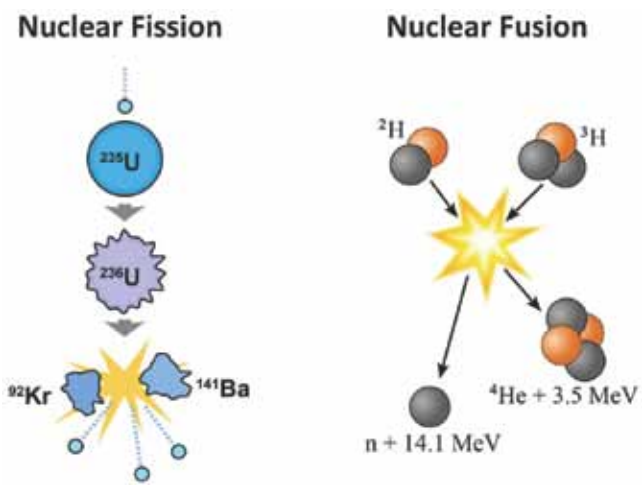
The chart shows where President Kennedy's Administration expected power to be by today—more than

FIGURE 4
United States Energy-Flux Density
(kW Per Capita, Divided by Fuel Source)



Source: Data from U.S. Energy Information Agency

FIGURE 5



double the current level. This has not only been a collapse of the U.S.: Worldwide per-capita energy use is only around 20-25% that of the U.S., and the needed increase from a world standpoint is even more dramatic, a stunning amount. The implementation of fission, including the thorium cycle much studied by India, is an absolute necessity, without which it will be physically impossible to ensure the dignity of all. But we need more; The time has come for an even higher kind of fire, the overdue fire of nuclear fusion.

Nuclear Fusion

Unlike fission, which is the splintering apart of a large nucleus, fusion is the uniting of two small nuclei, which produces an order of magnitude more power than fission, and, critically important for us, it produces a different kind of power, especially with the best fusion fuel within our grasp: helium-3 (**Figure 5**).

To explain the importance, let's look at this chart (**Figure 6**) of several kinds of fusion, and the resulting products. Deuterium and tritium are isotopes of hydrogen, which means that they have one proton (which makes them hydrogen), but deuterium also has one neutron and tritium has two. Chemically, they behave like hydrogen. For example, you can make heavy water with deuterium. Just as two hydrogen atoms bond to form a molecule of hydrogen gas, releasing a small amount of energy, these isotopes can be combined chemically.

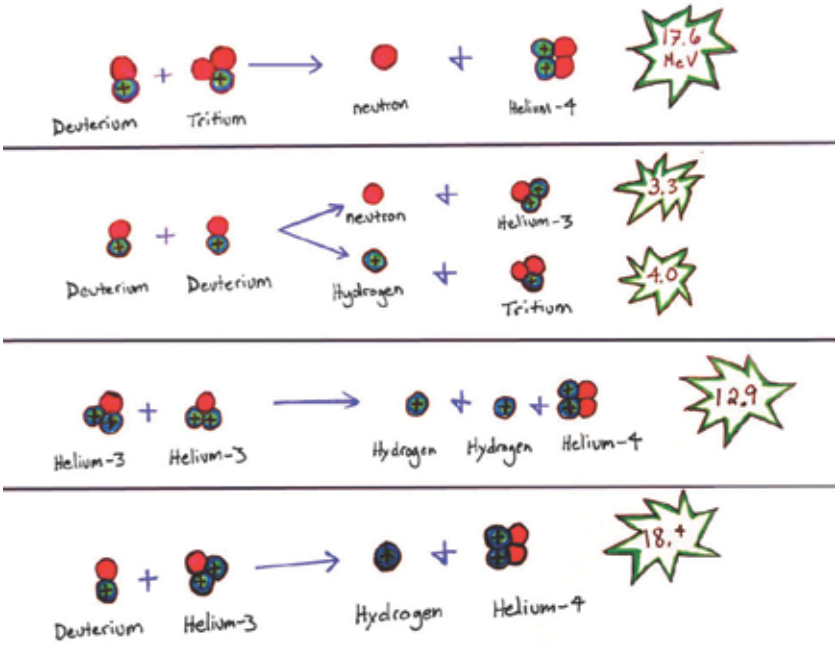
Most laboratories study the fusion of deuterium and tritium, where the two protons and three neutrons form an alpha particle (helium-4, two protons and two neutrons) and a single neutron, releasing 10 million times more energy than combining those same two atoms chemically.

The power is not in the materials, but in the mind, in our power to bring about new changes in nature.

Now, the neutron produced by this fusion of deuterium and tritium is a big problem, because it cannot be controlled by the electrical and magnetic fields of magnetic- or electrostatic-confinement experiments. That means that the neutrons go wild, smashing into the walls of the test apparatus, making them hot. Believe it or not, these advanced designs, like the ITER being built in Cadarache, France, would produce electricity by heat. The neutrons hit the wall, making it hot; the heat would boil water, producing steam, which then blows through a sophisticated windmill to spin a dynamo generator. This is ancient technology!

This is why helium-3 is so beautiful.

FIGURE 6
Types of Fusion Reactions



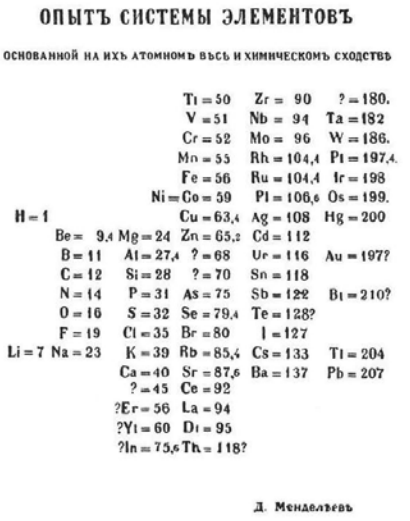
LaRouchePAC/Natalie Lovegren

Look at the results of combining helium-3 and deuterium: We have a total of three protons and two neutrons. The products are an alpha particle (helium-4) and a proton, both charged particles, and both capable of being controlled by electromagnetism. This is very important! We can make electricity (the flow of charge) directly from these moving charged particles, doubling efficiency and potentially making power plant construction much, much simpler. The resulting particles could also be steered to create thrust for a fusion-powered rocket. And, a supply of energetic protons could allow us greater control over isotopes.

With the charged particles created by helium-3 fusion, we will finally have moved to a new form of fire, one that does not involve heat!

What is an isotope? Here you see Mendeleyev's table of the elements (**Figure 7**), and here a modern version (**Figure 8**). There are fewer than 90 elements found in the crust of the Earth in any appreciable quantity. Yet, we have studied over 100 elements, by making them. And here (**Figure 9**) you have a graph of not only elements, but also isotopes. Look at how many there are—over 1,000! While the chemist may not see a difference between two isotopes of tin, nuclear and living processes have different relationships to isotopes.

FIGURE 7
Mendeleyev's Periodic Table

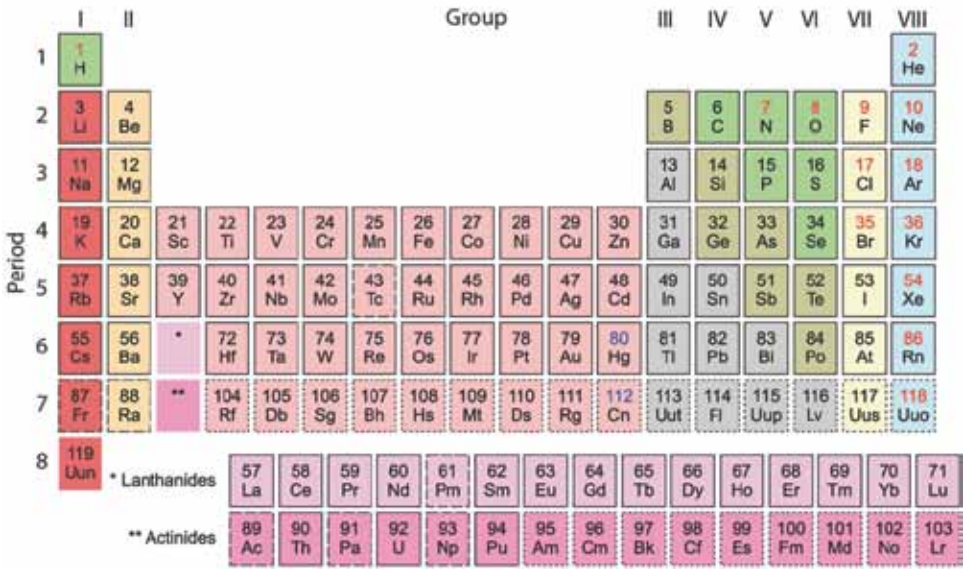

ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ

ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВѢСѢ И ХИМИЧЕСКОМЪ СХОДСТВѢ

				Ti = 50	Zr = 90	? = 180.
				V = 51	Nb = 94	Ta = 182
				Cr = 52	Mo = 96	W = 186.
				Mn = 55	Rh = 104,4	Pt = 197,4
				Fe = 56	Ru = 104,4	Ir = 198
				Ni = Co = 59	Pl = 106,6	Os = 199.
H = 1				Cu = 63,4	Ag = 108	Hg = 200
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112		
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?	
	C = 12	Si = 28	? = 70	Sn = 118		
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?	
	O = 16	S = 32	Se = 79,4	Te = 128?		
	F = 19	Cl = 35	Br = 80	I = 127		
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204	
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207	
		? = 45	Ce = 92			
		?Er = 56	La = 94			
		?Yt = 60	Di = 95			
		?In = 75,6	Th = 118?			

Д. Менделѣевъ

FIGURE 8
A Modern Periodic Table



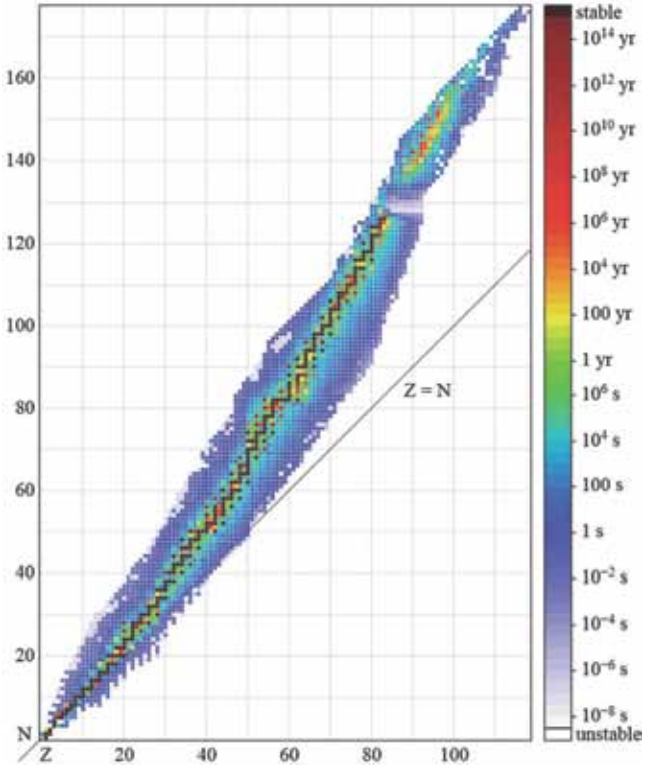
A Helium-3 Economy

Now that we are excited about and eager to get our hands on some helium-3, where can we find it? Unfortunately, there is less than a ton available on the entire Earth! But conveniently for us, there are over a million tons of it on the Moon! If only we could use it, both there, and by bringing it back to Earth. Unlike diamonds, which would be a waste of fuel to bring back from the Moon, helium-3 is worth far more than its weight in gold. This will require a major investment and a significant intention to succeed. And China is making moves in this direction.

Just as the world rejoiced with the landing of Curiosity on Mars, China's Chang'e on the Moon, and India's successful orbiting of the Mars Orbiter Mission, we should all be happy that China has expressed an orientation to lunar exploration, and lunar development, including the helium-3 resources of our neighbor. For example, the father of the Chinese lunar program, Ouyang Ziyuan, speaking on the resources of the Moon, said:

"Helium-3, an isotope of the element helium, is an

FIGURE 9
Stability of Nuclides



Atomic number (Z) goes to the right, atomic mass (N) goes upwards. Colors indicate the stability of the nucleus.

ideal fuel for nuclear fusion power, the next generation of nuclear power. It is estimated that reserves of helium-3 across Earth amount to just 15 tons, while 100 tons of helium-3 will be needed each year if nuclear fusion technology is applied to meet global energy demands. The Moon, on the other hand, has reserves estimated at between 1 and 5 million tons."

What will a society developed upon the platform of helium-3 fusion look like?

Such a society would not have concerns about energy (it could even use incandescent light bulbs!) or materials, since the power of a fusion-powered plasma torch would be the ultimate in materials processing, dissociating everything into its constituent elements. Trash or ore could be vaporized and decomposed into its constituent elements. Even the oceans could be usefully mined for trace minerals dissolved there. Speaking of oceans, desalination of seawater to provide freshwater for cities and farms would be within the means of a fusion economy, allowing mankind greater defense against the uncertainties of nature. In the nighttime, we turn on a light; in a drought, we could turn on the water.

New materials, isotopically tuned, could usher in a new generation of advances in materials science. For example, artificial diamonds using only carbon-12, are stronger than normal diamonds. Nuclear medicine could be much improved, with the ability to produce needed radioisotopes on a smaller and more local scale, for use in medical imaging and treatment of disease.

And this power will extend beyond the Earth. We must develop a power over the inner Solar System as a whole, and fusion can make this possible.

At the Schiller Institute conference held here last April, we discussed the theme of planetary defense, and the potential for an as-yet-undiscovered asteroid or comet striking the Earth and wiping out an entire nation or even human life in its entirety. Better observatories, including space observatories, are needed to detect asteroids; better information sharing is needed to analyze the data; and, most importantly, we must have the ability to do something about these threats! Otherwise, it might be impossible to do anything about a recently discovered threat, and we would have the terrible situation of knowing of the coming destruction while being impotent to stop it.

I'll show two examples[1] of how inadequate chemical rockets are. The first is a movie of how the NASA Messenger mission was sent to study Mercury. Messenger was launched in August 2004 for a 2011 insertion into Mercury orbit, taking over six and a half years to arrive, by using six "gravity assists": one from the Earth, two from Venus, and three from Mercury itself, in addition to five rocket engine firings to change its orbit. In these "gravity assists," the satellite travels close enough to a planet to get a small tug as it passes by.

Similarly, you see here the ESA Rosetta mission to study a comet. Rosetta was launched in 2004, and will arrive and land on the comet next month,[2] taking a full decade to fly by the Earth, Mars, Earth again, an asteroid, the Earth yet again, and another asteroid before reaching its target. This path is like a train schedule that has you change trains ten times to go 20 kilometers. Just imagine: If it would take ten years to reach a newly discovered dangerous asteroid, we could not do anything about it!

1. The video clips can be seen on the Schiller Institute's New Paradigm website.
2. It landed on Nov. 12.

These satellites are like a hot air balloon relying on air currents to move it to its intended destination in a mostly passive way. In contrast, with fusion power, we could carry enough fuel to have a rocket that can fire its engine continuously, going faster and faster and faster as it travels, able to reach any location in the inner Solar System within days or a couple of weeks! If we are to ensure the survival of mankind, we must take this threat seriously, and develop the power, the platform, from which it is a solvable problem.

I mentioned China's work toward lunar development and helium-3, and I must mention that in addition to getting the helium-3, we also need to work out how to make the fusion happen, since we do not currently know. Fusion experiments continue to surprise us, because we do not yet know everything. On this front, too, China is progressing, with a world-leading superconducting tokamak, and plans to educate 2,000 fusion scientists by 2020. Instead of the suicide pact of the EU and the trans-Atlantic banking system, this is the direction the world must take: to develop as would make Prometheus proud of us!

Creation Itself

To do this, we must now look at the act of creating fire: the act of discovery itself. What kind of thinking is required for the scientific advances required for the future?

LaRouche has identified two triads of thinkers responsible for moving science far forward. The first triad, which created modern science, were Filippo Brunelleschi, Nicholas of Cusa, and Johannes Kepler. Brunelleschi discovered that physics, rather than geometry, defined space in the small, and Cusa's discoveries on the very large—on intelligence itself as existing within the contradictions of pure rationality—these discoveries were unified by Johannes Kepler.

Kepler, in his beautiful life and work, sought to know God's reason for creating the world as it was made. Why were there the six planets known to him? Why did they have the orbits they did, rather than others? And what made each one move as it did? Why did they change their speeds? Kepler shocked his contemporaries, by bringing Earthly physics to bear on solving problems in the heavens, and discovered the Sun as the cause of the planets' motions, and the composer of the system as a system. He did this by demonstrating without a doubt that mathematics could never discover what science could demonstrate.

The work of the second of LaRouche's two triads has not been completed. This triad consists of Max Planck, whose discovery of the quantum nature of energy shook the concepts at the basis of understanding the very small; of Albert Einstein, who partially implemented Bernhard Riemann's program to develop the shape of space-time based on the physical principles that cause it; and of Vladimir Vernadsky, whose genius mind gave us many tracks of study that have not yet been developed. Most significantly for LaRouche's economics, is Vernadsky's concept of the noösphere: the action of thought itself upon the surrounding environment. Mankind is a geological force, and thought is more powerful than, and powerful in a different way than, volcanoes, gravity, magnetism, or light.

In contrast to the method of thought of these great thinkers, Lyndon LaRouche points to the 1905 program by David Hilbert (and Bertrand Russell) to axiomatize mathematics, and science generally, turning all of knowledge into a branch of logic, and killing the creativity of anyone foolish enough to adhere to their program. Although Cusa had already proved Russell wrong centuries earlier, Kurt Gödel developed a devastating proof that even if Russell and Hilbert tried to eliminate metaphor and creativity from the universe, the universe didn't agree. No "complete" system can ever be created, can ever exist.

This supports Riemann's program for science: that the process of discovery is the foundation of science. The authority of science does not lie in having the right answers (since we will never have them). Instead, the authority of science lies in how it overturns current thoughts by making a new, incommensurable discovery, one that does not fit into the earlier system.

A culture oriented around this identity, as in the beautiful music we heard yesterday, should inspire and enable us to do, is the victory we must seek. We must eliminate oligarchy, hunger, poverty, and, crucially, uselessness. The highest duty of society and of nations is to provide an opportunity for their people to make lasting contributions to the future, to provide their people the opportunity to live lives that they can know were necessary and beneficial.

Today, the greatest specific platform for such a history-making scientific transformation is a fusion economy based on helium-3. The Moon is out there. It's a reminder to us, and challenge to us, to make the next leap.