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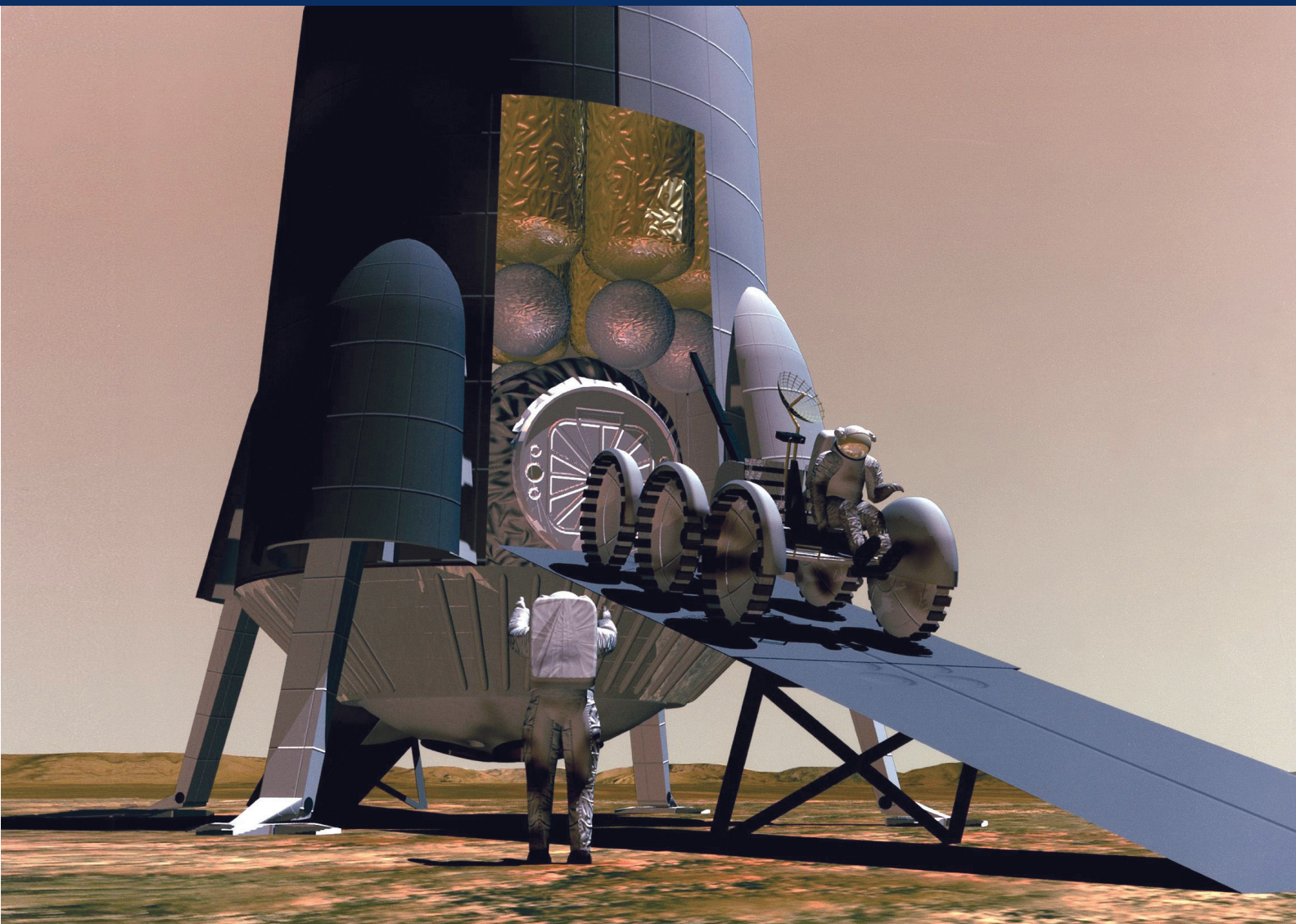
The Moon-Mars Mission: The Next Stage of Civilization



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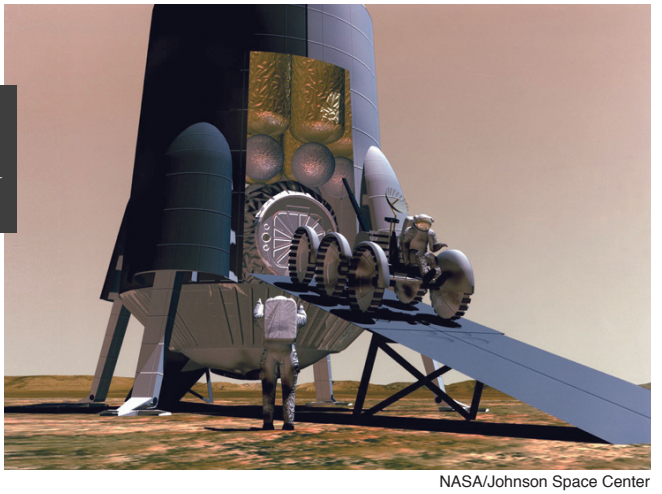
Cover This Week

Artist's concept of humans on Mars.



NASA/Johnson Space Center

THE MOON-MARS MISSION: THE NEXT STAGE OF CIVILIZATION

I. Space, Imagination, and Morality

The Jan. 27, 1989 Jailing of Lyndon LaRouche Defined an Era, Which Now Must End

Watch **The LaRouche Case** video

Watch the **LaRouche Memorial** video

Sign the Petition to Exonerate LaRouche at lpac.co/exonerate

II. The Scientific Optimism of the Schiller Institute

I . Space, Imagination, and Morality

APOLLO MOON LANDING – 50TH ANNIVERSARY

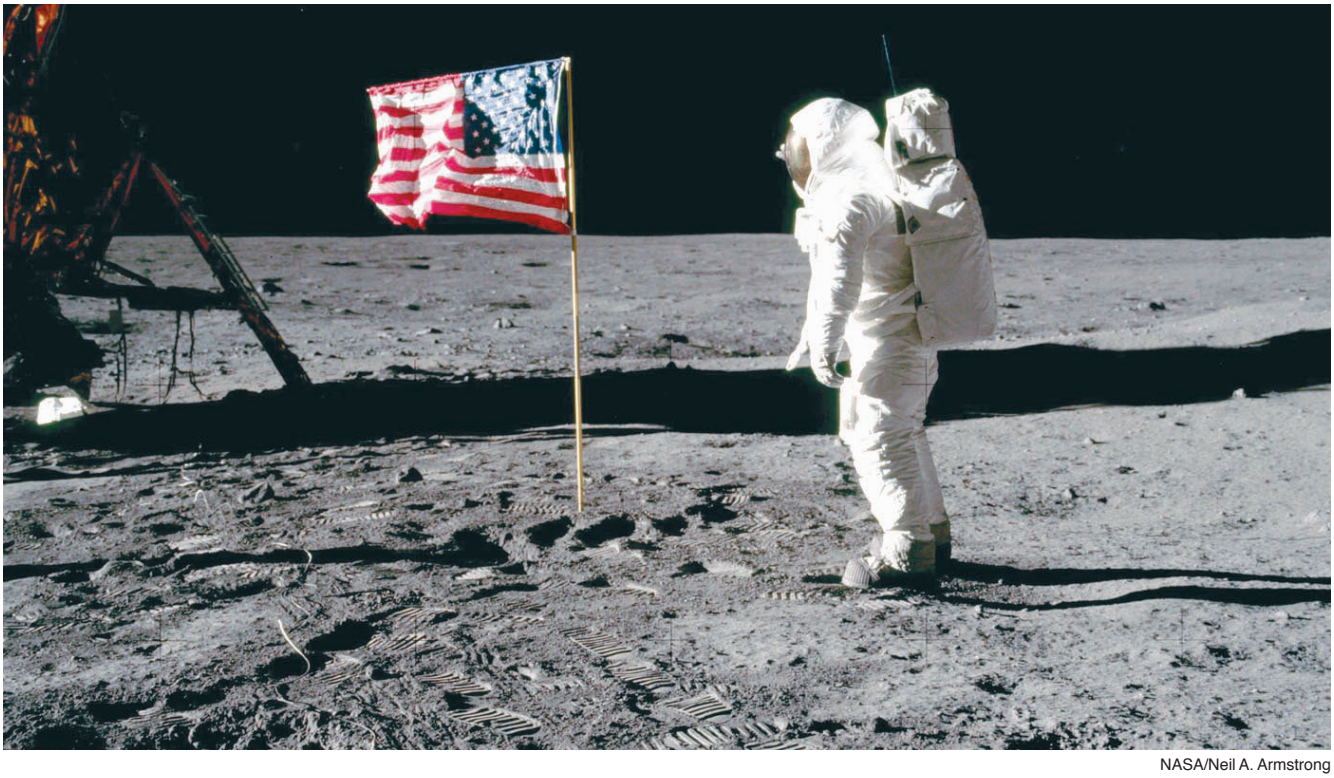
Space Travel Elevates People in More Ways Than One!

by Helga Zepp-LaRouche

This is an edited translation from the original German, of the presentation that opened the Fusion Energy Foundation conference in Munich, Germany, reported in this issue of EIR.

July 13—There is hardly any other phenomenon of human existence that exemplifies man's unlimited ability to overcome previous limits by qualitative insights into the laws of the universe, in the way that space travel does. The 50th anniversary of the Apollo Moon Landing on July 20, is therefore the occasion to commemorate all of the great space pioneers, while renewing the optimistic vision of the future of humanity, and our ability to create new civilizations outside the Earth.

Just in time for this commemoration, which is being celebrated worldwide with countless events, China's National Space Administration reports that its Moon Landing Probe *Chang'e-4* and moon rover *Yutu-2* are continuing to provide exciting information from the far

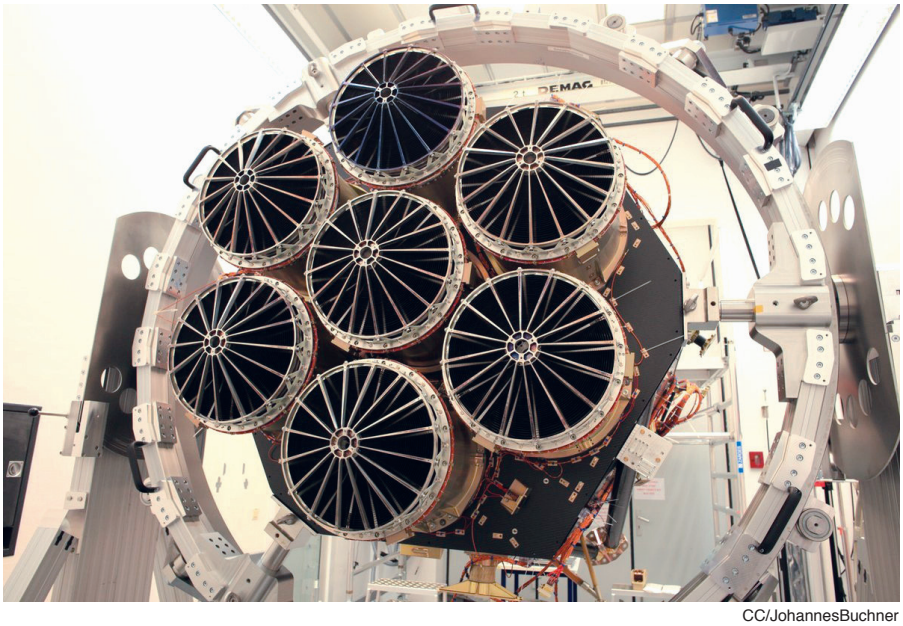


NASA/Neil A. Armstrong

Buzz Aldrin salutes the U.S. flag on the Moon, July 20, 1969.

side of the Moon. India launches its *Chandrayaan-2* spacecraft on July 15,[1] which is scheduled to make a historic landing in September near the south pole of the Moon, where ice—meaning water—is suspected to be located in the perpetually shadowed craters.

Ouyang Ziyuan, the "father" of China's space program, recently reported at a press conference that China will launch a Mars mission in 2020 to investigate whether Mars is suitable for terraforming, the process of creating conditions on a planet that make possible a permanent habitat for human beings. And as part of the largest bilateral German-Russian space project, the SRG, launched today, the *eROSITA* X-ray telescope will explore galaxies billions of light-years distant in unprecedented resolution.



CC/JohannesBuchner

The eROSITA telescope, consisting of 7 identical mirror modules, will conduct the first complete sky survey in the medium X-ray range. It was launched July 13, 2019.

The fantastic thing about these reports is that they provide evidence that human creativity is always able to open up new horizons; as Russian scientist Vladimir Vernadsky recognized, man's immaterial ideas represent a geological force in the universe, and as Nicholas of Cusa recognized, there exists a correspondence between the laws of the macrocosm and those of the microcosm.

The Importance of Space Travel for Human Survival

Above all, the importance of space travel and exploration is that it clearly demonstrates that the Earth is not a closed system, and that therefore the entire thesis of the finiteness of resources and the consequent necessity of zero growth or even negative growth, is completely absurd. The Hubble Space Telescope has so far discovered that there are at least two trillion galaxies, that there are more stars in space than grains of sand on Earth, and all of these celestial bodies are full of resources—those we already know, like the helium-3 on the Moon (which will supply the fuel for the second generation of fusion reactors), and those resources for which we do not even have a scientific conception today.

If we are to secure our long-term survival as a species, then the future lies in international cooperation in exploring many fundamental challenges to human knowledge: the study of space and so-called "deep space," the origin and history of the Universe, the nature of life itself, and the essence of human creativity.

If we combine our efforts internationally to answer these questions, then we have every reason to be optimistic about the future.

I would like to quote here two space visionaries: First, from the article "The Science and Technology Needed to Colonize Mars," written in 1986[2] by my recently deceased husband, Lyndon LaRouche:

> What is the desire of the good person? What else but to discover the laws of creation less imperfectly, to the end that our knowledge, as guide to our practice, deviates less from that will of the Creator expressed in the lawful ordering of this

1. For technical reasons, *Chandrayaan-2*'s launch was aborted one hour before final countdown. A new launch date has not yet been announced.

2. LaRouche's 1986 article, originally published in *Fusion* magazine, was most recently reprinted in *EIR* in two parts: Part 1 appears in the April 26, 2019 issue, and Part 2 in the May 3, 2019 issue.

universe. Who can be good, who does not yearn for agreement with the Creator, and, on that account, to lessen the imperfection of one's own understanding of the lawful ordering of creation?

What could be a more beautiful event in the existence of mortal mankind than to step up from the mud of our planet, into space, to accept whatever challenge we discover to be awaiting us there? To think of such a task as imminently before us, is to experience an awesome sense of beauty within us.

On this planet, especially during the recent 20 years, increasing portions of the populations of even Western Europe and the Americas are afflicted with cultural despair.

"There is no future," say the doom-saying "ecologists." Believing the "ecologist" propaganda, the young person seeks momentary escape in the here and now: Drug usage proliferates, destroying growing ratios of our youth, on this account. That same stink of irrationalism and cultural pessimism, which spawned the Nazi upsurge in Weimar Germany, spreads among our nations, spoiling the very will of our nations to survive.

We must turn the mind's eye of the young upward, to the heavens, while we point: "There lies the future of mankind."

In that respect, the conquest of space is a prize beyond price.

NASA

The Saturn V Rocket moments before liftoff of the Apollo 11 mission, July 16, 1969, Kennedy Space Center, Florida.

The Killing Fraud of the Green Movement

Twenty-three years after this characterization of the green movement, the manipulated irrationality and the cultural pessimism it has induced have become clinical. During the past year, the Intergovernmental Panel on Climate Change (IPCC), the representatives of the "Green New Deal," and the whole phalanx of the end-times prophets of the "We Don't Have Time" networks have said that humanity has only 12 years left to avert the climate catastrophe, and have thus created a phenomenon of organized hysteria among teenagers. However, Prince Charles goes even further. At a meeting with the Foreign Ministers of the Commonwealth, who are effectively the top diplomats of the British Empire, Charles reduced this period to just 18 months in which to bring Nature into balance and save humanity.

Do you still remember the dying forests? On February 14, 1983, *Der Spiegel*, in an article entitled "We Face an Ecological Hiroshima," predicted the end of the forests, and all mainstream media massively ran with this campaign. Twenty-two years later, on May 18, 2005, the German public broadcasting network *3sat* laid to rest the dying forest tale in its program "nano." Suddenly, the line was that this thesis was based on "insufficient research" and on the "suppression of critical perspectives," and that it had fomented a "general depressive mood."

And what about the ozone hole? After an avalanche of ideologically tainted computer models had conjured up the coming end of the world, Nobel Prize winner Dr. Paul J. Crutzen, known as "Professor Ozone Hole," re-

canted his ozone hole warnings in January 1997 as "too apocalyptic," and today hardly anyone remembers the topic.

The danger does not lie in these alleged catastrophes, but rather in the ideology of the environmentalists and climate protectors, which is being promoted in ever-new versions by the financial oligarchy: On the one hand, to ensure huge profits for investors who invest in "sustainable financial products," and on the other, to keep the population in a state of pessimism that makes them feel small, scared and powerless.

Behind this is nothing more than a veiled call to abandon the development of real scientific progress, to increase the wealth of a small class of speculators and investors, and to tell hundreds of millions of people that they are not entitled to food, clean water, healthcare, housing and education. These two completely opposite images of humanity—expressed in space travel and eco-hysteria—determine whether people are conscious of their creativity and are therefore free, or whether, reduced to fearful bundles of nerves, they accept the axioms of the neoliberal oligarchy.

Convair/General Dynamics Astronautics Atlas Collection

Krafft Ehricke surrounded by various satellite models, October 10, 1957.

A Positive Trajectory, Based on Science

Global Times reported last year that China has found it necessary to correct its one-child policy. It was previously assumed, mistakenly, that resources were limited and that population control would help lessen the pressure on resources. Since then, the new focus is on innovation—and people, especially young people, are considered to be a source of creativity. Now it is assumed that more people create more opportunities and inspire irrepressible creativity. The groundbreaking success of the Chinese model speaks for itself.

Not only China, but all of Asia, and Russia as well, are on a very different trajectory from the neoliberal establishment in Europe or the United States. By contrast, the West is in the process of doing away with itself with the green ideology. As one can see in the condition of Europe, with its various protest movements, this policy not only destroys the foundations of the institutions underpinning the state, but it represents an existential threat. Ultimately, this self-induced decline of the West is the source of new conflicts and even the danger of a great war.

The ecology movement is not based on scientific facts, but rather has all the hallmarks of a fundamentalist religion, that rejects, in its fanaticism, the validity of reason. What we need in its stead is a movement to truly protect nature, a movement that develops so-called nature-like technologies that reproduce natural processes that occur in the universe, in accordance with the laws of nature.

The best examples of this are thermonuclear fusion and space travel. With nuclear fusion, we imitate the processes by which heat and light are produced in the Sun, and with space travel we are subject to the "extraterrestrial imperative," as it was called by the great space pioneer Krafft Ehricke. That is to say, we are forced in space to respect the actual laws of nature if we are to survive there.

The anniversary of the Apollo Moon Landing should fill all of us with optimism for the perspective that Lyndon LaRouche developed in his book, *Earth's Next Fifty Years*: that in Vernadsky's sense, the world is increasingly characterized by the increase of the *noösphere*, that is, by the effect of human creativity.

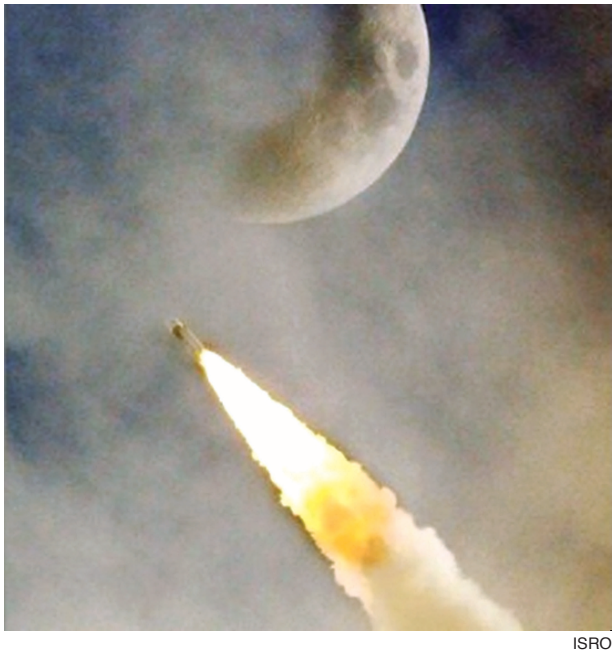
The first of the three fundamental tenets of Krafft Ehricke is: "No one and nothing in the natural laws of the universe imposes any restrictions on man—except man himself." It is up to us to shape a new phase in human history!

Apollo 11 Anniversary Celebrated in Action by India, China and Russia with the USA

by Stephanie Ezrol

July 15—The Schiller Institute, founded by Helga Zepp-LaRouche, is holding major conferences in New York and Munich, Germany to celebrate the 50th anniversary of mankind's first steps on the Moon, and to provide a powerful impetus to that science-driver spirit into the next 50 years and beyond. The New York conference can be followed live on Saturday, July 20 from 1 to 5 p.m., and the Munich conference, which took place on July 13, is reported in this issue of *EIR*.

China, India, and Russia are effectively adding to that chorus—China and India directly, in and around the Moon, and Russia in the direction of nuclear fusion power, which is essential for any manned travel to Mars and for mankind's development and happiness. All four powers are planning missions to Mars in 2021.



ISRO

Artist's conception of the launch of India's Chandrayaan-2 to the Moon.

Russia

On July 9, Russian President Vladimir Putin became the first head of state, to challenge the world community to embrace the absolutely required development of fusion energy. Fusion energy is the power source for what he called, "better living conditions and opportunities for unleashing human potential" into the future for all of humanity. Fusion energy is key to that hopeful future, which he said will only be achieved through international cooperation.

He presented those words in his opening speech at the Global Manufacturing and Industrialization Summit (GMIS) in Yekaterinburg, Russia to 2,500 government officials, business leaders, scientists and NGO representatives gathered for a three-day summit, organized by the U.A.E. Ministry of Energy and Industry, the United Nations Industrial Development Organization, Russia's Ministry of Industry and Trade, and the Roscongress Foundation.

President Putin, speaking for the second greatest nuclear power on the planet, added:

> I believe that in order to secure cleaner air, water and food, which also means a better quality of life and longevity for billions of people on our planet, we must offer up radically new technologies … nature-like technologies that reproduce natural processes and systems according to the laws of nature. It may seem strange at first, but fusion energy, which in fact is similar to how heat and light are produced in our star, in the Sun, is an example of such nature-like technologies.
>
> Potentially we can harness a colossal, inexhaustible and safe source of energy. However, we will only succeed in fusion energy and in solving other fundamental tasks if we establish broad international cooperation and interaction between government and business, and join the efforts of researchers representing different scientific schools and areas. If technological development becomes truly global, it will not be split up or reined in by attempts to monopolize progress, limit access to education and put up new obstacles to the free exchange of knowledge and ideas.…
>
> The International Thermonuclear Experimental Reactor (ITER) serves as a prime exam-

ple of open scientific, technological cooperation. Scientists are now planning to use it to launch the process of controlled thermonuclear fusion. Our country is actively participating in this project, and is now prepared to suggest that they use Russia's scientific infrastructure for joint research, joint scientific investigation, for the international scientific teams that are working in the sphere of nature-like and other breakthrough technologies, including unique mega-science installations. Scientists will be able to literally see nature's creation processes.

ASIPP

Technicians in Hefei, China, nearing completion of the poloidal field coils for insertion into the International Thermonuclear Experimental Reactor (ITER) in France.

The Russian president had harsh words for those who reject profound scientific creativity and innovation. He attacked the "total rejection of nuclear or hydrocarbon energy" to promote the kind of "showy, but not effective solutions" that create problems, saying,

> It comes down to appeals to give up progress, which will make it possible at best to perpetuate the situation and create local well being for a select few. At the same time, millions of people will have to settle for what they have today or, it would be more appropriate to say, what they don't have today: access to clean water, food, education and other basics of civilization.

These "road to nowhere" approaches "only lead to new conflicts," such as the migration crisis in Europe, and the U.S. as well, for that matter, he said, adding that people can retreat to living in caves if they want,

> but it is impossible and pointless to try and stop human progress. The question is, which base can this progress realistically be built upon to achieve the millennium development goals set by the United Nations?

India

India's second robotic mission to the Moon, *Chandrayaan-2*, this time to the Moon's South Pole, was scheduled for today, July 15. That mission was postponed one hour before liftoff for technical reasons. But there is every reason for optimism, given India's success with the *Chandrayaan-1*, which orbited the Moon in 2008.

For *Chandrayaan-2*, Indian scientists have chosen a South Pole landing site, between two craters called Manzinus C and Simpelius N. This will be the first *in situ* exploration of a lunar pole by any country. The mission will expand mankind's knowledge of the water ice at the South Pole discovered by the first Indian lunar mission. *Chandrayaan-2*, consisting of an obiter, a lander, and a rover, will go into Earth orbit, and then to the Moon. After 27 days in lunar orbit, the Vikram lander will be sent to the Moon's surface. Four hours later, Pragyan ("wisdom" in Sanskrit), the rover, will leave the lander to begin its work.

Simonette Di Pippo, Director of the United Nations Office for Outer Space Affairs, reported,

> The *Chandrayaan-2* mission's studies of lunar topography, mineralogy, elemental abundance, the lunar exosphere, and signatures of hydroxyl and water ice will contribute to scientific progress for all of humankind.

China

China's Chang'e-4 Yutu-2 (Jade Rabbit-2) rover is on the far side of the Moon—that face of the Moon previously never explored, but only seen from a lunar orbiter—and recently sent back to Earth a new series of stunning photographs.

China has announced it has finished construction of its first Mars rover, scheduled for launch in July or August this year. *RT* reported, "Its mission is to hunt for signs of life, and also explore if Mars can be terraformed to make it habitable for humans." If all goes well, it could be sending data to Earth as soon as 2021.

Schiller Institute Live Webcast: APOLLO + 50

Mankind's Future Must Determine Our Present

A Dialogue of Cultures on How To Develop the Population and the Productive Workforce for Earth's Next Fifty Years

Saturday, July 20, 2019, 1 p.m. - 5 p.m.
New York City

The conference proceedings will be available live at http://lpac.co/july20. To attend the conference in New York, registration is required. Suggested Donation: $20 or $10 for students. For more information, or to pre-register, call: 917-475-8828.

In 1987, Lyndon LaRouche authored the video, *The Woman on Mars*. At that time, he proposed a 40-year mission to Mars based on restarting the aborted Moon missions, including extensive industrialization and mining on the Moon for Helium-3, the best fuel for thermonuclear fusion reactors. Nearly 20 years ago, LaRouche advanced these ideas even further in his book, *Earth's Next Fifty Years*.

NASA/Bill Ingalls

Lyndon H. LaRouche Jr., in his nationally televised 1988 Presidential campaign video, The Woman on Mars.

Thermonuclear fusion, applied as a commercial power source, not only supersedes any other available power source, and is non-polluting—it would supply the only efficient power source for travel throughout the solar system. Humanity—not merely China, or the United States, or Russia, but all humanity—has always looked up to the stars, because we have an extra-terrestrial imperative, to know the secrets of the universe. Eliminating war through the joint investigation of the solar system and galaxy—the local neighborhood in which we reside—is our first next step toward the adulthood of the human race.

On this 50th anniversary of mankind's greatest scientific achievement, let us take a page from the same President John F. Kennedy, who had proposed the Apollo Project to an inspired America, and who, together with America's "mortal enemy," the Soviet Union pulled the world away from the brink of extinction in October 1962. In September of 1963, Kennedy told the United Nations:

> Finally, in a field where the United States and the Soviet Union have a special capacity—in the field of space—there is room for new cooperation, for further joint efforts in the regulation and exploration of space. I include among these possibilities a joint expedition to the Moon. Space offers no problems of sovereignty; . . . Surely we should explore whether the scientists and astronauts of our two countries—indeed of all the world—cannot work together in the conquest of space, sending some day in this decade to the Moon not the representatives of a single nation, but the representatives of all of our countries.

NASA

President Kennedy announcing before a special joint session of Congress the dramatic and ambitious goal of sending an American safely to the Moon by the end of the decade. May 25, 1961.

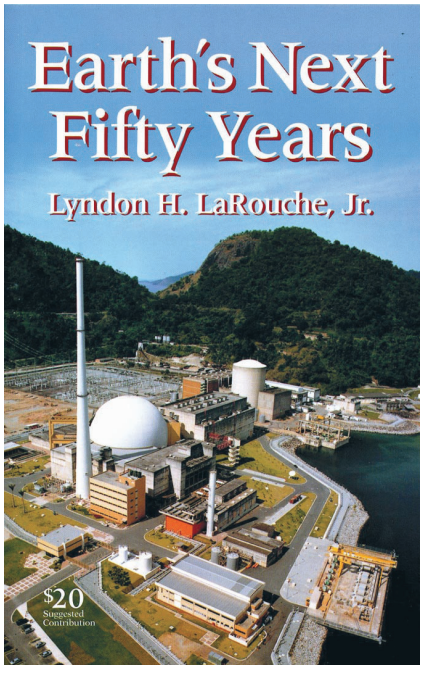
Now, many other nations—India, China, Brazil, several European nations—possess capabilities far more advanced than those of the 1960s Soviet Union or United States. If a mere fraction of the wealth now wasted on war, or foolishly misspent on combating "global warming," were pooled and deployed in a joint space effort, we could in fifteen years create an entirely new economic platform for all of humanity—a worldwide cultural "paradigm shift" as has been proposed by Schiller Institute founder Helga Zepp-LaRouche—that propels the human race forward, in the spirit of what has been called by China "win-win cooperation," in the form of its Belt and Road Initiative (BRI).

Lyndon LaRouche, in his 1984 "Draft Memorandum of Agreement Between the U.S. and USSR," provided a model for a durable survival solution to potentially lethal conflicts among nations, by elevating the discussion to the higher self-interest of humanity, thereby dissolving the basis for conflict.

President Donald Trump has recently met with Presidents Xi of China, Putin of Russia, and Chairman Kim of North Korea, as well as others, to avert war. President Trump has also proposed a return of the United States to the Moon in five years, by 2024. Might the United States take the occasion of the July 20 commemoration to propose a joint Moon-Mars mission, involving Russia, China, India, the European Space Agency, and nations in the continents of Africa and South America, both essential launch sites for the continuous and permanent missions required?

Why permanent? Because mankind will now permanently move to the first level of human civilization, which is expressed in the ability to navigate the solar system as a whole. The higher, galactic level (the second stage), and the yet higher intergalactic level, are what we are now only able to observe, in part. For these, we yet "see as through a glass, darkly." But we know that it takes humanity as a whole, in the tens and hundreds of billions, to develop the scientific competence to investigate and explore the more than two trillion galaxies we now know to exist. We need the creative potential of every single person on the planet to accomplish this.

To prepare for this, the new space program must be part of a broader commitment to simultaneously revolutionize the labor process on Earth as well as in space, through new stages of technologies, and through ending poverty on the planet in the next years through the cooperative arrangements and economic development made possible through the World Land-Bridge. Both tasks require mastery of the concept of increasing the energy flux-density of power systems. Lyndon LaRouche's book, *Earth's Next Fifty Years*, outlines how more than one billion jobs in mining, manufacturing and agriculture, of the highest skill levels, must be created now, to fulfill mankind's "extraterrestrial imperative" to investigate the solar system, the galaxy, and beyond.



It is the power of this vision, the potential of what the astronauts saw when they watched the Earth rise from the Moon, which we of the Schiller Institute must seek to evoke in our fellow citizens, the nation, and the world, this July 20. Join us in this mission, for which "failure is not an option."

Munich Meeting Honors 1969 Moon Landing, Calls for Moon Settlement, Space Exploration

by Wolfgang Lillge

July 13—This afternoon the German Fusion Energy Foundation (FEF) sponsored an event in Munich, Germany on the occasion of the 50th anniversary of the first Moon landing in 1969. Speaking at the event were German FEF chairman Werner Zuse; Frank Wukasch, a senior German space scientist; Jacqueline Myrrhe, a German space journalist; and Werner Grandl, an engineer and architect from Austria. A special address from Helga-Zepp LaRouche, Chairwoman of the Schiller Institute, was read, which is included in this issue of *EIR*.

Zuse opened the meeting with the idea that space science today uniquely provides optimism in our time of crisis. He described the cultural pessimism which is being spread through the green agenda, reminding the audience that Lyndon LaRouche had founded the FEF in 1974 in New York City precisely to counter this false ideology of limits to growth. The FEF rapidly became a world network for science and technology. The current potential for a Moon-Mars mission, as announced by President Donald Trump, and for exploring space to improve the conditions of life on Earth, is the living legacy of Lyndon LaRouche—his thought, policies, and interventions.

By the end of the 1970s *Fusion* magazine in the United States had achieved a circulation second only to *Scientific American* among science magazines, reaching almost 100,000 copies per month.

In his 1986 article, "The Science and Technology Needed to Colonize Mars" (reprinted in *EIR*, May 3, 2019), LaRouche wrote:

> . . . There are many practical things which must be done, urgently, to save our nation. These are the indispensable, which we shall lack the resolution to accomplish, unless our decision-making once again embraces the essential.
>
> Space is there. It is a challenge within man's grasp. It is a challenge which bears upon the improvement of life on Earth. We must respond to that challenge with goodness.

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German Fusion Energy Foundation Chairman Werner Zuse reading Helga Zepp-LaRouche's message to the German FEF meeting in Munich on July 13, 2019.

EIRNS

Left to right: Werner Grandl, Frank Wukasch, Jacqueline Myrrhe, and Werner Zuse, all made presentations at the German FEF event.

Zuse then read a message to the meeting from Helga Zepp-LaRouche, Chairwoman of the Schiller Institute, who situated the need for space research in the overall idea of the common aims of mankind. See the full text of her message in this issue of *EIR*.

Presentations by Space Experts

Following Zuse were three presentations by space experts from Germany and Austria. Frank Wukasch demonstrated key aspects of the history of space flight up until the Moon landing. Jacqueline Myrrhe showed very vividly the success story of the Chinese space missions up until the landing of their *Chang'e-4* on the far side of the Moon. And Werner Grandl developed his own ideas for space exploration, how we could use not only the Moon, but also asteroids, as a source of raw materials, emphasising especially helium-3 for future fusion power production.

Somewhat echoing the German-American space pioneer and visionary Krafft Ehricke, Grandl presented a multitude of concepts for developing the Moon, including a Lunar Mass Driver to catapult material from the surface of the Moon into Moon orbit for subsequent transport to Earth; a modular lunar base that would accommodate up to several thousand people with the walls of these habitats filled with regolith to shield against micro-meteorites, radiation and temperature fluctuations; and several concepts of how to create artificial gravity in space.

OTRAG: Private Space Launch Company

Demonstrating scientific passion, despite the tragic foolishness that dominated much of the post World War II period, Frank Wukasch showed a documentary film he had helped make that was quite shocking. The film told the story of a group of dedicated German rocket scientists, including Mr. Wukasch, who after World War II continued to develop rocket technology on a private basis, out of which the OTRAG company (Orbital Transport und Raketen, AG, or, in English, Orbital Transport and Rockets, Inc.) emerged in 1975, based in Stuttgart.

Because the amended 1954 Treaty of Brussels prohibits the development or launching of missiles from German territory, OTRAG negotiated an agreement with President Mobutu Sese Seko of Zaire in 1976 to lease an area four times the size of Belgium in the heart of the jungle to serve as a launch site. Working under very primitive conditions, OTRAG, advised by Werner von Braun, succeeded with very simple means and a dedicated staff of aeronautical engineers to produce a workable rocket comparable in size to the V2 from the wartime Peenemünde Army Research Center. OTRAG-1, with four propulsion modules, a nose cone, and four fins, was successfully launched in 1977. The group came under heavy attack from all sides—the United States, Europe, and the Soviet Union, and finally the whole project was crushed.

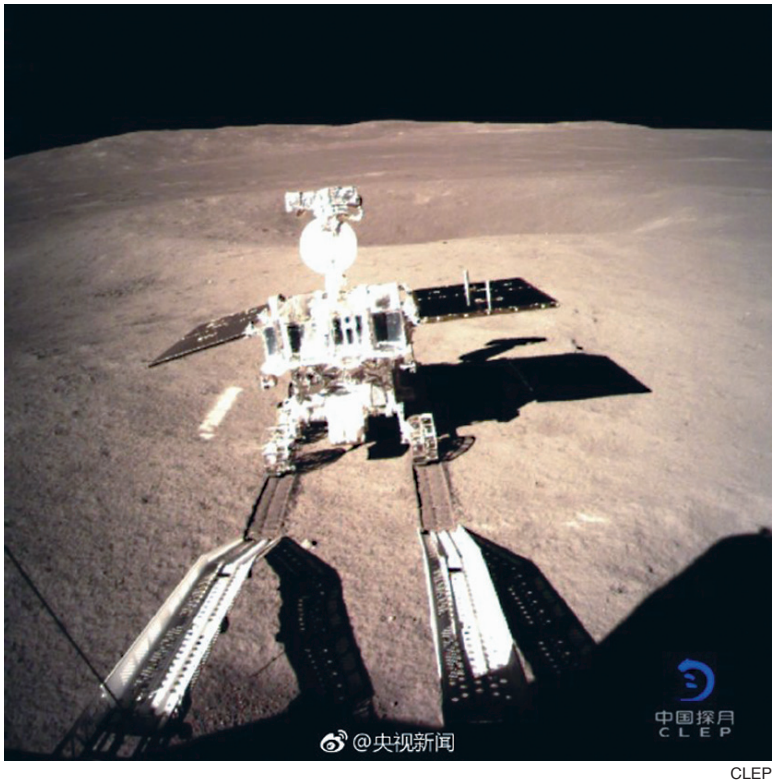
In this moment of a new, ever-growing win-win paradigm, there was not a single person who attended the meeting who did not leave optimistic about mankind's future in space, and energized to play some role in that future.

Economic Development Is at the Heart of China's Lunar Program

by Marsha Freeman

July 13—On January 4, 2019, Eastern Standard Time, China became the first nation in the world to land a spacecraft on the far side of the Moon. Contrary to most Western media commentary, this accomplishment was not motivated by an imaginary "Asia space race," or to obtain bragging rights in the international space community. The China Lunar Exploration Program (CLEP), made up of a series of increasingly challenging missions, is considered a key element in the economic advancement of China's population.

The United States has started lunar return programs three times in the past 30 years, but stopped them when they were deemed to be "too expensive." But China's lunar exploration program has been provided with a constancy of goals and support by being situated under the umbrella of long-term economic development plans such as the Belt and Road Initiative and other great infrastructure projects. It is understood that the lunar exploration program is a "science driver" for the economy, not an "expense."



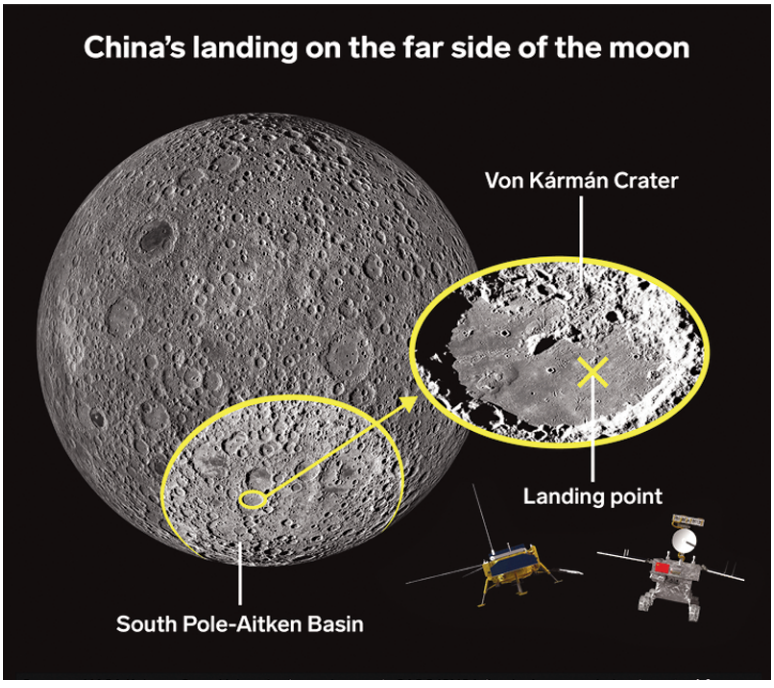
CLEP

China's Yutu-2 rover rolls away from the Chang'e-4 lander, the first spacecraft to land on the far side of the Moon.

The United States has a choice. On the one hand, we can commit to the multi-decade science-driver crash program for space exploration required to fulfill President Trump's call to industrialize the Moon as a stepping-stone to Mars, or continue with what economist Lyndon LaRouche described as a "casino economy," accumulating huge amounts of money in the gyrations of the stock market and its associated speculative arenas. In the minds trapped in the world of British monetarist thinking, this casino accumulation is considered "wealth," and has replaced the production of physical goods, such as high-speed rail and advanced nuclear energy systems. The continuation of such "wealth" accumulation will leave this country without the economic (physical and intellectual) resources to carry out a science-driver space program.

In 1985, when China was deciding which pathway it should take in economic and cultural policy, members of its scientific community consulted Lyndon LaRouche. A group of Chinese scientists visited the United States and met with a staff member of the Fusion Energy Foundation to find out more about the LaRouche-Riemann economic model. They were specifically interested in the impact of military and space science on the entire Chinese economy. Only two years earlier, President Ronald Reagan had announced the Strategic Defense Initiative (SDI), which had earlier been formulated by LaRouche.

In a letter dated November 11, 1985, addressed to Zuwei Huang of the Beijing Institute of Space Systems Engineering, LaRouche answered the question raised, through an extensive discussion of political/economic/scientific/cultural history. In responding to Zuwei



NASA/Arizona State University (map); renderings of lander and rover (lower right), China Aerospace and Technology Corporation/China National Space Administration

Chang'e-4 landed in the small Von Kármán crater within the huge South Pole-Aitkin Basin; it is the first spacecraft to land on the far side of the Moon.

China's Lunar Vision

How did China advance past the established space powers (the United States, Russia, Europe, and Japan) in its exploration of the far side of the Moon?

Thanks in large part to the tireless, nearly 30-year effort of one scientist, China's long-range lunar development program is a multi-phase exploration program to eventually create a manned base on the Moon. In addition to carrying out leading-edge scientific investigations, the Moon base will provide the infrastructure to exploit lunar mineral resources, most importantly the mining of the isotope helium-3 from the lunar soil. As the advanced fuel for fusion energy on Earth, energy on the Moon, propulsion for deep-space manned exploration, and materials processing, helium-3 fusion would play an important role in the integration of the economy of the Moon with the Earth. In this way, the Moon would become what space visionary Krafft Ehricke called the "Seventh Continent" of the Earth.

In addition to the direct impact on the economy of China's lunar program, that program has been a significant contributor to the leadership's objective to become a world leader in science and technology. Therefore, the civilian space program is not

Huang, he addresses, thirty years in advance, a major challenge that China faces today: "So, twofoldly, technological progress is indispensable to production of the material preconditions of human life," which China has recognized, by lifting hundreds of millions of people out of extreme poverty. Now the challenge is the scientific and cultural uplifting of the population. ". . . and the principle of technological progress affords to labor a form of existence which is consistent with man's superiority to the beasts."

In conclusion, LaRouche wrote:

> I would recommend to you, your colleagues, and your government that China consider concentrating much of its physical science under institutions integrated by a common mission-assignment respecting the colonization of the Moon and Mars. For reason of the nature of the primary and auxiliary technologies that mission-assignment implies, not only space-related research and BMD [ballistic missile defense], but every frontier of scientific inquiry is implicitly subsumed under that mission-assignment. This would foster the highest ratio of scientific benefit in every field, per average scientist and technician employed.

EIRNS/Philip Ulanowsky

Former EIR Economics Editor David Goldman briefs Lyndon LaRouche on progress on the LaRouche-Riemann economic model in 1983.

subject to the vagaries of changing annual budget priorities, or changes in Party leadership, because it is integral to the overall goals that have been set for the country.

The Chinese are well aware of the "Apollo effect," when the optimism created by the Moon landings created a generation of scientists and engineers. China has recently engaged the public in a broad range of activities, through the widely celebrated National Space Day, observed on April 24, on the anniversary of China's first satellite launch in 1970. The highlight of last year's celebration was exhibits with models of the *Chang'e-4* Moon lander and *Yutu-2* rover. And as in the United States, for the most recent lunar missions, Chinese school children have been invited to choose the name for the landers.

The success, so far, of China's lunar missions has put its technical expertise and the dedication of its scientists and engineers on the world stage. But it took 30 years, and extraordinary perseverance, to get there.

Ouyang Ziyuan: Father of Chang'e

It was in the mind of the now 84-year-old scientist, Ouyang Ziyuan, that China's lunar program was born.

Despite an early interest in astronomy, Ouyang decided to study geology and mineral resources after high school. In a 2013 interview with Lu Yishan, a reporter with the *Yangcheng Evening News*, Ouyang explained:

> In 1957, *Sputnik* opened for humanity a new era of exploration. This gave me an extreme shock. I always believed China would have the capability of launching a satellite. I began to conduct a study of a meteorite in 1958, [in the new field of] Cosmo-chemistry.…" Gradually, we pulled together a theory and an array of researchers for investigations of meteorites from the Moon and other celestial bodies.

Ouyang's biographer, He Ping, reports in *Ouyang and China's* Chang'e *Project*, that,

> [From the beginning of the 1960s,] Chinese scholars conducted comprehensive and analytical studies of the Moon, its topography and land formations, its origins and the history of its evolution, continuously following the progress of studies of the Moon by the international community, compiling reports, like "Progress in Studying the Moon's Structure," "The Mysteries of the Moon," "The Study of Celestial Bodies," and several monographs.

Ouyang continued, in his 2013 newspaper interview:

> In [May] 1978, President Carter's National Security Advisor, Zbigniew Brzezinski, visited China and left a small Chinese flag that had been taken to the Moon by an astronaut, and second, a piece of the Moon mounted in Plexiglas about the size of a thumb.… The State Council asked the Academy of Sciences Guiyang Institute of Geochemistry [where Ouyang was a researcher] to investigate the time and place where the rock was found. With great care, they examined the 0.5 grams. [We] issued a 14-page report and affirmed that the rock was picked up by the Apollo 17 astronauts, and determined where the rock was from, whether there was sunlight there, which they could tell from certain characteristics.

Lunar Probe Development and Launch

By all accounts, that one-gram piece of Moon rock would set Ouyang Ziyuan on his life's course.

Not long after, a group of scientists led by Ouyang proposed to China's political leadership to start to develop and launch a lunar probe. But China, having just come out of the period of the Cultural Revolution, was left unable to tackle such a complex and far-reaching space project.

Due to his background in geology, Ouyang was tapped to find a suitable site for underground nuclear testing, which required that he learn nuclear physics. This would no doubt be useful in his later promotion of the development of fusion energy.

But by the mid-1980s, China's leadership under Deng Xiaoping turned to the policy of "the four great modernizations," to try to catch up to the advanced sector of Europe, the United States, and Japan. One of the great modernizations was the focus on science.

For implementation, Project 863 was promulgated in March 1986. Its purpose was to provide federal support to fulfill the need of China to invest in broad areas of technology development. The funding of R&D projects under Project 863 continued for decades, including in aerospace. Space writer Brian Harvey reports in his comprehensive book, *China's Space Program*, that between 1986 and 2001, about $800 million was invested

in 5,200 individual projects under Project 863, including funding for the development of a robotic arm for China's future space station.

Ouyang explains in his interview that by the early 1990s, the scientists believed that China was ready to embark on deep space missions:

> In 1993, we submitted a proposal for a first lunar science mission.... Experts approved it. The Institute of Geochemistry issued a report in 1994, "The Necessity and Feasibility of China's Development of a Lunar Probe." In 1995, the Academy of Sciences proposed to continue the study of a program, which led to a more detailed proposal, "The Development Strategy and Long-Term Plan for China's Lunar Exploration." The Academy approved a plan with three parts:
>
> 1. Unmanned probes;
> 2. Manned landings; and
> 3. Creation of a lunar base, with the development of resources and the lunar environment.
>
> The first, unmanned phase was later divided into three parts: orbiting, landing, and sample return.

Chinese Academy of Sciences

Ouyang Ziyuan, known as the "father" of the Chang'e series of lunar missions, speaking at the Xi'an Institute of Optics and Precision Mechanics in November, 2010.

This renewed push by the Chinese scientists for a lunar program coincided by chance with a discovery that would change the view of the Moon as a cold, dry, dead world. In 1994, the U.S. spacecraft, *Clementine*, a joint project between the Strategic Defense Initiative Organization and NASA, discovered the likely existence of water ice inside permanently shadowed craters at the Moon's South Pole. Soon, spacecraft would be under development in Europe, the United States, Japan, and India to investigate further. Water on the Moon could be used to sustain life as well as be one of the ingredients for rocket fuel. It could provide one of the resources necessary for a long-term manned base on the Moon.

In 1998, Ouyang and his team were asked for specific designs for lunar missions. They organized a gathering of experts from various technical domains from around the country; in August 2000, the gathering approved the proposed lunar research plan. They released a report, titled, "Scientific Objectives and Payload of the Lunar Exploration Satellite." On that basis, Ouyang and his colleagues wrote a prospectus for the lunar program.

In a March 3, 2003 interview with *People's Daily*, China National Space Administration Director Luan Enjie provided an overview of the lunar exploration program that was soon to be made public:

> The exploration of the Moon can become the incubator of science and technology, and promote the development of the nation's economy by bringing forth new ideas of a revolutionary nature. [Mankind must] leave the Earth homeland, establish permanent research stations, develop products and industries in space, and set up a self-sufficient extraterrestrial homeland.

State Council Approves Lunar Mission

On January 24, 2004, the State Council approved the report laying out the lunar exploration program, as did Premier Wen Jiabao. This ratified the development of the lunar probes, inaugurating the multi-phase China Lunar Exploration Program (CLEP). The lunar missions were officially named Chang'e, drawing on the legend of the goddess who flew to the Moon with her Jade Rabbit (Yutu), having been banished from Earth, for having angered the gods by drinking the elixir of immortality.

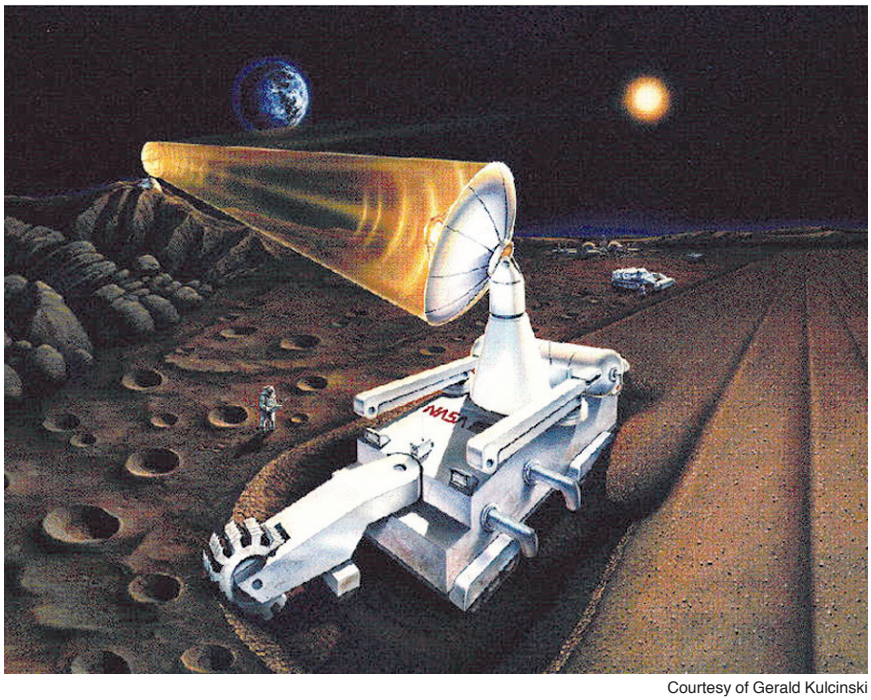
The secret Chinese space program was about to undergo major changes. In November 1999, China carried out an unmanned test of its man-rated Shenzhou capsule. For the first time, Chinese space officials spoke publicly about the test while it was underway. Previously, the world had only learned about a Chinese space mission after the fact, and if it had been a success.

In 2000, the Information Office of the State Council took a major step toward "opening up" its space program. In November of that year, the State Council pub-

lished, in English, a 24-page white paper titled simply, "China's Space Activities." The white paper laid out a 20-year perspective for China's space plans, with an emphasis on Earth-orbital applications, such as remote sensing, just then being developed in China. It also revealed the plan for the near-term launch of a manned orbital mission, *Shenzhou-5*, which in fact took place three years later.

China well recognized that it would take years for it to "catch up" to, or even compete with, the world's space-faring powers. That was not the motivation for the programs. As outlined in the white paper:

> As a developing nation, China's fundamental tasks are developing its economy and continuously pushing forward its modernization drive. [The space program is] an integral part of the state's comprehensive development strategy.



Courtesy of Gerald Kulcinski

An artist's conception of the Mark II Lunar Helium-3 Miner.

No specific years, only general outlines, are given for each program category. The space program is not a "race," the report makes clear. And it has proceeded from the beginning at a pace that is determined, not by political exigencies, but by technical readiness.

In 2006, the State Council released a ten-page update report titled, "China's Space Activities in 2006." The purpose, the report states, is "to give people around the world a better understanding of the development of China's space industry over the past five years, and its plans for the near future."

The report explains, again, that China places its space program within the context of its "overall development strategy," with a focus over the following five years on technology transfer from the space industry to "upgrade traditional industries."

The first flight of the lunar exploration program, *Chang'e-1*, was only one year away.

Helium-3: Lunar Fuel for Fusion

From the beginning of China's lunar program, Ouyang lobbied for the development of the resources on the Moon. As quoted by Ouyang's biographer, He Ping:

… "[T]he mineral resources of the Moon, its energy resources and its specific environment, will open up a new source of development for mankind in the future. If China would continue to look at this opportunity without lifting a finger, then it will be difficult to safeguard the interests of our people, and we will forfeit our ability to have a say in matters of space exploration," states the 1994 report, "The Necessity and Feasibility of China's Development of a Lunar Probe."

For years, discussions about resources on the Moon referred mainly to the presence of water ice. But in the 1970s, scientists, closely examining the rocks brought back by the *Apollo* astronauts, and the unmanned Soviet *Luna* probes, also found helium-3. It has been estimated that just at the Sea of Tranquility, where the *Apollo* 11 astronauts landed, there are 8,000 tons of helium-3.

This isotope of helium has been deposited in the top layers of lunar soil by the solar wind over billions of years. It is rare on the Earth, due to the interference by the Earth's atmosphere and magnetic field. But not much value was attributed to this find at the time. That changed a decade later, when scientists carrying out research on fusion energy, began looking for helium-3 for fuel.

Fusion is the process by which the Sun and the other stars create their energy. It is often described as the opposite of fission, which is the splitting of atomic nuclei. Fusing light ions releases orders of magnitude more energy than fission, without fission's radioactive by-products. Helium-3 is an "advanced" fusion fuel, because it is more difficult to produce fusion energy with it than with the more common isotopes of hydrogen. But its products allow a more efficient use of the energy produced.

Although the helium-3 on the Moon was not considered a resource in the 1970s, in the 1980s, when fusion experiments using helium-3 were making progress, the scientists soon realized they would need more helium-3 than is available on Earth. Now helium-3 on the Moon became a resource, and mining it became a major objective of China's long-range lunar plan. From the time it was discovered that a potentially large quantity of helium-3 existed on the Moon, Ouyang became a strong and vocal promoter of developing this new resource for fusion fuel.

Energy for Ten Thousand Years

At the 36th Scientific Assembly of the UN Committee on Space Research, held in Beijing in July 2006, Ouyang presented a special lecture, in which he said:

> One hundred tons of helium-3 will be needed each year if nuclear fusion technology is applied to meet global energy demand. The Moon has reserves estimated to be between 1 and 5 million tons. Each year three Space Shuttle missions could bring back enough fuel for all human beings across the world. [These millions of tons of helium-3 on the Moon could provide] at least 10,000 years of energy for all mankind.

He explained in the lecture that China's first lunar missions would enable the analysis of minerals covering only five elements. "We will try to improve that to fourteen" minerals, he said, which was, in fact, done in later missions. The target, he explained, is to "improve our understanding of helium-3 reserves" and refine the estimate of the amount of it on the Moon.

Helium-3 is thinly dispersed in the lunar soil, and soil samples must therefore be brought back to laboratories on Earth to determine the contents. *Chang'e-5*, to be launched by the end of this year, will bring back lunar samples from the Earth-facing near side of the Moon. It has also been proposed that the far side of the Moon could contain a higher concentration of helium-3 than the near side, since it is more exposed to the solar wind, and lacks any protection from Earth.

China is not the only country that has expressed an intention to exploit the helium-3 reserves on the Moon. Scientists in Russia have noted the importance of those reserves for many years and have included mining the Moon in their long-term plans. India, too, has recognized the importance of the enterprise.

China's Plans for the Future

On January 14, 2019, following the successful landing of *Chang'e-4* on the far side of the Moon, the leadership of the China National Space Administration (CNSA) held a press conference to discuss the ongoing *Chang'e-4* mission and the future of China's lunar exploration. During the briefing, Wu Weiren, chief designer of the lunar program, said that CNSA is organizing Chinese experts to work on the follow-on lunar missions. Next will be the *Chang'e-5* near-side, equatorial sample return mission. Following that, three future missions are being planned:

- *Chang'e-6* will conduct a very challenging South Pole sample return. Whether it will be conducted on the near or far side depends upon the results of the sampling mission of *Chang'e-5*.
- *Chang'e-7* will conduct comprehensive exploration of the South Pole, including its land formations, material composition and environment.
- *Chang'e-8* will test key advanced technologies on the far side. Companies will be invited to industrialize the technologies developed for the mission.

China's *Science and Technology Daily* reports that Wu Yunhua from CNSA added: "On *Chang'e-8*, we are planning even more crucial experiments for our lunar exploration, including to determine the possibility of establishing a lunar base for scientific research, if we can do 3D printing on the Moon, and whether it is possible to use the lunar soil for the construction of buildings, in order to jointly construct a lunar base for further exploration of the Moon."

For the scientists carrying out China's lunar exploration missions, the Moon is not the limit, but a necessary stepping stone to the rest of deep space.

Ouyang Ziyuan, now 84 years of age, attends the Chang'e launches, and is looking beyond the Moon. He told Xinhua on November 23, 2012: "I hope Chinese people can set their 'footprints' all over the Solar System."

Published in *EIR* on
September 11, 1987

Design of Cities: In the Age of Mars Colonization

by Lyndon H. LaRouche, Jr.

Planning the colonization of Mars gives deeper meaning to the ages-old task of rendering man's habitation of unfriendly natural environments fruitful, healthy, and as agreeable as possible. We must consider features of the artificial Mars environment other than merely the molecular-biological requirements of the human being. We must take into account the importance of immunizing the psychological well-being of the colonists, against the eerily new kinds of stresses associated with prolonged exposure to the alien environments of space.

We must take into account, in a new way, both the physiological and psychological importance of the architectural design of the local environment in which the explorers and colonists work, and perform their normal personal functions away from the workplace. Admittedly, the permanent colonization of Mars is probably 40 years ahead; yet, even now, in the early stages of planning that colonization, and during the coming months and years, we must set some of the architectural guidelines for planning the future geometry of the new cities, the working space, and the ordinary living space, in which space explorers and colonists will work and live.

Increasing fascination with space-exploration, especially among the young, ensures that whatever we announce as necessary features of recolonization of the Moon and Mars, will have an increasing impact in reshaping the policies governing life here on Earth. Even in the stages when only a handful of Earthlings are actually venturing into space, increasing portions of the Earth-bound population will shift the popular sense of human identity toward the idea of mankind as a space-explorer and space-colonist. This will bring about an adjustment in popular values, a change in the way human beings think about human beings.

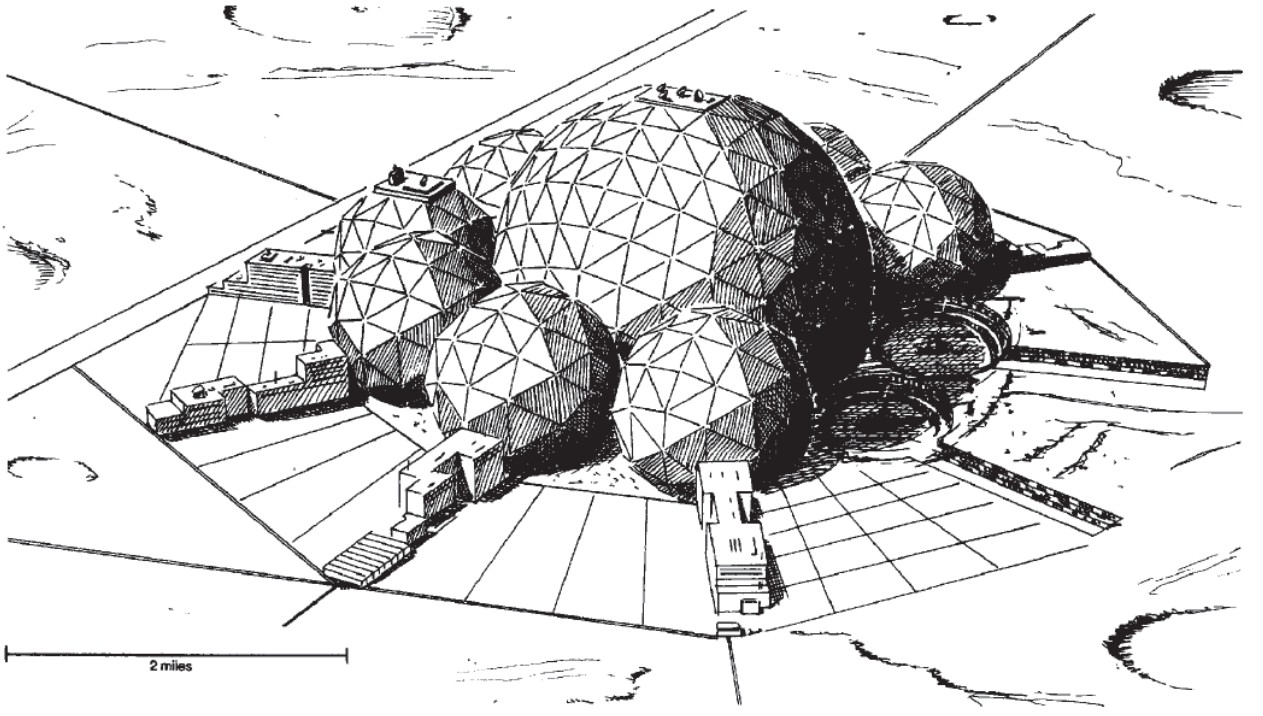
During the coming years, while flights deeper into solar space are still mainly in the planning and development phases, more and more people on Earth will look at life here on our home planet through eyes which are becoming, in the informed imagination, the eyes of the space-explorer. With ever-greater frequency, the suggestion will be made, that which we can accomplish in space might point toward the best solution for problems here on Earth.

This spillover of space planning into practice on Earth, is a sometimes indispensable, as well as a likely result of the growing popularity of space colonization programs.

Over the years immediately ahead, increasing attention to the design of future cities on the Moon and Mars will lead toward the easier recognition of the urgency of the establishment of many new cities on this planet, new cities designed and built—not only in the Sahara Desert—in ways influenced by our thinking about architecture in space. That connection is the subject area within which this report is situated. To bring this matter within the reach of as many laymen readers as possible, I begin with reference to some very ordinary features of my own adolescent introduction to "human engineering," to show how this led me to uncovering the scientific principles which should govern proper practice of architecture in space colonization.

'Human Engineering'

My first gainful employment began before my 16th birthday, in a summer's job as what is called a "handdinker"—at 25¢ an hour—in a slipper-manufacturing firm. It represented about as low a level of skill as one might find in such a place. My assignment was to stand at a wooden block, with a die in the left hand and a



Christopher Sloan

Kepleropolis is our best guess on the appearance of the first city on Mars. The problem was to design a city capable of supporting 500,000 individuals. The main dome of 1 mile in diameter is built in a near-hemispherical crater and made of some as yet unidentified material which would be transparent, yet block cosmic rays. The sphere of the dome would be placed such that its "ecliptic" was at ground level. At surface level under the main dome would be a large educational/recreational park. Immediately subsurface would be administrative offices. Below that would be various levels of transportation, storage, and a central fusion power facility. Atop the dome is a 1-mile high observatory and communications station. Surrounding the main dome are 10 domes capable of supporting "neighborhoods" of 50,000 individuals each. They are linked to huge industrial buildings extending along 10 radii from the center of the main dome. Areas between the industrial buildings are devoted to terra forming, agricultural, or other activities related to the industries. This particular drawing shows the city while under construction.

shoe-cutter's mallet of several pounds weight in the right, and to punch out as many of the same object as I could, over and over again, each hour. At first, that work seemed to me about as boring as one might imagine. I quickly realized that it need not, and should not be boring.

My thoughts at that work-bench were on the subject of what is called "motion-study." The object of my inquiry, was to discover how I could accomplish the maximum of the desired result with the least effort—soon, I added: the least painful after-effects experienced overnight and the following day. The mental image I adopted, was of the ordinary pendulum of a grandfather's clock: to achieve a rhythmical movement, in which my body fought itself the least in bringing about those motions, with the proper force, to achieve the optimal result.

My father had secured this lowly employment for me, as part of his program for training me as a management consultant in the shoe-manufacturing industry. Indeed, this did help to impel me toward the consulting profession. The scientific principle I confronted in seeking to master that lowly, repetitive toil, was an experience which guided my attention to the character and importance of "human engineering" of the operator's workplace, and of the traffic flow of materials and work-in-progress through the production center locally and the production facility as a whole.

No person, but one who has developed the habit of looking at every experience in this way, should be considered qualified for the profession of "economist." Do not tell me silly money theories of how objects are bought and sold; tell me exactly how they are produced and how they are physically distributed. Tell me

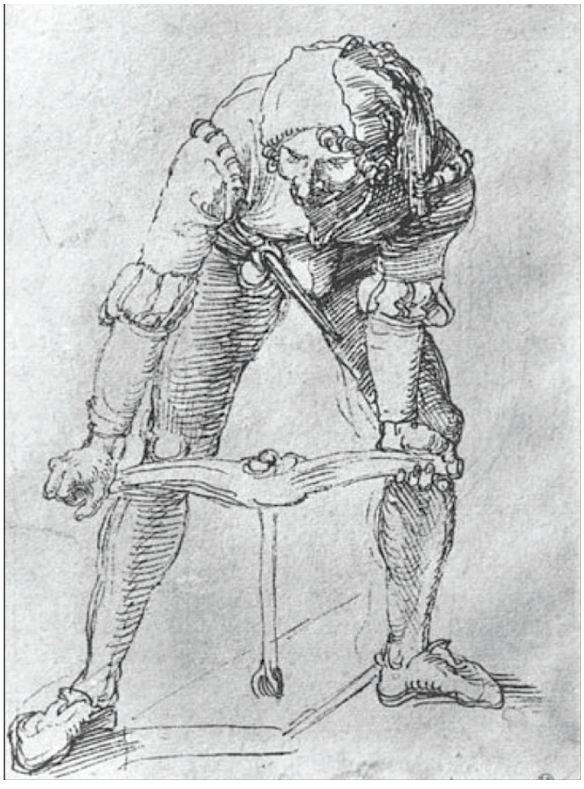
how much labor, of how many people, working under what conditions, is required to provide an acceptable standard of market-basket of goods for one household. Tell me not the importance of a certain amount of money in a salary or wage; tell me not merely the money prices of things. Tell me what kind of a life a year of a man's labor will, on the average, buy for his family household; tell me how you propose to effect economies of labor which will help to improve that life.

Only one who understands the importance of these questions, and has acquired the skills for answering them, is qualified to become an economist. These attitudes and skills are not sufficient, by themselves, to qualify a person as an economist; but, no person who lacks these rudimentary skills will ever be better than useless as an economist.

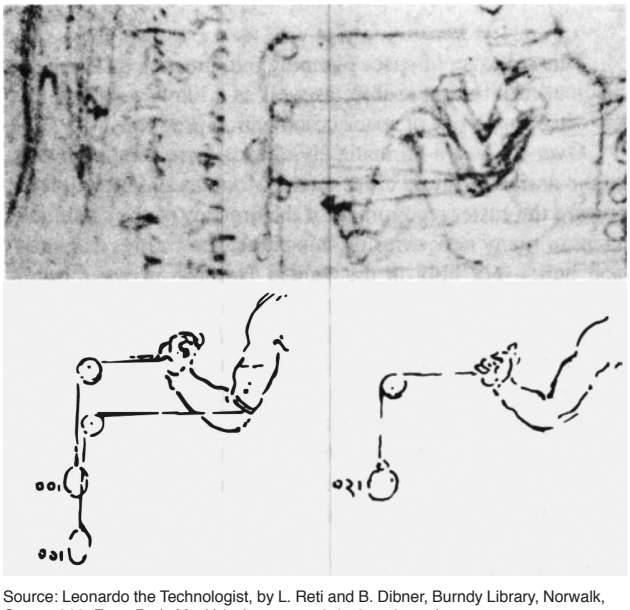
In recent decades, industrial "time studies" by teams of so-called efficiency experts have become notorious, as the higher-priced, trained industrial engineering was replaced, by the cheaper fellow hired off the street for his skill in wearing a white shirt while using a stop-watch and clipboard on the factory floor. Today, "time studies" are notorious, because the drift has been away from capital-intensive investment in economy of labor, toward increasing the labor intensity of the workplace. As my own view of "hand-dinking" experience indicates, the purpose of industrial engineers' "human engineering" practice was directly the opposite to policies of labor-intensification; the purpose was to achieve greater productivity and quality with less effort by the operative.

The benefits of "humanistic engineering" (a better term than "human engineering") include such obvious economic gains to employer and employee as lower rates of industrial accidents, less cardiovascular and other illness, and so on.

The skilled industrial engineer did not need to refer to a stop-watch very often. The norms of movements of eyes and limbs, once established, gave the industrial engineer handy reference tables of a sort he understood, because he had learned to construct such tables as part of his professional education. He worked essentially as I thought through the best methods for hand-dinking. He thought about the physical geometry of the movements of man, machine, and work-in-progress; once he had mapped those qualitative features of the job, he could assign allowed times for each required motion with far greater accuracy than a platoon of time-study boys studying the same workplace.



Classical studies of motion in the human body from the Renaissance. Above: Albrecht Durer, pen and ink study of a Young Man leaning forward and working with a large drill (journeyman joiner), around 1500. Below: Leonardo da Vinci sketches showing the estimation of human muscular effort with the help of a dynamometer. The force is measured in pounds which represent the lifting capacity of the group of muscles under scrutiny. In the sketch above, no fewer than six different cases covering the whole body are examined, while in the sketches below, Leonardo tries to compare the force of the arm in different positions and points of attachment.



Source: Leonardo the Technologist, by L. Reti and B. Dibner, Burndy Library, Norwalk, Conn. 1969. From Paris Ms. H (written ca. 1494) 101. 43v and 44r.

As a youth, I saw this problem expressed in a brutal way each time I stood in a shoe-manufacturing payroll line-up myself, or observed the operatives punching out and leaving the plant at the end of the day. I could identify accurately the nature of the occupation of the older operatives, merely from observing their bodily movements as they passed the timeclock. Their bodies were distorted by the combination of labor-intensity with the peculiarities of the organization of the workplace; so, one could spot the lasters, the welters, and so forth, from the posture of their arms, torsos, and way they walked.

Sadly watching that parade, one recognized the human importance of making operatives more the masters of their machinery, less an increasingly crippled appendage of the machine.

For this reason, I learned to hate technological stagnation bitterly. In "humanistic engineering," we work to change the geometry of the workplace, to the effect of simplifying the motions, and reducing the effort required of the operative, with special emphasis on eliminating the kinds of repetitive motions which are unhealthful. We recommend to the employer: "build this … change the lighting, so … this change in the tooling of the workplace," and so on. In a climate of investment in technological progress, there is gain in profit and quality by the employer, and personal and income advantages to the operative, too.

Trading so many dollars' worth of unnecessary exertion by the operative, against an investment which costs actually less per unit of output than the amount saved in terms of unnecessary operative's exertion avoided, is the normal way in which productivity increases with gains to the operative as well as the employer. This is true up to the point that paid-out dividends become too large a portion of gross earnings, or borrowing costs for new investments in capital stocks become much too high.

The humanistic professional might measure his personal satisfaction from his work, by reflecting on the image of twisted bodies of middle-aged operatives parading past the time-clock. The personal conscience of the true professional is: that saddening spectacle, and everything akin to it, must be eradicated systematically from our production.

The gains effected so, are not merely physical ones; the mental ones are more or less as important. In the longer time, it is the mental gains which are of the utmost importance. The employer who says to his employee, "I don't pay you to think," is not the genius-laden tycoon he might think himself to be. The secret of the superior productivity of U.S. labor, in times dating from earlier than our recent 20 years of "post-industrial" drift into technological stagnation, was precisely that U.S. farmer's and industrial operative's superior ability to think while working.

Every good industrial manager agrees. He might inform you of the steady gains in quality of product and productivity which industrial firms obtained through the employees' suggestion box. He might also instruct you on the subject of increased accident-proneness among operatives for whom a lower premium is placed on thinking as integral to the operative's role at the workplace. A more profound, more valid general argument could be made: The biophysics specialist might suggest that we correlate brain alpha-wave activity in persons with their ability to sustain continuing technological progress efficiently—and to avoid accidents on the job, or while driving a motor vehicle.

In general, as the level of skill and technology are increased, production depends increasingly upon a more active role by the operator's capacity for effective kinds of problem-solving innovations, as an integral part of the workplace.

Think of space colonization as what it is: essentially, very high levels of skill and technology by every person involved. The chief flaw in the relatively better sort of industrial engineer practiced up to about 20 years ago, was the lack of attention to what should have been recognized as the underlying principles of motion-theory. Industrial engineering education should have included at least two years' span of study of the relevant work of Leonardo da Vinci, Albrecht Dürer, Raphael, and Johannes Kepler. Had such studies been promoted as they should have been, a good industrial engineering graduate would have understood the principles which govern economy of labor. He would have mastered also, the rudiments of applying classical principles of aesthetics to architecture and urban design, and understood these subjects properly from the standpoint of "humanistic engineering."

General Design of a City

At the end of World War II, significant numbers of the leading scientists in Germany were gathered into a pool at Aachen, awaiting reassignments. Some of these applied their skills to planning the reconstruction of the war-ruined Ruhr district. Part of their design was im-

plemented. Other elements, if not implemented, nonetheless influenced thinking about reconstruction policy.

Since about 1977, I had been engaged in studies for the economic development of Africa, including the urgent need for building cities of a new type in black Africa, as an indispensable, central feature of any successful effort to develop black Africa in a general way. My own work in the latter connection gave my associates an advantageous standpoint for recent examination of the work of the Aachen circles; leading features of the Aachen designs coincided on key points with principles of design I had come to view as elementary through my own work.

Such is science. Different groups of investigators, in different times and places, but working from the same general store of knowledge, converge on the same result. The right principles of design of cities, are not matters of local tastes; they are as universal as is the nature of the individual human being who, as the inhabitant of the city, is the measure of its proper design. The unchangeable principle governing the proper design of a city is elementary; it is the same for a city on Earth as it is for a permanent colony on Mars.

The proper design for a city, is a study of motion of people, the goods they use, and their activities. The general scheme for design is therefore the principle of least action—which I shall describe at a later point in this report. It is sufficient, for the moment, merely to state as an assertion, that the definition of least action required for this purpose is harmonic orderings cohering with those determined by the Golden Section of the circle. For reasons to be made clearer, the significance of the Golden Section suffices to show that the general design of a city is implicitly a proposition in Gauss-Riemann topology.

I shall develop this theme by stages, after I have described the general arrangements.

The simplest form of result has three features: 1) The paradigmatic form, for approximately level regions, is spherical, with one hemisphere lying above the surface, and the other below the surface. Let us term the circular cross-section of the sphere at the surface-level the "ecliptic," as in the ecliptic of the solar planetary orbits. Then, 2) The harmonic organization of the ecliptic is analogous to Kepler's arrangement of the orbits of the Sun and its eight major solar planets, as divided by the domain of the shattered ninth planet, today' s asteroid belt lying between the orbits of Mars and Jupiter.

The Sun, tuned to a Keplerian F, is the central educational park of the city. The orbits of Mercury, Venus, Earth, and Mars, correspond to the administrative and residential areas of the city. F-sharp, the asteroid belt, is the boundary between the inner city and the outer, "industrial" planets.

Since the design of the city is based on least-action movement of human activity (per capita, per hectare), it is the transport system—for persons and freight—which appears as a delimiting feature of the internal design. In the modern form of the city, this movement is on distinct levels: walking, passenger rapid transit, subsurface transit of freight, subsurface transit of activities by utilities.

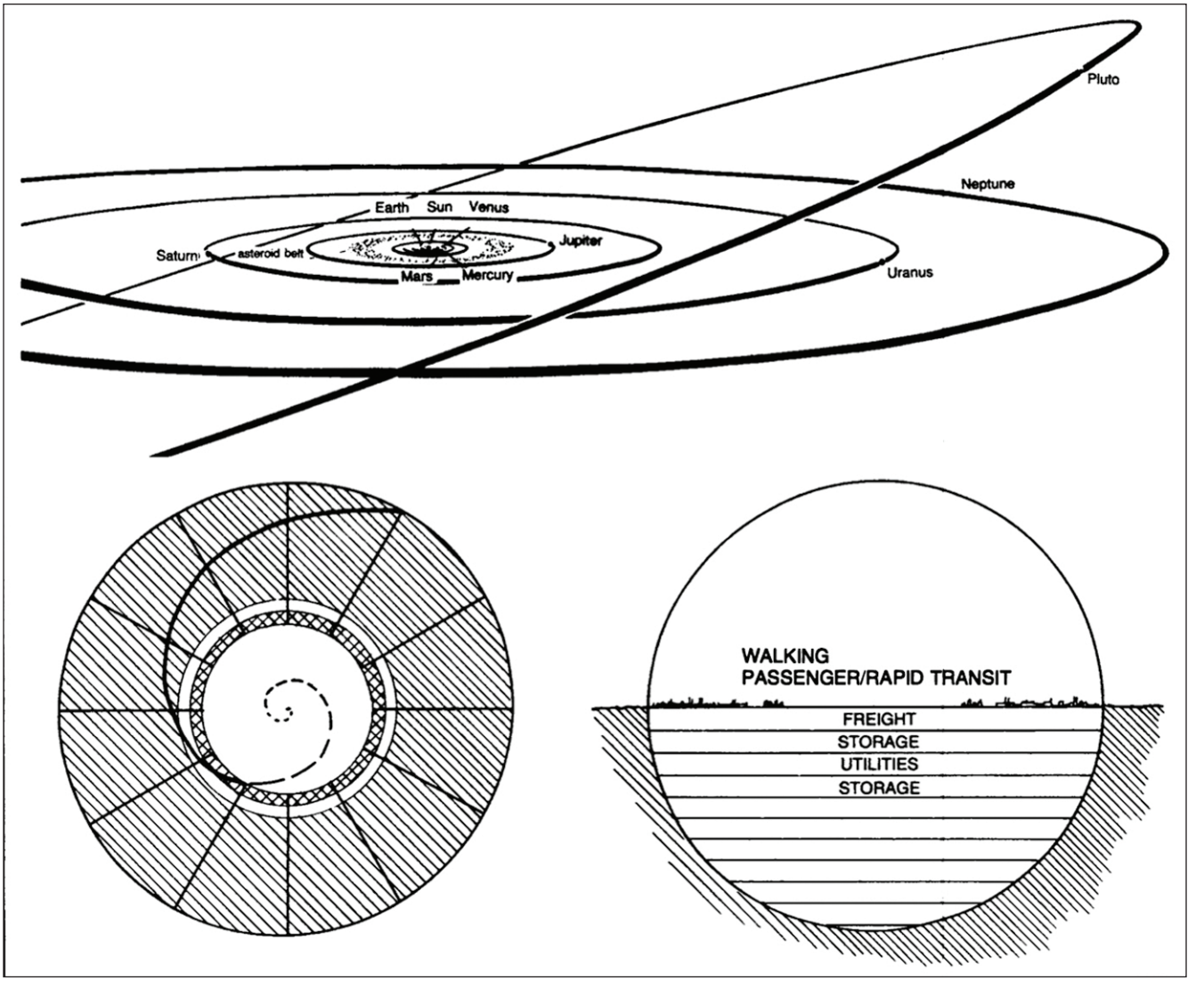
Thus, the subsurface hemisphere is defined in terms of subsurface movements of people and freight, and in terms of stores of essential goods: the density of the subsurface structure increases as a function of per capita motion per hectare as we proceed inward from the "asteroid belt" to the "Sun," the educational and classical cultural activities situated within a large, educational and recreational park. So, within the inner part of the "solar complex," the density of activity increases as we near the "Sun."

Beyond the asteroid belt, the per capita density of activity per hectare in industrial use, again increases, initially relative to the average for the inner portion of the complex as a whole, and then diminishes again, as the eye travels toward the outermost orbit of these "outer planets."

Throughout the complex, the density of movements per capita per hectare is harmonically distributed as in planetary orbits: these are defined in terms of transport systems, especially the subsurface rapid transit, freight, and utilities. The spokes and rims of these transport orbits are cut by a plane self-similar spiral of movement, radiating from the "Sun," and intersecting the spokes and wheels of the outward and lateral movements.

The spokes are twelve in number, and the inner orbits are four. So, the spokes are named North, Northeast by North, Northeast, Northeast by East, and so on. The orbits are named for musical tones, Kepler-style. The spiral-way is known as the Gaussway.

This signifies that such a city has a finite maximum population. If more population is to be accommodated, an additional city must be developed, linked to others by high-speed magnetic-levitation rapid transit links—at nominal speeds of about 300 miles per hour. (Indeed,



Two schematic diagrams of a hypothetical future city, on Earth or on Mars. On the left is the "inner city" with its educational park (the "Sun") at the center, and surrounding residential and administrative zones. The rims are analogous to the orbits of the planets Mercury, Venus, Earth, and Mars. The boundary of the inner city corresponds to the asteroid belt. A self-similar spiral from the "Sun" park to the asteroid belt is called the Gaussway. The right-hand diagram shows a vertical cross-section of such a city, with the junctions to be situated in the upper or lower hemispheres, respectively. The heaviest increment of cost in the building of the city, will be the emphasis on building the deep substructure first, and then putting the upper portion of the city upon that prepared substructure.

magnetic levitation is used throughout the surface transit systems for movement of persons and freight.) How large is that finite maximum?

At first glance, three factors appear to decide this: 1) The unit-area and volume required by an average person's meanfree-path motion within the city: the congestion factor; 2) The ratio of lapsed time expended in normal travel by a person within the city, to time spent in other activity; 3) The size of the "Sun."

These three factors must take two other sets of factors into account. The first of those two other sets of factors is, that each design of a city is delimited by my six primary constraints for a Riemannian representation of technological progress: 1) Level and rate of improvement of per capita market-basket content, in quality and quantity; 2) density and rate of increase of usable energy available per per-capita unit of per hectare population-density; 3) level and rate of improvement of effective energy-flux density of modes of applied technology; 4) ratio of rural to urban labor force employment in the region in which the city is functionally located; 5) ratios of employments of the urban labor force, in terms

of scientists and kindred professionals per hundred members of the labor force employed as operatives, and in terms of capital-goods producing to household goods producing operatives; 6) the general level and rate of advancement of technology in practice. These six factors define the true basis for measuring individual activity levels within the city as a whole.

This is also affected in obvious ways, by the second additional set of factors, the demographic factors centered around the birth-rate per female of child-bearing age-intervals, and life expectancies.

All three sets of factors, taken together as part of a single function, are the primary determinants of the city's proper choice of maximum population levels.

In all these considerations, the irreducible quantum of action is the activity scale required for the average individual. The individual person's level of activity, per unit of population-density, becomes the definition of scale, with respect to which all other measurements are defined.

A good design for a beautiful city, is one which will be durable through a thousand years of technological progress. This presumes that the city is designed such that it easily adapts to the effects of technological progress.

It adapts so, in terms of increasing of the energy-density per per-capita unit of population-density. It adapts so, in terms of raising the level of effective energy-flux density per square centimeter cross-section of target-area of work. It adapts so, to related increases in mobility of persons. It adapts so, to the increase of the ratio of time expended in creative leisure, to that required for labor.

What remains constant is man. The biology of the person requires daily about six to eight hours of sleep, two to three hours expended in eating. We know today, or should know, that—for what might be termed pyscho-biological reasons—no acceptable substitute for the "nuclear family" as a mode of development of new individuals will ever be discovered.

We know that maturation will never be briefer than a span of between 20-odd and 25 years, of which at least between 16 and 18 years must be within the setting of the family household.

From this, the design of the dwelling unit follows. The size of sleeping and bathing quarters, the need for dining areas and their dimensions, and so forth, are defined in an elementary way. Improvements in privacy of thoughtful activities, and other advances in quality of dwelling places are desirable, and will become more demanded as society progresses. Yet, walking through some better maintained, older areas of cities in Europe, and elsewhere, and from scholarship in the same matter, we see that the elements of design of a good space organization of the dwelling unit have not changed much over centuries, even thousands of years.

If we learn from those studies, by applying principles of "humanistic engineering" to what we learn, we can do much better today than any preceding generation of mankind, in building a city today, for whose design we will be thanked by its inhabitants a thousand years into the future.

Natural Human Movements

As I stated earlier, 20th-century industrial engineering wasted much of its efforts, and contributed a few important mistakes, by neglecting the rigorous study of the natural movements of the human body associated with such pioneers as Leonardo da Vinci, Dürer, Raphael, and Kepler.

Since classical Athens of Plato's time and earlier, it has been the central principle of classical aesthetics, that beauty of form and movement is limited to those harmonic orderings of form which are coherent with a harmonic series based upon the construction of the Golden Section of the circle. Classical Western aesthetics defines this as a rigorously definable standard of beauty for the form of music, poetry, painting, sculpture, and architecture.

This standard was embedded in Western civilization by such writings of St. Augustine as his *De Musica*. In the wave of city-building unleashed by Charlemagne, what were called "Augustinian principles" were the guide to the development of cathedral towns around such "Augustinian" works in light, acoustics, and form, as the famous cathedral at Chartres. Classical aesthetics was defended during the "New Dark Age" by such influentials as Dante Alighieri and Petrarch, and became the central theme of the Golden Renaissance at about the time of the 1439 Council of Florence. Brunelleschi's successful invention in architecture, completing the construction of the dome on the cathedral at Florence, was a signal point of reference throughout that century.

The single most influential scientific thinker of that entire period was Cardinal Nicolaus of Cusa. Cusa's revolution in scientific method first appeared in published form in his 1440 theological text, *De Docta Ig-*

norantia (*On Learned Ignorance*). This text included a revolution in ideas about geometry and physics, solving several classical problems left over from the work of such as Parmenides, Plato, and, most immediately, the Archimedes whose work on the quadrature of the circle Cusa directly corrected in his own 1440 book.

What Cusa actually accomplished, was the establishment of a true "non-Euclidean geometry." Instead of a system of deductive theorems, based on a set of axioms and postulates, Cusa showed that the physical laws of the universe could be represented by means of nothing more than geometrical constructions, constructions all based on no more than a single principle of physical geometry. This principle of Cusa's is rightly described as a "Maximum Minimum Principle." In geometry, it is recognized as including the so-called "isoperimetric theorem of topology," as that was elaborated by Bernoulli and Euler at St. Petersburg during Benjamin Franklin's lifetime. In physics, it is recognized as the Principle of (physical) Least Action, as this was variously defined, geometrically, in various stages, by Fermat, Leibniz, and the work of Karl Gauss and his successors.

Following the publication of his *De Docta Ignorantia*, Cusa devoted a number of other published writings to matters of scientific method. Leonardo da Vinci was brought to systematic study of Cusa's scientific work through Leonardo's Milan collaborator, Fra Luca Pacioli, of *De Divina Proportione* fame. From the collaboration between Pacioli and Leonardo, nearly all of modem science was set into motion, together with several revolutions in painting and music.

Briefly, to assist the layman in following this, part Pacioli's and Leonardo's collaboration which is of direct bearing upon the understanding what we have identified as "the scale of individual human activity," is the following.

In one of his most influential dialogues, the *Timaeus*, Plato presents and discusses the fact that in visual space only five regular solids can be constructed. These—the tetrahedron, the cube, octahedron, the dodecahedron, and the icosahedron—have been known since as "the five Platonic solids," or, simply, "the Platonic solids." Plato ascribes the proof of this to a collaborator working at the Cyrenaic temple of Ammon.

The importance of the "five Platonic solids," is that they are a crucial proof that visual space—as our eye-brain define the image of space for us—is not empty space stretching infinitely, in straight lines of Albertian perspective, to beyond the furthest imaginable extremes of the very, very large, and very, very small. What might appear, wrongly, to be empty space and time, has an efficient geometrical shaping, and this in a way which contradicts all of our childish intuitions about the universality of extension in straight lines.

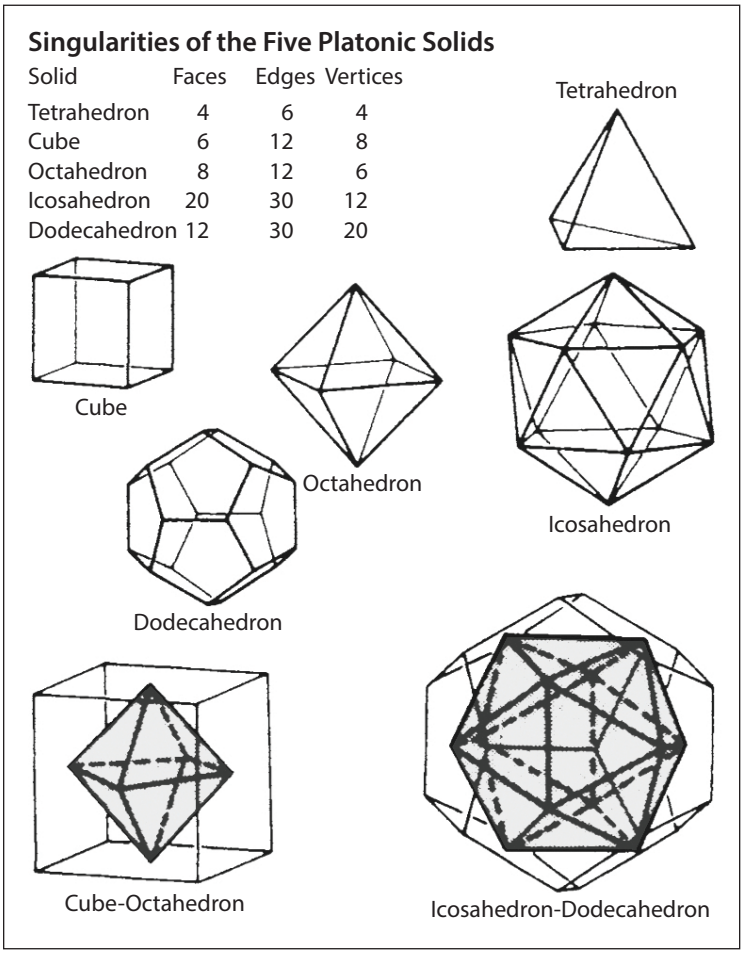
Thus, we say, physical space-time is self-bounded. This does not mean that our universe has some sort of fence around it. It means what is already clearly stated by the report that, in visual space, the only regular solids which can be constructed, excepting the sphere, are the five Platonic solids.

Plato already emphasized this notion of "self-boundedness" of visual space. For example, in his *Republic*, he supplies the usually misunderstood reference to what we call today "Plato's Cave." He warns that what we imagine ourselves to see, as images in visual space, are like shadows cast by firelight upon the wall of a darkened cave. Through our senses, we are able to know reality, but what our senses show us directly is merely the shadow of the reality.

Today, after the work of Gauss, Dirichlet, Weierstrass, Riemann, and so forth, we say, "Of course, that is true." Today, as especially in the case of "nonlinear" sorts of electromagnetic processes, we know that cause and effect occur outside the limits of our ideas of visual space. Cause and effect occur efficiently in what Gauss and Riemann enable us to define as a fully constructible geometry of the "complex domain." We can show also that the "shadows" recognized by our senses are a true, if distorted reflection, into "Euclidean space," of what actually is occurring within the physically real world of the complex domain.

Therefore, the study of the reasons for the uniqueness of the "Platonic solids" is the most fundamental line of inquiry in the physical sciences. What is the reason, that visual space should be "self-bounded" in the way this proof demonstrates? It should be obvious, that no amount of interpretation of empirical evidence, stated in terms of the physical spacetime of Descartes, Newton, Laplace, or Maxwell, is sound physics, unless we show that our observation of visual space has taken into account the reasons for the self-boundedness of the visual representation of physical space-time as a whole. Competent physical science begins, therefore, with rigorous proof that we have discovered the reason for this "self-boundedness" of visual space.

Pacioli recognized the importance of reconstructing



The five regular or "Platonic" solids.

the proof of the Platonic solids. He succeeded in producing a model of such proof which was improved upon by scientists such as Euler and Gauss during later centuries, but which that more advanced work shows to have been in the proper direction. Pacioli's and Leonardo's work shows that they properly grasped Cusa's contributions to the founding of modem scientific method. Leonardo, and Durer, Raphael, and Kepler after him, established the basis for revolutionizing our approach to architecture and urban design, as well as establishing, in a related way, the principles of "humanistic engineering" which ought to inform the work of the qualified industrial engineer.

A scientist comes away from a study of Cusa's work as a whole, with the sense that the proper descriptive name for "science" is "an intelligible representation of the lawfulness of the universe." This was what study of Cusa's work imparted to Pacioli and Leonardo, and Kepler: later. Although our subject-matter here is, the principles of architectural form which must govern the design of new cities, it is also urgent—especially if it is our goal to design cities to endure for a thousand years—that we show that those principles are premised upon unassailable truth. Therefore, we should sum up the proper meaning of "intelligible representation."

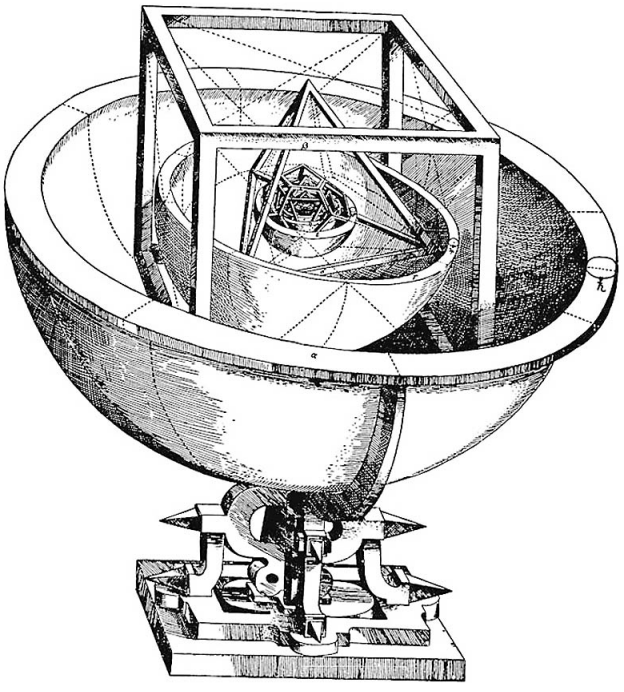
Go to a blackboard. Draw upon that board all sorts of shapes of lines, including the most arbitrarily irregular ones you are able to produce. These are "representations."

Now turn to face the classroom. Can you meet any challenge members of the class might pose to you, on the subject of these representations? Can you show under what circumstances each of those representations might necessarily exist? In other words, can you start from a single, most elementary principle of a purely constructive geometry? Can you, without aid of any additional assumptions (axioms, postulates), and without any resort to formal deductive reasoning, show how constructive geometry generates each and all of those representations you have drawn?

If you can succeed in meeting that challenge, in the fullest of its implications, you have met in that degree, the challenge of "intelligible representations," as distinct from mere "representations." The most troublesome question you must face, is the very first question: What is the correct choice of "most elementary principle"? If you grasp what that question implies, you are prepared to appreciate the genius of Cusa's work.

Two examples which I have frequently employed, over the years, bring the idea of "elementary intelligible representation" to bear with full force. I challenge you, to supply me an intelligible representation of two terms, "creation" and life." These are terms common in our vocabulary, especially the latter. In modem civilization, all serious thinkers have recognized that these two terms have a connected meaning. Yet, I challenge you: If you can put such a word into your mouth, can you also supply me with an intelligible representation of what you mean by that word, or even any representation at all?

If you use as system of reasoning such as that of Euclid's *Elements*, these two words correspond to ideas for which you have no possible representation, and cer-



Kepler's famous model of the planetary orbits as determined by a series of nested Platonic solids.

tainly no intelligible representation. Yet, already, Cusa did have an intelligible representation of both, and Pacioli, Leonardo, and Kepler, a more elaborated such representation. This representation is the fundamental idea underlying a modern form of the science of classical aesthetics, and underlying the principles of functional form for design of new cities.

In formal logic, "creation" does not occur; it is merely asserted to have occurred. "Creation" is implicitly situated between two successive moments of existence, such that something which does not exist in the first, exists in the second. There is no representation of that which occurs between the two moments.

Perhaps the most famous case of use of formal logic to deny the existence of "creation," is that expressed by Immanuel Kant, most emphatically in his *Critique of Judgment*. Kant asserted that no intelligible representation of creative mental action, such as that responsible for fundamental scientific or artistic discoveries, is possible. Kant did not assert that "creation" does not exist; he argued, that since the human mind is, according to his view, incapable of providing an intelligible representation of an act of creation, mankind can not know "creation" as an idea.

Kant's argument is absurd, with one qualification. In deductive logic, it is axiomatically impossible to provide even a representation of the idea of "creation," and certainly not an intelligible representation.

The word "life" encounters exactly the same difficulties as the representation of the word "creation." In formal logic, or in molecular biology, it is impossible to provide even a representation of "life" per se, let alone an intelligible representation.

Today, intelligible representations of "creation" are available to us even in mathematical physics, as the case of the Riemann Surface illustrates this most directly and simply.

The same Gauss-Riemann physics, applied to a more advanced representation of the work of Pacioli, Leonardo, and Kepler, permits us to provide an intelligible representation of "life" per se, as molecular biology can not. Moreover, in the same context, we can show that both notions, "creation" and "life," are of the same characteristic.

This is no digression from the principal subject-matter of the present report. A correct understanding of these two terms is essential for a rigorous definition of what architecture must measure as "human activity," for the work of designing cities which will be of durable worth for a thousand years yet to come. That connection will become clearer as we progress.

Functionally, there is only one Platonic solid, the dodecahedron, each of whose twelve equal facets is a regular pentagon; the other four—the tetrahedron, the square, the octahedron, and icosahedron—are simply and directly derived from the dodecahedron, rather than the proof of their existence being derived separately from that for the dodecahedron. So, we must say that the dodecahedron expresses adequately the self-boundedness of visual space.

The construction of both the regular pentagon, and the dodecahedron, depends upon the prior construction of the Golden Section of the circle. So, the construction of the Golden Section represents the self-boundedness of visual space. In other words, the limit of constructability of intelligible representations in visual space is constructions dependent upon the construction of the Golden Section.

This point is traced to its elementary root by aid of Cusa's solution to the problem of the intelligibility of the problem of attempting to square the circle, a solution whose result is reflected in a central way within his 1440 *De Docta Ignorantia*. Cusa implicitly eliminates

the use of deductive method in geometry and in physics, and also eliminates all need to base geometry and physics on an initial set of axioms and postulates. From this point on, in the history of development of modern physical science along a pathway of progress, through the work of Leonardo, Kepler, Leibniz, Gauss, and Riemann, circular action is the only elementary conception upon which geometry and physics are premised.

Circular action is defined, topologically, as the least amount of parametric action required to generate the relatively largest area or volume. Since volume exists, circular action must be understood as acting upon circular action in every interval, reciprocally. For purposes of identification, we call this "doubly-connected circular action." The analysis of possible constructions in visible space requires us to employ the notion of "triply-connected circular action."

That is the definition of the term "least action," not only in constructive (or, "synthetic") geometry. It is also the basis for definition of "least action" in the physics of Kepler, Fermat, and Leibniz. It is the point of derivation for the work of Gauss, Riemann, et al., in defining the form of least action in the complex domain: multiply-connected, (conical) selfsimilar-spiral action. Understanding the way in which the two definitions of physical (multiply-connected) least action are connected, is the mathematical-physics premise for those measurements of human activity central to proper architectural designs.

Pacioli and Leonardo already knew this universality of (circular) least action from the work of Cusa. For that reason, it was possible for Pacioli to elaborate a most respectable approximation of the stricter proof for the uniqueness of the Platonic solids. If universal cause-effect action is representable as multiply-connected circular action, all action in visual space is fundamentally underlaid by this form of physical least action. Hence, the self-boundedness of visual space, as shown by the Platonic solids, must be a constructible "property" of universal least action of this form. Hence, the Golden Section of least action, a construction itself derivable from nothing but this form of least action, is a sufficient demonstration of the necessary characteristic of the self-boundedness of visual space.

The most famous immediate application of this result, by both Pacioli and Leonardo as collaborators, was their definition of the form of life: All living processes are distinguished from ordinary non-living ones, in respect to morphology of growth and function, in the respect that that form is ordered as an harmonic series consistent with the harmonic series defined by the Golden Section.

Today, we qualify that discovery. Between the limits of the very, very large (astrophysics), and of the very, very small (microphysics), any process which is harmonically ordered in congruence with the Golden Section is either a living process, or is a special class of work done by a living process. Kepler, who based his founding of a comprehensive mathematical physics chiefly upon the combined work of Cusa and Pacioli-Leonardo, was the first to prove that the universe as a whole is governed by the same harmonic ordering. Some leading scientists among the writer's collaborators, are proving that a Gauss-Riemann correction for Keplerian laws of astrophysics also rules on the scale of organization of atoms and smaller scales of physics. With that qualification, Pacioli's, Leonardo's, and Kepler's geometrical (least action) definitions of living processes, is conclusively demonstrated today to be fully as accurate as Pacioli represented this to be at the beginning of the 16th century.

Thus, all of the movements and related functions of the human physiology are harmonically ordered least-actionbased movements of this sort.

This standpoint governed several aspects of the work of Leonardo. In anatomy, he explored the Golden Section harmonics of the physiology of persons, horses, birds, and so on. In pioneering the principles of design of machinery, and the design and use of weapons, the same principles predominated. He revolutionized the science of perspective, by emphasis upon anomalies of visual space associated with the periphery of vision, rather than an Albertian, linear vanishing-point. This we note in viewing the originals of such master works of Raphael as the famous murals in the papal apartment, and the "Transfiguration" on display in the Vatican museum.

It can also be shown, that his general approach to application of hydrodynamics, to not only water movements but also phenomena of electromagnetic radiation (including propagation of sound!), is based on the same principles of constructive geometry.

Thus, must "humanistic engineering" be reformulated in terms consistent with these principles of human physiology. Thus, must the design of new cities be adapted.

The Form of Mental Activity

This is also true of the most characteristic form of human mental life, the aspect of human mental life which absolutely separates mankind from the beasts. The form of design of the city must be agreeable to the form of this aspect of human mental behavior, as well as the functional requirements of form imposed by human physiology otherwise. It happens that the form of mental behavior is also congruent with the harmonics of the Golden Section. We must make clear the most relevant points involved.

Man is the only living creature who is capable of willfully changing the form of his species' behavior for the better, and does this through creative discoveries bearing upon laws of nature. Scientific and technological progress are but the paradigmatic expressions of human existence.

Today, we know how to construct an intelligible representation of the creative mental processes involved in either scientific discovery or valid works of classical forms of art. However, there is no principle in this (Riemannian) branch of mathematical physics to this effect, which was not already stated in another way by the dialogues of Plato. Looking at the Socratic method retrospectively, in examples of such dialogues from the pens of Plato and Leibniz, the work on representation of nonlinear functions by Gauss, Dirichlet, Weierstrass, Riemann, and Cantor, permits us to show that Socratic method is such a nonlinear method.

The reason that creativity is not an intelligible idea in formal logic—Kant's argument—is readily illustrated by reference to the case of any scientific discovery of a new principle.

If the previous state of scientific belief is represented in a deductive way, there is no way that the new discovery can be represented as a deductive action in those terms of reference. A new deductive schema, representing scientific belief consistent with the discovered new knowledge, can be constructed; however, there is no deductive method by which the transition from the first to second deductive schema can be represented. This is Kant's problem.

If we compare the two deductive schemas directly with one another, a crucial difference is exposed. There is a difference among one or more of the postulates of the two arrays. The act of creative thought is reflected in the form of the changes in postulates which have occurred.

That is the characteristic of the Socratic method. In that method, every proposition considered is driven to deeper and deeper levels of critical examination, until the exposure of the axiomatic basis underlying the proposition is exposed. An inappropriate, or otherwise false postulate is exposed to light, and the appropriate change in postulate effected. The correct proposition is then constructed on this new basis.

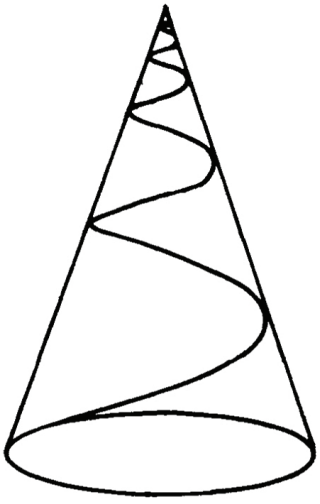
The two cases, the case of the deductive mathematical representation of two successive schemas, and the alteration of underlying postulates of propositions in Socratic method, are equivalent. The changes so encountered, in both cases, can not be made intelligible, or even represented directly, in deductive method; they have the form of a mathematical discontinuity. By definition, formal logic does not permit the construction of a continuous function which includes such a kind of discontinuity. Kant's problem.

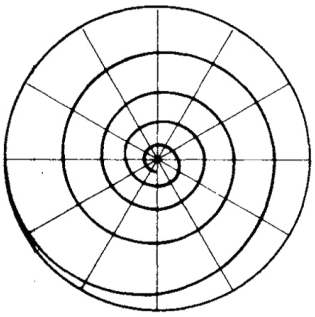
For such cases, we require continuous "nonlinear" functions of a sort which exist only in the mathematical physics of Gauss, Dirichlet, Weierstrass, Riemann, et al. Consider as much explanation of this as bears directly on the scope of this report.

Like the physics thinking of Cusa, Leonardo, Kepler, and Leibniz, the physics of Gauss and Riemann is not based on the methods of deductive geometry or algebra. It is based on the method of constructive geometry. We may say, that it differs from earlier forms of synthetic geometry because it is the constructive geometry of the complex domain, rather than of visible space. However, although that statement is an accurate one, we must restate it differently, for our purposes here.

The difference is, that the mathematics of visible space's (shadow) images is based upon multiply-connected circular action, while Gauss-Riemann physical space-time is represented by a constructive geometry based upon multiply-connected (conic) self-similar-spiral action. A doubly-connected form of least action, in the latter case, immediately defines continuous functions which generate discontinuities without losing their quality of being continuous. Such functions are the minimal precondition for representing intelligibly notions corresponding to "creation" and "life" per se.

This implies immediately the question, where does the Golden Section fit within Gauss-Riemann physical spacetime? The answer is elementary. To illustrate this in the simplest way, project the image of a cone's self-similar-spiral onto a flat surface, enclosing that spiral within a circle corresponding to the perimeter of the





The simplest illustration of how the Golden Section fits within Gauss-Riemann physical space time: Project the image of a cone's self-similar spiral onto a flat surface, enclosing that spiral within a circle corresponding to the perimeter of the cone's base. Divide the circle into 12 equal sectors by radii. Then, observe how these radii divide the lengths of the spiral's arm, and also how the spiral's arm divides the length of the radii. The divisions are those corresponding to the Golden Section.

cone's base. Divide the circle into 12 equal sectors by radii. Then, observe how these radii divide the lengths of the spiral's arm, and also how the spiral arm divides the length of the radii. The divisions are those corresponding to the Golden Section.

Since creative mental activity, as typified by the generation and assimilation of fundamental scientific discovery is the characteristic form of human mental activity to be considered in the design of cities, what we have identified as the principle of measurement for human physiology, is also the principle of measurement for human psychology.

Why Keplerian Harmonics?

I have reported earlier, that the design of the city is based upon Keplerian harmonics, with the qualification that we must employ the correction of Kepler's calculations supplied by Gauss-Riemann physics. Since nearly all university textbook and classroom instruction on the subject of Kepler's work, is rather savagely incompetent, that matter must be cleared up immediately, before indicating how Keplerian harmonics apply to the design of cities.

Kepler informs us that his solar hypothesis was built entirely around two central sets of notions, those of Cusa and those of Pacioli and Leonardo. The hypothesis around which the entirety of his work was organized, was Cusa's solar hypothesis as amplified by the work of Pacioli and Leonardo to which I made reference above.

Whether Kepler had access to the relevant sermons of Cusa, as well the works of Cusa printed for publication during the 15th century, I can not say at present. He certainly knew very well the work of Archimedes to which Cusa referenced his own discovery of what we term today the isoperimetric theorem. In crucial parts of his construction of the solar system, Kepler worked as if he knew how Cusa had treated the problem stated by Archimedes' theorems on the quadrature of the circle, as a maximum-minimum problem.

Kepler applied to Cusa's solar hypothesis the work, and associated theological, cosmogonical standpoints represented (chiefly) in Pacioli's *De Divina Proportione*. Hence, the Golden Section was central in his work, and the role of the Platonic solids subsumed by the Golden Section. Kepler's system gives us nine orbits for the principal planets: four inner planets, four outer planets, and a ninth planetary orbit lying between the two sets.

Gravitation occurs in Kepler's astrophysics as a characteristic of the self-bounded character of the visual form of physical space-time. So, Kepler's laws implicitly state the mathematical function for universal gravitation, which he links to electromagnetism as defined by Gilbert's *De Magnete*. If we examine this feature of his physics from the standpoint of the later work of Gauss, Riemann, et al., Kepler's gravitation is not as a force acting between physical bodies, but the physical effect of the geometry of least action in self-bounded physical space-time.

In other words, Kepler's space is not empty space, not mere distance between interacting bodies; it is not the space of Descartes, Newton, or Laplace. Kepler's space-time is an efficient agency. Indeed, looking at Kepler's construction of his three laws with the eyes of Gauss or Riemann, there is no distinction among matter, space, and time in Kepler's physics. Matter is physical space-time. In that specific sense, but only that sense, we may say that space-time acts directly on matter. We continue to relate our references to Kepler's work as that work would be explained from the standpoint of a student of Gauss and Riemann.

All of the 17th and 18th century opponents of Ke-

pler's methods and results were proven to be incompetent through the work of Gauss at approximately the beginning of the 19th century. Since these opponents of Kepler based the fundamental principles of their physics on the same premises used to attack Kepler, Gauss's proof showed not only that Kepler's physics was correct, relative to the erroneous arguments of Galileo, Descartes, and Newton; this proved also that the entire physics of Galileo, Descartes, and Newton was axiomatically wrong throughout.

The center of Gauss's empirical proof for Kepler, and against Galileo, Descartes, and Newton, was the case of the asteroids' orbits.

Kepler had insisted, that a planet had once existed between the orbits of Mars and Jupiter. Kepler had given both the location and harmonic-orbital values for this planet. The fact that, until the end of the 18th century, no rubble from a destroyed planet was found in such an orbit, was considered evidence of Kepler's error. Indeed, if it could have been proven that no planetary body had ever occupied that position, this would have shown a pervasive flaw in Kepler's work as a whole.

In each case, following the discovery of Pallas and Ceres, Gauss recognized that these were fragments of Kepler's missing planet. He used Kepler's orbital values for that planet to predict the next relevant appearance, of each asteroid. This successful prediction vindicated the entirety of Kepler's work on principle; after that, there was no scientific basis for continuing to regard the work of Galileo, Descartes, and Newton as competent physics.

Thus, it was proven experimentally, that our universe is not organized on the basis of "forces" through which bodies act upon one another at a distance. It was proven that our universe is not made up of separate qualities of matter, space, and time; only physical space-time exists, and to the effect that it must appear to our senses as if the geometry of empty space acted efficiently on ponderable, discrete bodies within it.

There are three features of Kepler's work which have the greatest relevance for the design of cities. 1) Although Kepler's calculations for orbits are not precisely accurate, his three laws are. These laws apply to the orbits of lunar bodies, and to modern discoveries in astrophysics in other matters. Kepler's discoveries were all essentially sound, if imperfected ones, and his general hypothesis is correct. The Gauss-Riemann corrections in Kepler's physics point the way to refining the laws and the calculations. 2) Physical space-time is harmonically ordered according to a universal principle of least action, rather than organized by means of action-at-adistance interactions through forces. The correct measurement of least action for visible space is the projection of Gauss-Riemann least action's effects upon the manifold of visible space. 3) The universe as a whole is "negentropic," not "entropic."

It is the latter of the three points listed to which we turn our attention immediately.

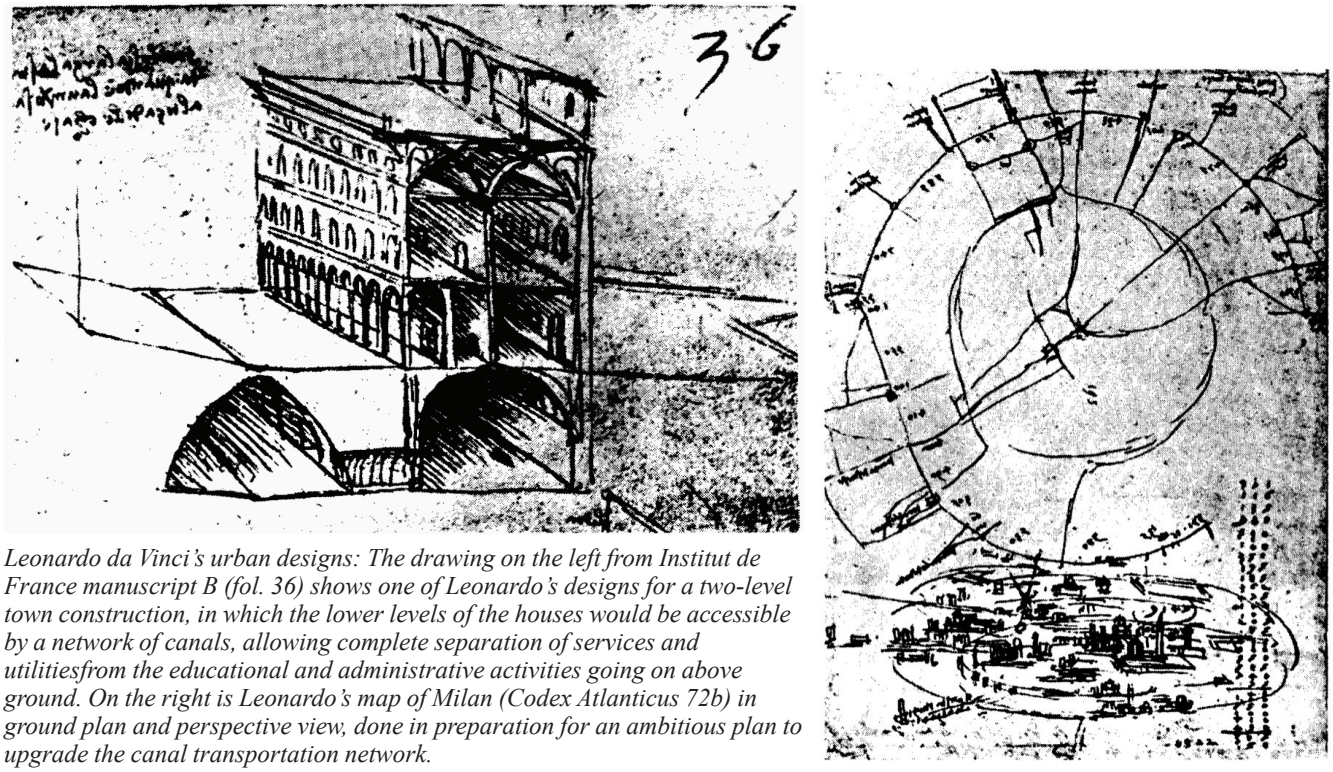
All functions which have an harmonic ordering consistent with the Golden Section represent reflections of multiplyconnected self-similar-spiral action occurring in the domain of the complex manifold. These occur only in two kinds of cases within our universe. Either they are the products of action by living processes, or they represent least-action as expressed at the extremes of astrophysics and microphysics. All processes which are harmonically ordered in a way congruent with the Golden Section belong to a single class of phenomena. They are processes which statistical thermodynamics classes as "negentropic." Unfortunately, although we can explain, on the basis of Gauss's constructive-geometric basis for probability, why such processes should appear to be "statistically negentropic," the usual statistical analysis of such processes is intrinsically an incompetent one.

Curiously, Isaac Newton was one of the first to warn of the incompetent results which result from attempting to explain fundamentals of physics from the deductive standpoint in mathematics, on which the statistical methods of Laplace, Boltzmann, et al. are based. The superimposition of a deductive mathematical schema upon the analysis of phenomena, will seem to show that our universe is running down, in the sense of a mechanical timepiece. This fact, of which Newton warned the readers of his work, is the simplest, adequate definition of what statistical thermodynamics call "entropy."

It is assumed, on such a statistical basis, that our universe is running down. It is widely assumed, that this is proceeding to such effect, that the increase of the universe's entropy as a whole is both the direction and ultimate, natural measurement of the passage of time.

That assumption of "universal entropy" is directly contrary to the astrophysical evidence, as the construction of Kepler's three laws proves the case.

We must measure "negentropy" and "entropy" in a different way. We must discard deductive mathematics,



Leonardo da Vinci's urban designs: The drawing on the left from Institut de France manuscript B (fol. 36) shows one of Leonardo's designs for a two-level town construction, in which the lower levels of the houses would be accessible by a network of canals, allowing complete separation of services and utilitiesfrom the educational and administrative activities going on above ground. On the right is Leonardo's map of Milan (Codex Atlanticus 72b) in ground plan and perspective view, done in preparation for an ambitious plan to upgrade the canal transportation network.

statistical methods included. We must employ the only available alternative, constructive geometry. In the latter case, we have the following relevant results: 1) The sense of "negentropy" is supplied as processes undergoing harmonically ordered growth congruent with the Golden Section's ordering of the visible manifold. 2) This means that "negentropy" can be measured in terms of the increasing number of discontinuities generated by the continuing process of such harmonically ordered growth. Mathematically, this is expressed in the form of Cantor's transfinite functions, as a harmonically ordered increase of the density of discontinuities within some arbitrarily small interval of action adopted as a unit of measurement. 3) This means that "entropy" must be measured as reversed "negentropy." As life is the paradigm of "negentropy," death and decomposition are the paradigm of entropy. Yet, entropy harmonically occurs in different geometric ordering than for negentropic processes.

That is sufficient description of the background to permit us to proceed to the matter of applications to the design of new cities.

Cities as 'Negentropy Machines'

Successful economic processes belong to the class of negentropic processes.

On first examination of its physical characteristics, a successful economic process is typified by a continuous process of increase of the combined quality and quantity of the standard market-basket of physical goods consumed per capita. This presumes a corresponding increase of output by the operatives producing these physical goods. It presumes technological progress's causing such increases of the productive powers of labor, and improvement of the varieties and qualities of products.

It is also an improved mastery of land area. This occurs to the effect that less land area per capita is required to sustain a population in a higher standard of living, than the land area required to produce a relatively poorer standard of living at an earlier time.

So, the proper mathematical function in the science of physical economy is expressed in terms of rate of increase of the population's potential population-density. This function is elaborated in terms of the set of set constraints identified earlier. It is a "nonlinear," continuous function of the general form of a Riemann Surface function.

Assume that a city satisfying this function's requirements, has reached the limit of population growth built into that city's design. Let us consider the "equilibrium condition" so defined.

First, as to population.

The fecundity remains constant, at the same rate after the population limit is reached, as earlier. So, the limit of population growth is expressed in terms of the number of households, and the number of persons limited only by the number of households comprising the total census of households. The "excess population" is deployed to populate new cities, including some on Mars.

Second, as to employment.

The labor force is defined as a function of the total population of labor force age. Of this, initially, on Earth, about half should be employed as operatives employed in production of household goods, producers' goods, or development, maintenance and operation of basic economic infrastructure (transportation, water management, communications, production and distribution of energy supplies, and basic urban sanitation). About one-tenth or more are employed as scientists, engineers, in direct management of production as such, medical professionals, or in teaching of the young. Unemployed members of the labor force, and persons in other occupations, combined, are kept within the limit of less than 40% of the total labor force, preferably less than 35%.

Within this composition of employment, several interrelated shifts occur as both the level and rate of technological progress are advanced. A smaller percentage is employed in production of households' goods, relative to growth in the ratio employed in the production of producers' goods. In production of producers' goods, there is increased emphasis on employment in the machine-tool class of production. The ratio of scientists and related professionals to the total size of the labor force rises. Gradually, there is a shift of employment from operatives' categories into science categories.

In social life.

As technology advances, the average school-leaving age rises in the direction of equivalence to a terminal degree in physical sciences. As the working day is shortened, the leisure so generated is consumed largely in adult education; this is aimed significantly at upgrading the technological competencies of the labor force as a whole, but also for the enriched development of the character of the adult individual, through scientific "leisure hobbies" and participation in the life of classical forms of art, in addition to travel.

Hence, the "Sun" of our city is at the city's center, a complex of facilities for secondary and higher education, for conduct of classical fine art, and similar activities, situated in a park and garden zone in the center of the city. Knowledge in the form of science and fine art are the heart of the city, the driving-force of the city's development. By affirming this, in such a fashion, we make the development of the character of the citizen to the fullest of its potentials the mainspring of life within the city.

Such design of the city, defines a knowledge-intensive society, and knowledge-intensity as the driving force of the city's maintenance, growth, and economic as well as cultural development. The energy driving the city, is produced in the outer orbit of the "outer planetary" region. This supply of energy is constantly increasing, per capita and per hectare, for the city as a whole. The effective energy-flux density with which this energy is applied to the target-areas of work, is also increasing. Yet, these energy supplies, their growth, and the shaping of their application, are always under the control of knowledge radiating from the city's "Sun."

The administration and commercial functions of the city are most proximate to the central park. Here, the density of land usage, per capita unit of human activity, is at the highest, and the structures, correspondingly, generally the tallest.

As we move outward, the density of movement per square hectare attenuates harmonically.

Beyond the F-sharp orbit separating the inner from outer city, we reach first the orbit of densest land use by the labor force's productive activities. The three further orbits each represent a less dense employment per unit of productive activities, including the power-generating complex for the city.

Beyond the last orbit, there is permanent agricultural, forest, and related uses of land, until the outer boundaries of the next city or township are encountered. No suburban sprawl is to be permitted, for ecological reasons, as well as economic ones.

Agriculture is at the verge of a fundamental revolution, and the agricultural needs of permanent colonies on Mars will be a goad to more rapid advancement in these directions.

The amount of agricultural product per hectare is about to increase by an order of magnitude, through methods which popular opinion today would, somewhat inaccurately, associate with large, multi-story "hydroponics" factories. The social system which has served the United States so well—family and intra-family-operated entrepreneurial farming—should be

protected and preserved, thus ensuring the best rate of improvement of quality of product, together with the highest rates of effective innovation.

Yet, we know that the maintenance of highly productive biomass, in the forms of crops, pasturage, water management, and well-managed woodlands, is essential to maintaining the general environment. The best way in which to accomplish this, is to entrust this work to entrepreneurial farmers, counting this maintenance of cultivated farm, pasture, and forest land as part of the necessary cost of agricultural production as a whole.

It must be our object to break the pattern of suburban sprawl, driven only by speculative gains, which is destroying so much of the land area of the United States today. We can effect all the qualities of beauty, privacy, and function, which might be sought through modes of suburban sprawl, in well-designed new cities, designed to remain viable for up to a thousand years or more. The initial investment per cubic meter of volume of dwelling constructed, will be much higher (at first), but the average annual cost of possession, in terms of maintenance and amortization combined, will be much less.

The judicious channeling of very low-cost public credit, loaned through the banking system and governmental capital improvements agencies and authorities, will make this change in construction policy feasible. The accelerated demand for the new types of materials and other products used for such construction, will expand the turnover and investment rates in such industries to the point of fostering a rapid rate of technological advancement in those industries. This increase in productivity, in a large sector of the economy as a whole, will rapidly lower the effective average physical costs of construction, for the city-building and kindred programs as a whole; the expansion of investment in advanced technologies in that sector, will spill over into the economy more generally. Within less than a generation, perhaps, the costs of housing and other construction for new cities' designs will fall to levels of per capita social cost below those of today.

The heaviest increment of cost in the building of the city, will be the emphasis upon building the deep substructure first, and then putting the upper portion of the city upon that prepared substructure. This is the cheapest way of building substructure of a city. With the proper designs, and use of the proper materials, this substructure will be cheaper to maintain, and to improve technologically, than present alternatives. The combined cost of amortization and maintenance of this substructural investment will drop to below that of what is presently considered a conventional city.

The utilities built into the city will last for centuries, and will be cheap to maintain for per capita unit of activity which those utilities support. The savings in movements of persons and goods will be greater than the apparent added initial costs of amortization of the investment, with none of the costs which the cities and their inhabitants of today endure in the forms of street traffic congestion, pollution, time delays, and costs.

It is not necessary, in this location, to detail the technologies involved in building the city. We know that such things can be done with technologies existing or in sight today. It is sufficient to supply the architects and their fellow professionals the set of criteria to be met, and leave it to such professionals to do what they do best.

We know, with a fair degree of certainty, the general nature of the scientific advances likely to occur during the next hundred years. A glance at some of the leading facts this involves, guides our attention to those principles which show why our new city should endure in its original design for a thousand years, or perhaps even two or more thousand.

For the coming 50 years, inorganic physics will be dominated by the development of controlled thermonuclear fusion as mankind's new energy source, and by increasing use of the technologies of "nonlinear" electromagnetic radiation. During the first half of the next century, the new levels of technology will be associated with per capita increases in energy consumption by up to 1,000 times that of today: space colonization will write "terawatts" for power units, where the largest power-producing units today measure output in "gigawatts." Technologies of production will increase the energy-flux density of process applications to the levels of coherent gamma-ray pulses, and coherent "particle beam" radiation in the direction shown by the "free electron" laser: effective energy-flux density will increase more rapidly than the quantity of energy consumed per capita.

For thousands of years to come, biological science will be dominated by the presently emerging new science of optical biophysics. By the middle of the next century, mankind shall leap beyond the limitations of fusion energy, to more powerful technologies based upon what are now termed "matter/antimatter" reactions. Gigantic "radio telescopes," many miles in effective aperture, placed in or near the orbit of Mars during the middle of the coming century, will enable astro-

physicists to explore the most anomalous astronomical objects within our galaxy and beyond, and to assist thus in proving the discovery of new physical principles, previously unknown to physical science.

Powerful fusion engines will enable mankind to reach any destination within the region of the inner planets within days of flight. However, even the extraordinary efficiency of fusion power involves a delimiting factor of fuel load on spacecraft. Special tricks would permit limited forms of manned exploratory flight into the region of the outer planets, and development of deeper space terminals based on the logistics of the Mars colony would assist the exploration of the outer region of the solar system. Yet, manned deep-space flights beyond the solar system must wait upon the development of a more powerful, more efficient propulsion system. The mastery of what we call the "matter/antimatter" reaction, is the visible pathway for developing techniques for deeper space explorations.

So, the next 100 years' technological progress can be summed up as shaped by two successive singularities in the continuous development of improved "energy technologies." This implies, as I stress now, that there exists a "nonlinear" continuous function, through aid of which we can project, beyond a third and a fourth singularity, into hundreds of years yet to come, and might do this with as much accuracy as would be of any practical use to us in the coming decades' planning of the design of new cities to be built within our solar system.

With that in view, one can return attention now to the subject matter of foreseeable changes in the life of our new city, as a result of such technological progress.

We know two things:

1) We know that the definition of man, as man is properly defined by knowledge up to the present time, will not change. Through aid of optical biophysics' mastery of the spectroscopy of the mitotic process, we will be enabled to improve greatly the maintenance and repair of the human organism, to control the aging of tissue to significant degree, as well as achieving early conquest of cancer, and the most challenging kinds of viral infections. The increase of mean life expectancies to the age of 120 years or more, and kindred extension of the upper age limit for defining the active labor force, are likely changes. However, no foreseeable change would change the required mean free-pathway of the motions of human beings. The nuclear family household must persist, unchanged, for thousands of years to come.

For such reasons, the spatial organization of the new city need not be changed from those specifications of spatial organization which are optimal for today's technologies.

2) Presently developed levels of knowledge in the Leibnizian science of physical economy, enable us to foresee how the foreseeable directions of advance in technology will introduce modifications of technologies integral to the functioning of the city as such. The six constraints, cited above, for the LaRouche-Riemann function in physical economy, permit us to foresee these changes with as much accuracy as is required for the design of the new city.

Essentially, the spatial requirements of organization of the city will not change. What will change is the per capita (and per square meter, and per cubic meter) quantity of energy consumed, and the effective energy-flux density of the use of that flow of energy supplies.

Think of the spatial structure of the new city as the basic structure of a machine. This does not change. Think of the changes introduced as analogous to alterations of the tools developed for attachment to that machine, in company with rather continual increases in energy-flows into the machine as a whole.

All of the changes will take the form of a combined, interdependent increase of energy-density and energy-flux density per cubic meter in the volume of structure represented by the new city as a unified machine for living.

In designing the new city today, the architects must think clearly of both the kinds of modifications to be introduced to the city's spatial organization of structure over the coming centuries, and think also of how we can ensure that the needed kinds of improvements in energy and energy-flux densities can be installed with the least time and effort.

Consider again, some things that will not change. The physical-geometrical function of a chair, a bed, a table, and of personal "space for mean-free-action" by persons, in all functions, will not change. The amount of fresh water required will not exceed the proper design limits specified for a new city today, even though there may be qualitative changes in the technology of fresh water management. The amount of air required will not change, although cleaner air will be achieved by aid of qualitative changes in technologies.

Within the city, and in travel to nearby population centers, a maximum speed of about 300 miles per hour achievable with magnetic levitation, will remain ac-

ceptable specification for generations yet to come. It is probably the case, especially on Mars, but also probably on Earth, that supersonic or even hypersonic speeds of continental travel of pressurized cabins through long reaches of evacuated, subsurface tube may appear during the next century. This will not affect the internal and nearby requirements for the new city itself.

The spatial design impact of the changes is foreseeable. Today's architects must simply leave room for installation of such changes within initial structures, and must provide the ready access needed for effecting such installations with the relatively greatest economy of labor.

The harmonics of the design will never change. What will change is the level and rate of increase of effective negentropy, per capita, and per cubic meter.

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"Some things will not change: the physical-geometrical function of a chair, a bed, a table, and of personal 'space for mean-free action' by persons, in all functions, will not change." The painting shows "St. Jerome in His Study," by Antonello da Messina, ca. 1456.

A Beautiful City

The general requirement must be, that wherever each function of human activity is to be served, the form of design employed shall be the principle of harmonic ordering congruent with the Golden Section.

This includes the proportions of rooms, the relative scales of the rooms of a dwelling place, the relations of windows to room sizes, and everything else blended into a harmonic unity. Here, the architect must become at once a composer of classical polyphony, a painter with the informed eye of a Leonardo, a Raphael, a Rembrandt, and a physicist in the spirit of Kepler.

Such harmonic composition will coincide with the optimal agreement with the physiology of human least action. It will provide the optimal acoustics, the optimal distribution of light, of air movement, and so forth. The physiological requirements, so addressed, are consistent with the psychological ones.

Contrary to the cults of Romanticism and Modernism which have spoiled our great Western European tradition of classical art, nothing is beautiful unless it is consistent with harmonic orderings based on the Golden Section. Such is the beauty inherent in all living animals and plant life. Art must emulate the principle of life on this account, but it is not art unless it does something more than that.

The composer of classical fine art must start with principles of beauty, and must never conclude with any result which is not congruent with beauty. Yet, this defines the character of the particular medium in which the artist works; it does not suffice to define the stirring of that medium of beauty as art. Art is not a business of selecting by mere intuition those random stirrings of the medium seen to have the pleasing quality of beauty.

Beautiful art is art because it is composed by an accomplished artist. What defines such a composer of art is the exact same mental quality which defines the accomplished scientific discoverer: the development of the composer's creative powers of mind, together with the composer's moral character. The composer of great art works in the medium of beautiful harmonic orderings as the scientific discovery works in his or her medium. The same powers of mind, perfected to such work in the one medium, or the other, are at work.

It is this creative endeavor, in the medium of beauty, which defines great art.

For that reason, the general quality which all great art shares in common, in whatever artistic medium, is that it contains nothing not fully susceptible of intelligible representation, as I have identified "intelligible representation" above. Furthermore, the entire composition is itself susceptible of such intelligible representation, to such effect that the uniquely creative features of the development of the composition are the kernel of the artistic idea.

There is never anything arbitrary, "Romantic," in classical art. It is always delimited by the principles of harmonics associated with the Golden Section in visual space, and perfect well-tempering in classical musical composition. No principle contrary to that definition of classical beauty, no deductive sort of arithmetic principle (e. g., the 12-tone system of the musical "modernists"), must be tolerated. The "idea" associated with classical art is never akin to what we encounter so often in the Romanticist "program notes" of the concert program, record jackets, or art exhibition. The idea of a classical artistic composition is the elaboration of the specifically creative feature of the composition's development.

A great architect, like a great classical painter—such as Leonardo or Raphael—is thus a professional who might have become a great musical composer or performer, who applies the same intelligible creative principles to a different medium. The architect's medium is the humanistic science of physical economy expressed as art, governed by the same principles as great classical art.

We must free ourselves of the heritage of both Kant's *Critique of Judgment* and the evil Prof. Karl Savigny's arbitrary, irrationalist separation of science (*Naturwissenschaft*) from the arts (*Geisteswissenschaft*). This means, inclusively, that in architecture, there is no proper distinction between "art" and "function." It means, as I have stressed throughout this report, that the principles of classical artistic composition are always in implicit agreement with the best solution to a problem of function, so much so, that wherever a purported functional design deviates from the rigorous standards for classical beauty in artistic composition, the deviation represents an elementary error in the principles of functional design adopted.

All architecture is a machine for use by human beings. It must agree with the requirements of the whole human being. This wholeness is expressed by human activity in its wholeness. All human activity is activity directed by the self-developmental characteristics peculiar to the human mind. As I have shown as a matter of principles, both the physiology of individual mean-free-pathway least action, and the characteristic human creative mental activity, are forms harmonically ordered in congruence with the Golden Section in visual space. That architecture which is defective as classical art, is therefore also defective in function.

Reference Johannes Kepler's famous dissertation on the subject of the snowflake. Focus, within that paper, on the discussion of the constructions by the bees, constructions which are excellent for bees, but not for human beings. The construction is not harmonically ordered in congruence with the Golden Section. This case illustrates an absolute separation in principle, from

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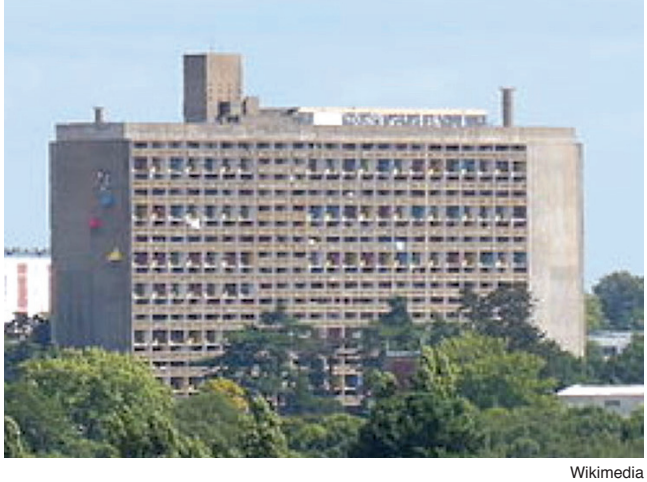


Wikimedia

Above: The bee's honeycomb. Below: The beehive-like "Unité d'Habitation" by the irrationalist architect LeCorbusier, in Nantes (France), 1952-57. Bees' constructions are not harmonically ordered in congruence with the Golden Section.

architecture for lower forms of life, and for humanity.

The most sensitive architects and students of classical painting are more notably aware of the fact, that the experiencing of the visual space in which persons' activity occurs, has an important psychological effect upon the persons experiencing that organized space. Leonardo and Raphael are of outstanding importance in any systematic study of this matter, particularly so because their own recognition and use of this principle is so directly, immediately situated with respect to the underlying principles involved.

In the experiencing of the organization of visual space, our minds draw upon the same kinds of powers of judgment we experience in the beauty of well-performed classical polyphony. Today, because of important researches into the organization of the relationship between the eye and the visual cortex of which it is functionally an integral part, we can understand the validity of Leonardo's principles of hemispherical perspective in a refined way. Although, to the extent of my present knowledge, the study of the acoustical functions of the brain are less well-mapped than those for the visual cortex, we know that Riemann's approach to the physiology of hearing was sound on principle; and, from knowledge of well-tempered polyphony, we know that the principles adduced for vision are congruent with those for the sense of beauty in hearing.

So, we know, that the same principles of creative composition expressed by such as Bach, Mozart, Beethoven, Schubert, Chopin, Schumann, Verdi, and Brahms—although not those of Romantics such as Lizst and Wagner—express in a musical medium the same underlying, proper principles of a great architectural composition. We should speak, without a sense that we might be indulging ourselves with mere metaphor or even hyperbole, of architects as composers. We should say this with an eye cast directly toward Leonardo and Raphael, but also with a sense that the musical reference is not merely analogy.

The standard should be: "intelligible representation of a beautifully artistic fulfillment of nothing but the functional purpose of the construction." The architect must start with function. By applying "Keplerian" harmonics to the understanding of that human function as an integrated whole, the problem to be solved, function, is stated also, and by no accident, in precisely the form which transforms a science of architecture into a practice of classical artistic composition, without moving one millimeter from science.

The creative solution is always in response to a problem posed in terms of satisfying the need of a human function, rather than decoration superimposed as a kind of flamboyance, upon the structural "cake." No arbitrary sort of "pleasing effect" is to be sought as mere decoration.

Since the architect is a human being, as the great classical composer is a musician, the architect designs by aid of traveling in his imagination through each mean-free-pathway activity of the persons inhabiting the city. He visualizes, in this imagination, using each part of the city for one or another of the functions of which the totality of their lives are each composed. He does this with a refined eye, doing from his more advanced standpoint in professional knowledge, more or less what I first learned to do in economic science standing, still at the age of 15, at the dinker's bench in that slipper factory.

The principles of beautiful harmonics he carries with him on this tour of the imagination, thinking of these principles not so much as ideas of beauty, but rather in terms of the harmonics of least-action movements of human individuals. The examination of each of the movements along this tour from the standpoint of Golden Section harmonics, defines for him an array of problems in geometric topology. The summation of these problems, is the total problem of this same form, the topology of the city as an integrated whole.

So, the composition of architectural design occurs in such a way, that it could be explained entirely as creative solution to the functional problem of topology so defined. It could be provided an accurate intelligible representation so.

Nonetheless, the result is a classical artistic composition in the strictest sense.

The successful solution to the topological problem of ordering human least action, will always be a "Keplerian" kind of harmonic ordering, with the included types of qualifications I have noted earlier in this report. The optimal result will seem to borrow from classical strophic forms of poetry, as does classical musical composition. Every human movement within the city, will have a characteristic harmonic value in a "Keplerian" system; the idealized, least-action form of movement facilitated by the design, is susceptible of being stated in terms of "Keplerian" harmonics.

Consequently, the coherence of design, incorporating all of the topological solutions included, can be expressed in the manner of classical musical composition.

This is more or less the same as to say that we can represent the composition of major paintings by Leonardo and Raphael in terms of principles of classical musical composition.

The architects intrude personally, as classical artists, into the composition as a whole—put their artists' signature on the composition—by the way in which they elaborate the composition as a whole.

The most famous case of this from classical music, is the history of compositions based on treatment of a collaboration between Frederick the Great and Johann Sebastian Bach, *The Musical Offering*. This represents a solution to a central problem in well-tempered polyphony, a solution which played a leading role within the later development of classical composition.

Major composers based some of their outstanding works on this: Mozart, Beethoven, Schubert, and Chopin, for example. A few examples from this history are sufficient to illustrate the point I have made on the architect's personal artistic signature on a design.

Mozart's intensive study of Bach's method of composition is reflected most strongly among compositions presented beginning 1783. He took up Bach's *Musical Offering* discovery directly in his famous keyboard Sonata No. 14, K. 457. Then, he improves greatly upon Bach's discovery in his "Dissonant" quartet, and sums up that result in the Fantasy (K. 475), which he prefixed to the sonata K. 457. Mozart's principal musical-scientific advancement beyond Bach, on this point, is his introduction of the "Keplerian" F-sharp, omitted in Bach's treatment and in his own K. 457. The implications of this F-sharp addition shaped the treatment of this Bach subject by later classical composers.

Mozart's advancement in treatment of this appears famously in Beethoven's *Pathetique* fortepiano sonata, and in other works, including his last fortepiano sonata, Opus 111. The Opus 111, in turn, supplied Chopin the referencepoint for his *Funeral March* sonata. Schubert's posthumously published C-minor fortepiano sonata is another treatment of the same subject.

From the standpoint of the topology of a "Keplerian" harmonic domain, the subject to which each composer addressed himself was the same musical-scientific problem. Yet, each introduced different sets of consideration in musical-scientific knowledge to the treatment of the subject. The compositions each differed thus, not only from those of other composers, but from the same composer's other settings of the same subject.

The most immediate difference among these compositions is shown by comparing the K. 475 with the K. 457 to which Mozart prefixed it, or between Beethoven's *Pathetique* and his Opus 111. There/ is, in these compared cases, a different choice of pathway of development. So, in those indicated cases, as in the others which might be cited, the creative-mental activity, although applied to the same general subject, was elaborated along a different pathway, to the effect that each of the compositions represents a unique sort of constructive-geometric intelligibility.

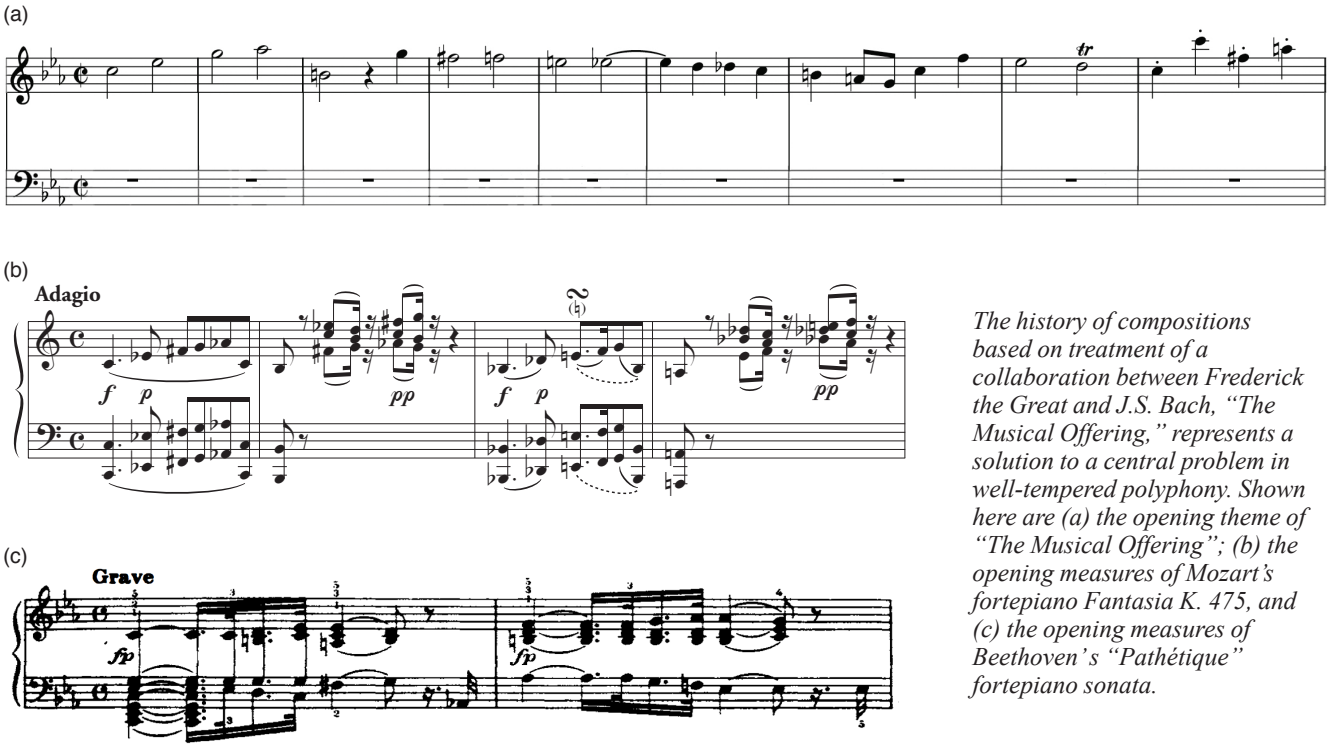
The architect's imbuing artistic coherence into the raw form of solution of the topological problem, is in no sense "mere decoration." The mind of the city's inhabitant requires that the city as a whole have the quality of intelligible coherence.

The human individual has, from birth, a double character. In the one aspect, the new-born infant is like a beast, seemingly controlled by what British philosophical liberalism denotes by "original and immediate instincts," as Adam Smith puts it, for "seeking of [sensual] pleasure, and avoidance of pain." The emotional correlative of this in the child and adult, is what we associate with the erotic impulse—something which explains Sigmund Freud, but which Freud is incapable of comprehending except in a perverted way. Yet, that same child or adult has a directly opposing character, associated with an opposing quality of emotion, designated in classical Greek by *agapē*—love of God, love of mankind, love of beauty, and love of truth.

The development of the individual character requires that the person become conscious of the distinction among the two qualities of experienced emotion, strengthen the *agapic*, and subordinate the erotic impulse entirely to those restricted occupations in which it is deployed under firm control of the *agapic*.

This *agapic* emotion is easily recognized in a child at constructive play. When that child discovers, what is for it the first time, a solution to a type of problem, the normal child is elated. "A light seems to tum on inside the mind of that elated child." Insightful adults observing this, may find themselves close to "tears of joy." In contrast, the child, instead of solving the problem in, for example, block building, may strike angrily at this construction, scattering the blocks in his rage; that is erotic.

All creative mental activity is not merely associated with the *agapic* quality of emotion, but is energized by that emotional force, without which the "mind would



The history of compositions based on treatment of a collaboration between Frederick the Great and J.S. Bach, "The Musical Offering," represents a solution to a central problem in well-tempered polyphony. Shown here are (a) the opening theme of "The Musical Offering"; (b) the opening measures of Mozart's fortepiano Fantasia K. 475, and (c) the opening measures of Beethoven's "Pathétique" fortepiano sonata.

turn off," and the solution not discovered. Contrary to some mystical speculations, the *agapic] emotion does not occur without a task-orientation in reality—although the erotic often does. It is a task-orientation associated with ideas of love of God, of truth, of beauty, and of mankind, which evokes this higher quality of emotion within us.*

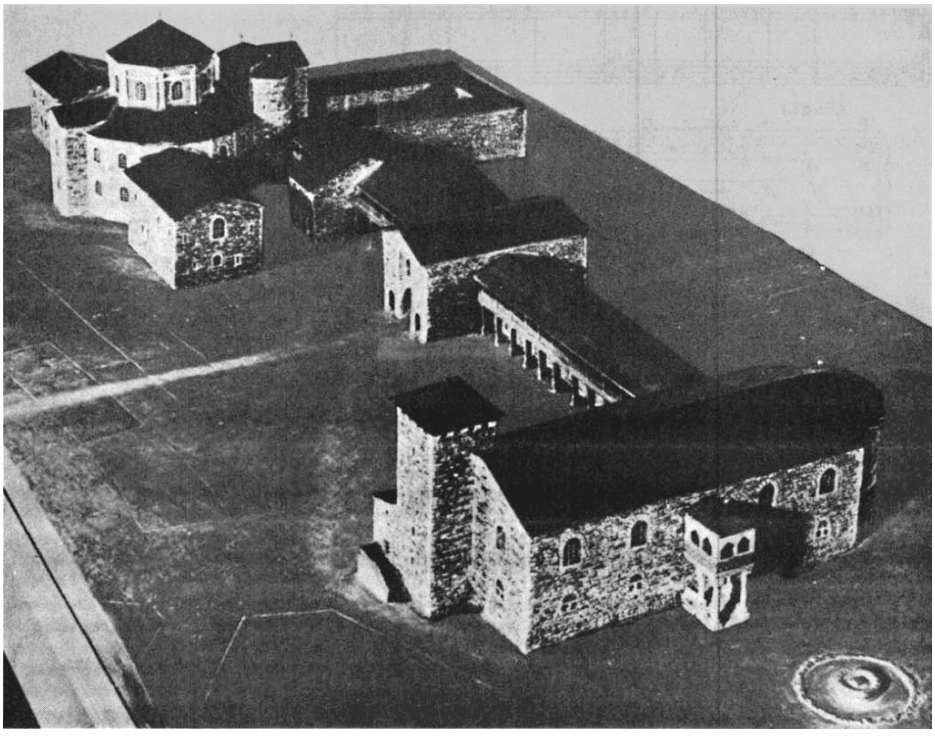
To produce a citizenry which is capable of greater use of these creative mental potentials, it is urgent to create a physical space-time for them, in which the dominant ideas expressed by human activity are those in agreement with the agapic force.

At this point, I can report without further argument of the point, that the *agapic* corresponds to the negentropic, and the erotic to the entropic. The city must be a visual space, so composed as to envelop the activities of its residents in a sense of artistic beauty. It achieves this, not by decoration, but by means of beautiful solutions to topological problems of essential functions.

A citizenry should have the means to speak only beautifully literate prose and poetry, as Dante Alighieri famously argues the importance of this. It should be subjected to nothing musical but the mastery of beautiful music. It should be surrounded with inspiring scientific and historical knowledge. The character of its young should be nurtured to the highest level of youthful potentials, by a classical-scientific, non-specialized secondary education along the lines outlined by Wilhelm von Humboldt. It should be imbued with familiarity of principles of beautiful artistic composition in visual space, and should be enveloped visually in such beauty.

The physical cause for the effect known as man's increase of society's potential population-density, and for the accompanying increase of the productive powers of labor, is "purely psychological": It is the production of advances in ideas in a way consistent with scientific and technological progress. It is the manner in which such progress in ideas reshapes human practice, that the power to perpetuate human existence is derived. Whatever increases the development of the individual character, such that *agapē* and scientific creativity are fostered, is the greatest force which society might summon to solve all the so-called practical, physical problems of life. Nothing could be greater folly, than to act on the assumption that *agapic* beauty is not essential to architecture, but merely spiritual, psychological. How could man exist, without command of that within himself, on which the existence of society depends absolutely?

Artistic beauty, thus deployed, enriches the mental powers of the population, fosters the strengthening of



Charlemagne's palace complex at Aachen, reconstructed model (Mainz, Römisch-Germanisches Zentralmuseum). In the wave of city-building unleashed by Charlemagne around 800, what were called "Augustinian principles" were the guide to the development of cathedral towns.

the *agapic* quality in human relations, and adds greatly to the strength of the city as a negentropic machine for promotion of advancement in the quality of human existence.

A Sense of Purpose

A city must not degenerate into a mere place for living and working. A city's existence must be ennobled by a higher purpose, as President Charles de Gaulle sought to uplift the French citizenry from cattle-like chewing of its own national cud, to a sense of France's unique purpose in service of the cause of civilization. Back to Cusa's *De Docta Ignorantia*: The city is a microcosm, which must consciously locate the meaningful purpose of its existence in the macrocosm.

Among all new cities, a citizen, asked what the city does, would respond automatically, to the general effect: "We are essential for making the world, and mankind better." The products of the city enrich the nation and the world. The citizen's contribution to the city's contribution to the nation and civilization generally, imbues the simplest of his or her contributions with the moral and efficient qualities of universality.

We wish that no person be homogenized by a city. We must impart the sense of the worth of individual, personal uniqueness in service of the universal, durable good. The citizen must have sound grounds to say: "I am unique, and I exist so because the general good needs the service of my uniqueness." This uniqueness is practically situated, not an arbitrary choice of "being different." There is always another task to be undertaken in the work of perfecting service to the good; there is always needed yet another person, peculiarly suited by commitment and development, to master the work of serving that unique, added need. What if that particular sort of work were no longer needed? The citizen would reply, "Then I should find something which required my unique dedication to service of the good."

The image of the working scientific seminar is a useful one, in further clarification of this point. In general, true scientific workers assemble in such seminars, not so often for a previously well-defined task; more often, the best practical results emerge simply from assembly to the vaguely defined common sense of sharing contributions to whatever useful purpose this process of sharing might itself suggest.

The right quality of such seminars is recognized among all accomplished scientific workers—at least, that is generally so. The exchange of published scientific papers approximates such seminars in some degree, but there is no adequate replacement for what such seminars contribute.

In the most fruitful seminars, what is exchanged is a discussion of preliminary experimental hypotheses. Finished results are brought in, as they bear upon this; but it is the discussion of preliminary hypotheses which is the most essential activity. The presentation of completed work, or work in progress, is usually the means for sparking the discussions; it is the discussions themselves, often moving in directions not anticipated by

any among the participants beforehand, which are often the most notable benefit.

Unfortunately, in academic liberal arts today, one finds nothing comparable to the quality of such scientific seminars. In academic liberal arts today, there is no rigorous principle of reasoning, comparable to that in serious scientific work, and few trained in the liberal arts' professions are willing to tolerate the attempt to introduce Socratic standards of rigor into the deliberative process. The new city must be designed to foster a change in that, and to spread the benefits of such change into the habits of exchanges of ideas among the citizenry generally.

The work of each and all of the citizens of the city must be integrated in a fashion akin to that of working scientists from various specialties attacking the problems of a common subject of interest in the most productive sorts of scientific seminars. This is another way of saying, that the *agapic* mood must rule: love of God, of truth rigorously sought and served, of mankind, and of beauty, is the shared motivation which binds social relations at higher levels of quality, and which thus fosters true freedom: the commitment to serving the common *agapic* purpose in one's own best way.

I do not recall a case, of a friendly, serious exchange with any person along such lines, from which I did not benefit in useful knowledge. Like my adolescent's experience with the dinker's bench, there is nothing useful from which something of value is not to be learned, sometimes with beneficial results far beyond what the circumstances might initially suggest. I love and treasure the uniqueness of each individual person, when the uniqueness is located in such a way.

That is the proper general mood and sense of social values in the new cities I wish to promote.

Do we wish to assemble forces for mastery of some important scientific problem? Build a new city with dedication to that and to future related sorts of tasks. For each other sort of important kind of purpose in service of the nation and humanity, build such a new city dedicated to that kind of work. Build new cities so, to uplift the quality and pride of entire nations, entire regions of this planet. We shall build new cities on Mars, around precisely such conceptions of function and purpose.

Now, therefore, let us begin to design and build.

ZEPP-LAROUCHE WEBCAST

The Extraterrestrial Imperative Is Key to Defeat the Deadly Pessimism Spread by the British Empire

This is the edited transcript of the Schiller Institute's July 13, 2019 New Paradigm interview with the founder of the Schiller Institutes, Helga Zepp-LaRouche, by Harley Schlanger. A video of the webcast is available.

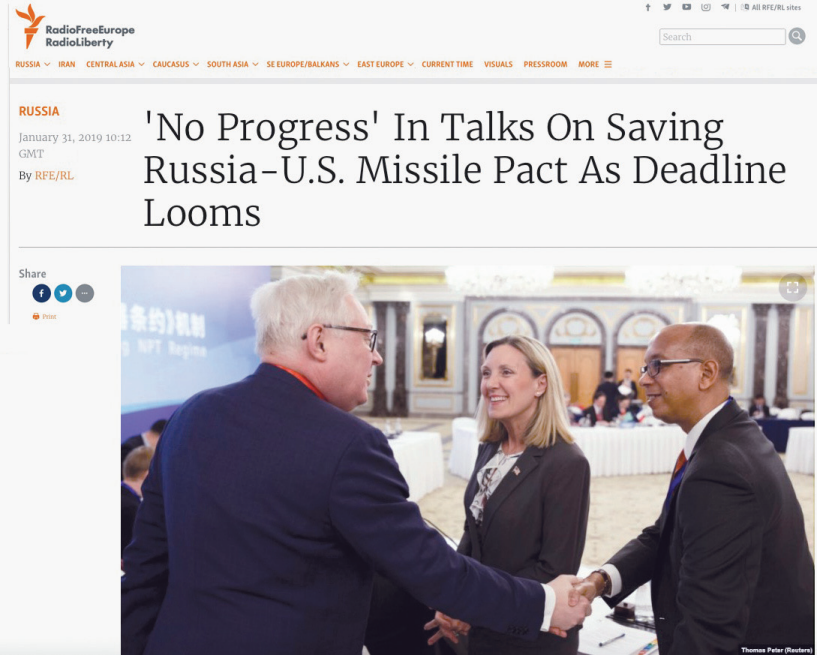
Harley Schlanger: Hello! I'm Harley Schlanger from the Schiller Institute. Welcome to our webcast with our founder and President, Helga Zepp-LaRouche. It's July 13, 2019.

I think we'll begin with some developments that are follow-ups to the G20 summit in Osaka, Japan and Trump's trip to the Korean Demilitarized Zone. There were developments in the North Korean situation in the last few days, which certainly seem to continue the "Singapore Spirit," Helga, what's going on with that?

Helga Zepp-LaRouche: That is one of the brightest spots in the strategic situation. Very clearly as a follow-up to the summit between President Trump and Kim Jong Un, the United States, in what can only be described as a step-by-step diplomatic approach, agreed to ease some of the sanctions on North Korea for the next 12-18 months. This is very important, because if you don't give anything to North Korea, you cannot expect them to go all the way in the denuclearization. The demand to do it all at once had actually led to the sabotage of the earlier U.S.-North Korean summit in Hanoi. But now the United States has agreed to ease the sanctions. North Korea has changed its Constitution putting less emphasis on the military, and instead emphasizing that science and technology *is* the most important resource of the country and it will be a high priority. I think this is a very good sign. These are positive outcomes from this summitry, but unfortunately, we are not yet over the hill.

Schlanger: I assume you would include in these positive outcomes the discussions coming up with Russia and the United States on arms talks.

Zepp-LaRouche: That is very important. The talks will take place in Geneva, between Russian Deputy Foreign Minister Sergei Ryabkov and Andrea Thomp-



DoS

Sir Kim Darroch, UK Ambassador to the United States (right, far end of table) sitting in at a meeting of Mike Pompeo, U.S. Secretary of State (left, center) and Jeremy Hunt, UK Foreign Secretary (right, center), in January 2019.

son, and one other Undersecretary of State from the U.S. side, David Hale. They will also discuss the new START (Strategic Arms Reduction Treaty) agreement, and as Ryabkov said, they will try to set up a structured dialogue to deal with all of these questions. That was exactly what had been missing the whole time, which is why people had said that the situation was more dangerous than the Cuban Missile Crisis. There are clearly positive steps unfolding.

But as I said, unfortunately it *does not* mean that the world is in safe waters; provocations are continuing, which clearly show the British hand. We had the seizure of the Iranian tanker several days ago off Gibraltar. Then both the U.S. and British defense departments claimed that Iranian speedboats were trying to guide or force a British tanker out of the international area in the Strait of Hormuz into Iranian waters, which was then intersected by a Royal Navy frigate. Those allegations were denied by Iran. It's very hard to say which story is true, but it just shows you that the situation is very far from being out of danger.

The British Ambassador to the U.S.

Schlanger: Speaking of the British hand, we have the continued fall-out of the affair of the British Ambassador to the United States, Kim Darroch, who resigned this week. But one of the most important memos that he sent back to the UK Foreign Office, was the one in which he said that Trump seems to oppose a march toward war with Iran, but another provocation could lead to a U-turn. This definitely once again shows the British desire for war, which you mentioned in terms of Iran.

Zepp-LaRouche: Yes. The fall-out of this Sir Kim Darroch affair is not yet fully developed, but it definitely has soured the so-called special relationship between the United Kingdom and the United States. And the fact that British Foreign Secretary Jeremy Hunt is giving full backing to Darroch also bodes ill if Hunt were to become Prime Minister. However, if Boris Johnson becomes the next Prime Minister, then the spe-

CC/Annika Haas

Boris Johnson, UK Secretary of State for Foreign and Commonwealth Affairs.

cial relationship would be viewed in a completely different light.

It's not just a question of personalities. The British Empire, as we have said many times, is not Great Britain—it's not even the British government, even if their hand was clearly in the Russiagate affair. What we mean by the "British Empire" is the entire system of the neo-liberal financial system, with its headquarters in London, and a little dependency, called Wall Street. It is this system of unipolar power running the world as an empire, modelling itself on the old British Empire, and based on the anti-American Anglo-American special relationship. So, that must be looked at more thoroughly. A new credit system is absolutely key to breaking up and burying that system of empire.

Schlanger: Hunt praised Darroch for acting in the best tradition of British foreign policy and diplomacy. That is precisely the case: The undermining of the United States is part of that British tradition.

In terms of provocations, Helga, there's now something brewing around the U.S. arms sales to Taiwan. Why is this significant? Why is the United States engaging in this now?

Zepp-LaRouche: This is a very dangerous. And for $2.2 billion in weapons sales to Taiwan, which China regards as a violation of the "One China" policy, why would the U.S. arm Taiwan, when officially the United States says that it agrees with the One-China policy? Now, this is a provocation. China's Foreign Minister Wang Yi, speaking from Eastern Europe where he was on a tour, said that the United States is playing with fire in doing that. All of these anomalies reflect the fact that Trump still, despite his intentions to improve the relationships with Russia and China, does not have his administration under control.

The Achilles Heel

Schlanger: We see also that Trump is now launching a tour of the United States, where he's talking about the economy, talking about some things that are important; the importance of manufacturing and so on. And yet the reality of the U.S. situation is what we just pointed out in the *EIR* on "The Bitter Truth about the U.S. 'Economic


LAPD Official Photo

Michael Moore, Los Angeles Police Chief (left): "[Homelessness] ... matches any other calamity that this city and this region in this country has seen. I believe that it is a social emergency." Shown are tents of the homeless on Crocker Street in downtown Los Angeles on July 8, 2018.

Recovery.'" We had a statement from the Los Angeles Police Department Chief, Michael Moore, about homelessness in Los Angeles. I think that says a lot about what's happening in the United States.

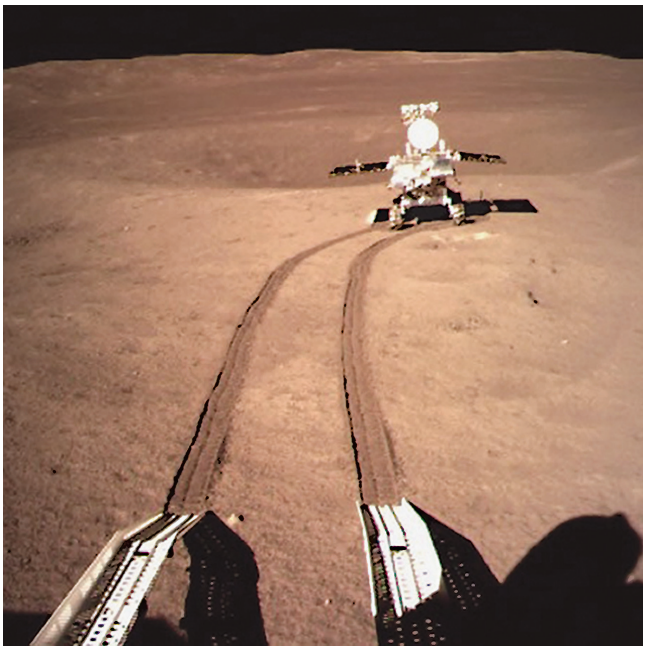
Zepp-LaRouche: He said that 800 homeless people died in 2017; in 2018, it was 900. Now that means almost three people per day. This is an unbelievable humanitarian crisis. This is what the Los Angeles Police Department Chief said. We are absolutely on the mark with the new *EIR* study "The Bitter Truth about the U.S. 'Economic Recovery'," and the absolutely urgent need to *completely* shift gears and go in the direction of the Four Laws of my late husband, Lyndon LaRouche.

Schlanger: We're coming into a moment that's quite significant historically, one that the Schiller Institute is going to be making sure that people understand its significance—that is, the 50th anniversary of the Moon landing. We're doing a lot around that, Helga. Why don't you identify for people the significance of this opportunity, now, to raise this question of space travel and exploration?

Zepp-LaRouche: The most important aspect is that it demonstrates the undeniable proof that the Earth is not a closed system. We are living in a large universe, which is, indeed, so large that even the best imagination has a hard time imagining it. For example, the Hubble Space Telescope has proven that we now know of at least *2 trillion* galaxies. There are more stars in the universe than grains of sand on Earth.

This puts the lie to the claim that resources are limited, a claim the environmentalist movement has been preaching for many decades. The Chinese mission to the far side of the Moon, where they plan to mine helium-3 as a fuel for future thermonuclear reactors on Earth, proves that any of these stars and heavenly bodies can be regarded as future sources of resources.

I find it very exciting that on the 20th of July, when we have the 50th anniversary of the Apollo Moon landing, there is a lot going on, which proves that the hiatus, at least in the West and for NASA, is over. You had the announcement by President Trump that he wants to put another man and the first woman on the Moon by 2024. There are big preparations underway in this direction.



CLEP

China's lunar rover, Yutu-2, *rolling away from the* Change'e-4 *lander on the far side of the Moon on January 3, 2019.*

Four Powers in Space

Coincidentally with this anniversary, the Chinese have reactivated their Chang'e-4 lunar lander and Yutu-2 rover on the far side of the Moon, and they have resumed their work. India has announced that in two days, on the 15th of July to start their Chandrayaan-2 mission, which is supposed to land in September near the South Pole of the Moon to investigate the ice in deep craters which are always in shadow. This is very exciting, because ice is water, and water is crucial for life on the Moon. India, which regards itself as a major space-faring nation, is actually doing that.

Ouyang Ziyuan, the chief scientist of the Chinese lunar program, announced that next year China will start its Mars mission to investigate if there can be terraforming on Mars, to find out if the conditions can be created for mankind to stay there for a long periods.

Another very good development, an area where the German science is still active and not Green, is that the largest German-Russian joint space mission was started, where they're sending space vehicles and satellites, which will study galaxies which are billions of light-years away, with higher resolution than ever before, to gain insights into the origin and history of the universe.

All of these things are absolutely exciting, because they prove that the creativity of man can always overcome barriers and open up new horizons. This is a complete refutation of the unscientific and superstitious view of the ecologists.

Schlanger: It also challenges those who say that the space program is a waste of money, it's really superfluous to the economic situation. But, your husband always emphasized the importance of new technologies and especially space technologies. How does this work to refute the neo-liberal view of economics?

Zepp-LaRouche: I think it is not money and not even resources that constitute wealth. But it is only the creative powers of reason, and the ability of man to again and again generate scientific and technological breakthroughs, which completely redefines what a resource is. That was the big fight which we fought against since its beginning.

CC

Prince Charles, in 2015.

Zero Growth: British Imperial Fascism

First of all, the Club of Rome thesis that appeared in 1972 about the limits of growth, was a complete fraud, because it was just a computer model where the end result was fixed—first, namely, to say that the resources are limited, and that therefore we have to conserve everything; we have to go to zero-growth. What they left out of their computer model was the fact that new scientific discoveries redefine what a resource is.

So, in a certain sense, this is just the last trick of the oligarchy, where their financial system is collapsing, and they are now trying to invite major investment in so-called "sustainable technologies." Goldman Sachs just put out a story saying they put out two indices, where people can see where they can invest in such sustainable technologies and play a positive moral role in this present climate debate.

People have a short memory, but these catastrophic announcements—Prince Charles came out and even changed the view of the Intergovernmental Panel on Climate Change (IPCC) that the world has only 12 years, which triggered the "Fridays for Future" hysteria among teenagers. At a meeting with the Commonwealth foreign ministers, Prince Charles declared that we only have 18 months to change the conditions which challenge the existence of mankind on this planet. He expects the ministers of the Commonwealth countries to carry out the necessary policies. This is completely crazy!

People have forgotten that in the 1980s, you had hysterical alarms about the portended dying of the forests. I remember *Der Spiegel*'s headline from the beginning of the 1980s saying that the ecological Hiroshima is about to happen, referring to the acid rain which would destroy the forests. Now, as everybody can see in Germany, the woods are in excellent condition. Later they buried this story, by saying it was not sufficiently researched, that this imprecise analysis caused a lot of depressive moods, and that they were sorry for that. Then in the 1990s, it was the ozone hole. Nobody talks about the ozone hole anymore. And now you have the world ending in 18 months.

I think this is all completely unscientific, and it makes very clear that the ecology movement is really not based on any scientific facts. They are basing their views on algorithms, on computer models, and these computer models are rigged to the benefit of the financial oligarchy and the neo-liberal system.

So, I think it's high time that we go back to science and technology, and the true laws of the universe, and then we will have bright future—but only then.

Schlanger: I find it quite humorous that Goldman Sachs is talking about moral standards when it comes to economics!

Space Visionary Krafft Ehricke

You and your husband became friends and collaborators with the space visionary Krafft Ehricke. He presented something that even goes far beyond the simple economic benefits. What is the importance of the idea of the extraterrestrial imperative that he put forward?

EIRNS/Stuart Lewis

Krafft Ehricke speaking with Marsha Freeman in New York City, November 28, 1981.

Zepp-LaRouche: It has everything to do with the identity of man and the image of man. What space travel and space research—the idea to build industrial complexes and villages on the Moon, the idea to use that industrial base for interstellar space flight of future generations—what all of this means, Krafft Ehricke very beautifully articulated in his **Three Laws of Astronautics:** 1) Nobody and nothing under the natural laws of this universe impose any limitations on many except man himself; 2) Not only the Earth, but the entire solar System, and as much of the universe as he can reach under the laws of nature, are man's rightful field of activity; and 3) By expanding through the universe, man fulfills his destiny as an element of life, endowed with the power of reason and the wisdom of the moral law within himself.

With these laws goes an incredible optimism that man can, indeed, find out the laws of the universe, and that these laws of the universe are in absolute correspondence to the laws of his own creative thinking. Now, that is very, very beautiful.

Opening the Global Manufacturing and Industrialization Summit in Yekaterinburg, Russia on July 9, President Putin spoke about the need to develop thermonuclear fusion in a crash program. He also mentioned that the beauty of fusion power is that it's one of the technologies which is very clearly imitating processes in nature. In other words, if we can have fusion power as an energy resource on the Earth, we are doing exactly what the Sun is doing in the production of light and heat. The future of technology will be more and more that we study what is the function of life, what is the function of creative reason; and that we will bring our activity on the planet more and more into cohesion with the physical laws of our universe. That will have a tremendous impact on how we handle our affairs politically on the planet.

Krafft Ehricke, by the way, was on the board of the Schiller Institute and appreciated the work of the Schiller Institute tremendously. He once told me that it's never the technology which is good or bad; it is always the human being: Is the human being morally capable of using these technologies for the good of the human species, or not? That is why he agreed that Friedrich Schiller's particular idea of the Aesthetical Education for the moral improvement of mankind was absolutely necessary to go along with scientific and technological progress, because science and technology alone don't answer the question of the moral behavior of man. But it is the Aesthetical Education, it's the influence of great art, Classical music, Classical poetry, and other Classical arts, which have the effect of ennobling the human being, and therefore, the two things absolutely have to go together.

Classical Music, Poetry, and Arts Fuel Progress

Schlanger: I think in that context, it's very interesting to see what's happening in Bolivia, with a legacy of colonial policy which has deprived such countries of that connection to Classical culture and science, and now, this relatively poor country in South America is moving ahead. This is an example of the kind of optimism you're talking about.

Zepp-LaRouche: Bolivia used to be the second poorest country in Latin America, just ahead of Haiti. In the recent years, because of collaboration, especially with Russia and China, they have done already a lot for poverty alleviation. President Evo Morales has just been in Moscow meeting with President Putin. They made many agreements: for nuclear energy, for agriculture, for infrastructure, trade deals. But especially they are very optimistic that Bolivia will become a nuclear

country. For this occasion, the Bolivian government put out a one-minute video, proudly announcing that they will become such a country, focussing on science and technology.

But, if you look at that, it's not just Bolivia; it's—as we mentioned—North Korea also wants to put primary emphasis on science and technology. Rosatom, the Russian nuclear firm, prides itself as one of the world's most advanced nuclear facilities, with the most capable of nuclear technology. They are co-investing in Egypt and are helping many other developing countries.

kremlin.ru

Russian President Vladimir Putin (right) welcomes Bolivian President Evo Morales for economic development talks at the Kremlin, July 2, 2019.

I think that what we will see in the very near future, is that many countries of the New Paradigm—that is, those countries working with the Belt and Road Initiative—will all go in the direction of higher energy-flux density, especially nuclear, with emphasis on fusion power crash programs, and even higher energy-flux density, a key notion developed by my husband, Lyndon LaRouche.

I think this is all very promising. This has incredible implications. *Politico* today has an article posing the question, "Which is the cleanest energy?" and answering, "Amazingly, it is nuclear energy." That's not a surprise, but it's important that they have started to discuss this.

Looking at the landscape and the world map, Asia is rising; but it's not just China. It's South Korea, now soon North Korea; Japan, India, many other Asian countries all absolutely committed to putting their future on innovation, on science and technology, on reason.

If you then look at certain quarters in the West—not everybody—the Italian government clearly is an exception. In their first meeting, Italian Finance Minister Giovanni Tria and his Chinese counterpart set up long-term financial structures to finance the Belt and Road projects, putting out $250 million worth of so-called "Panda bonds" to finance Italian investments of small and medium industries in China. So, Italy is clearly going ahead.

But if you look at some of the other Western countries—especially Germany, which is breaking my heart, because it's the country which has produced so many thinkers and inventors and poets and composers, and now they are on this Green suicide pact. Naturally, the Green phenomenon is also in many other European countries and the Green New Deal of the Democrats in the United States is also afflicted with the same insanity.

Green Paradigm is British Genocide

The problem is, with these policies, the West is destroying itself, while Asia is rising. I think this is a very, very dangerous phenomenon which can only lead to new conflicts. This is really behind this present confrontation by NATO and by the British, against Russia and China, because they don't want to accept that these countries have turned to the principles of science and technology and the Western elite, the neoliberal elite is absolutely stuck to the idea of making profit for a few at the expense of hundreds of millions of people. Because when you go with the Green paradigm, what you are saying is, "we stick with the speculation in CO_2 emissions and hedge fund investing in solar and windmills."

But that means only the speculators get rich. You are actually saying, whether you say it explicitly or not, that hundreds of millions of people will not have food, they will not have clean water, they will not have enough money for education, for housing; this is really

the core of the present migrations in Latin America and in Africa and Southwest Asia.

So, I think we have to get a paradigm shift. We have to come back to the idea that the human species is the only species capable of making scientific breakthroughs, of getting a better understanding of the physical laws of the universe, and that that is what increases the productivity in the production process, what increases the productivity of the labor force, and is the source of our long-term survivability.

All these were ideas which were beautifully developed by Lyndon LaRouche. This is why I keep saying, if you want to save the West, we have to have the exoneration of my husband. When what people wrongly called the Deep State, which is in reality is the Anglo-American secret service apparatus linked to this neoliberal establishment—when they put my husband innocently into jail, former Attorney General and my husband's attorney on appeal, Ramsey Clark, said that it was not just a person, it was supposed to put an entire body of ideas into jail.

If the West wants to survive, then that injustice has to be remedied and the name of my husband has to be absolutely cleared, so that people have a fresh mind and study his ideas. Because that is the absolutely crucial antidote to this stupid, silly stuff coming out of the mouths of such people as Prince Charles.

Creative Beauty is the Path to Freedom

Schlanger: I encourage our viewers to look at some of the books that Mr. LaRouche wrote. For example, *There Are No Limits to Growth*, which absolutely refuted the Green ideology back in 1983. We will be having some events over the next week in commemoration of the 50th anniversary of the first lunar landing. I'd urge people also to keep an eye on our website for that.

Helga, is there anything else? I think we've covered a lot.

Zepp-LaRouche: I think it's a good moment to reflect on the significance of space and think about the fact that the idea of space travel has everything to do with the image of man. It is an optimism which is caused by that. The oligarchy doesn't like people to be optimistic. Because if man is conscious about his or her creative powers, then you are free.

I was really both shocked and disgusted about some

EIRNS/Stuart Lewis

Ramsey Clark speaking at a Schiller Institute conference in New York City on September 10, 2016.

of the programs coming from the 2nd channel of German TV, or even some programs on the German Deutschlandfunk, which is sort of the official radio: They basically completely try to suppress the beauty of space travel, by saying this was all done by German Nazis. Well, I would really say that anybody who says this has no idea who Krafft Ehricke was, or all the other scientists, who were devoted to science, and not to an ideology which they were basically imprisoned by, or rather in circumstances where they couldn't oppose. So, to smear it that way, or when this ridiculous program in the German radio says that in the beginning people thought of astronauts as heroes; but now this has all gone, and one can see that astronauts are just victims. This is so ridiculous! Whenever you hear something like that, you should be absolutely aware, that this is the handwriting of an oligarchy that does not want you to be conscious of your own creative powers.

With that, I want you to think about it, because you will see a lot of beautiful pictures in the next days. We ourselves will have events on the 20th of July; we'll have big rallies promoting this idea. So, join the Schiller Institute and help us to get the world into a New Paradigm which is already emerging in many parts of the world.

Schlanger: OK, with that Helga, till next week. Keep spreading optimism!

Zepp-LaRouche: Yes!

Central Banks May Lead Manufacturing Recession Straight to Wall Street Blowout

by Paul Gallagher

July 12—There have been plenty of warnings since late 2018, from present and former central bank members and regulators in the trans-Atlantic countries, that the "next recession"—whenever in the future each one thought it might begin—will bring a wave of corporate defaults, which will blow up the huge debt bubble centered in the American corporate sector. Despite all the ominous talk about a "China debt collapse," recent surveys published on *Bloomberg News* have shown that far more of this bubble of overleveraged corporate debt is in the "advanced" countries, than the developing countries, including China.

VOA

Steel pipes for export pile up at Lianyungang, China, Dec. 8, 2018.

With very little coverage in those advanced countries—even in the media's financial pages—the global recession was abruptly announced at the beginning of July, with a literally worldwide set of surveys of purchasing agents showing manufacturing and industry contracting in the major nations across the globe.

'Manufacturing Downshifted'

Purchasing Managers' Indices (PMIs) of manufacturing, published all over the world on July 1 for the second quarter of 2019, showed that a global recession is underway as measured by manufacturing and industry. The exceptions are some nations central to China's Belt and Road Initiative infrastructure projects, but the advanced-sector economies are all falling.

The manufacturing sector of China itself, like the American manufacturing sector, has stopped expanding this year. Behind the noise of all the indices and sub-indices based on surveys—two such for June were published in China July 1, one a government survey of state-owned enterprises and the other a private survey of SMEs, both appearing to show contraction by a small margin—the consistent picture is one of manufacturing stagnation since the beginning of 2019. This is also true of U.S. industrial production and manufacturing employment data. In China, it appears that what is contracting sharply is manufacturing for export; for example, that sub-index of China's official NBS Manufacturing Index was at 46.3 in June. This is well below zero growth, which is indicated in these PMIs by the level 50.

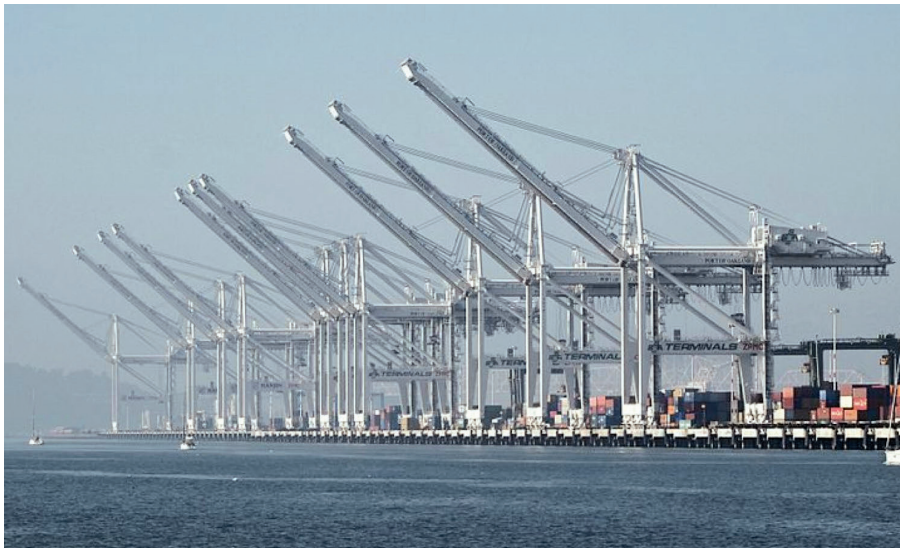
Many other Asian manufacturing indices for the second quarter show zero growth or below: Taiwan 45.5; South Korea 47.5; Japan 49.3; Australia 49.6; Malaysia 49.9. But Indonesia, Philippines, Thailand, Vietnam, and Sri Lanka continue to show manufacturing expansion.

This is "soft" data from surveying purchasing managers of large firms and CEOs of small and medium

enterprises, but it shows the impact on manufacturing of the general situation of stagnation in world trade.

One purchasing managers' index for U.S. manufacturing released July 1 was that of the firm Markit, whose chief economist is Chris Williamson. His comment:

> U.S. manufacturers' reported business conditions have remained the toughest for nearly a decade in June. The past two months have seen the lowest readings since the height of the global financial crisis in 2009. The survey … paints a worrying picture of marked declines in both output and jobs. The June survey sub-index readings are consistent with manufacturing output contracting at a quarterly rate of 0.7% and factory payrolls falling by 18,000.



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These cranes in the Port of Oakland, California are overlooking a stagnation in world exports, as manufacturing also turns down.

The so-called "Global Purchasing Managers' Index," put out by JPMorgan, piggybacks on all the others. The economist compiling it, Olya Borichevska, Vice President of Global Economic Research at JPMorgan Securities, summed up in a July 3 report:

> The global manufacturing sector downshifted again at the end of the second quarter. The PMI surveys signaled that output stopped growing, as inflows of new business shrank at the fastest pace since September 2012.… Conditions will need to stage a marked recovery if manufacturing is to revive later in the year.

And Worse in Western Europe

The industrial conditions in much of Western Europe were indicated as even worse. German industrial production is dropping, being 2-4% below 2018 levels in the past two reported months. The German Federal Statistics Office found that production in April was 1.8% below a year earlier. In May, it was 3.7% down from 2018. Also in May, factory orders in the German economy fell by 2.2%. "The great order book deflation continues," an economist at ING, a Dutch multinational banking and financial services corporation, told Reuters July 7: "Devastating new orders data just undermined any hopes for an industrial rebound."

Led by the automobile sector, which is the dominant one in German industry, and the chemical sector, the manufacturing sectors reported drastic corrections to their forecasts for the coming three months. For the auto sector, this comes against the background that 12% fewer automobiles were produced in the first half of 2018 than a year earlier; 15% fewer were exported. In the chemical sector. BASF, the leading chemical producer and a leading one on the global scale, said it expected a huge drop of 30% in production in the third quarter of 2019. Layoffs were announced: Volkswagen 7,400; BASF 6,000; Ford 5,000—just to name some of the big cases. Short work for remaining workers was announced in significant sections of the auto, metals, rubber and plastics, machine building, and leather industries, according to the German Economic Institute, DIW.

And the American "manufacturing recovery," the "exceptionalism" constantly cited by Trump Administration officials, including prominently the President himself, has clearly ended in 2019. Manufacturing job growth, as reported by the Labor Department, stopped in January. And in June, the Commerce Department reported that U.S. factory orders were up just 1.0% in a year; industrial production was up only 0.8% in the same period.

This does not even consider the American farm economy, which every observer agrees is in a terrible

federalreserve.gov

Federal Reserve Board Chair Jerome Powell presents the Monetary Policy Report to the House Committee on Financial Services on July 10, 2019.

condition following four years of falling and even negative farm income, and then devastating floods in the most productive agricultural states this year.

Race Back To Zero Interest and QE

Federal Reserve chairman Jerome Powell's virtual promise on July 10-11 to Congressional committees to start cutting the discount rate at the end of this month, completes a rout of the most important global central banks, turning away from their short-lived "normalization" talk and back toward quantitative easing, zero rates and printing money. Only last December, the Fed was still *raising* rates.

Already on June 4, Powell, speaking at a Federal Reserve conference in Chicago, said that the Fed was ready "to help sustain the recovery with whatever is necessary." Powell said, clearly referring to a return to QE, "Perhaps it is time to retire the term 'unconventional' when referring to tools that were used in the crisis. We know that tools like these are likely to be needed in some form in the future."

But the Federal Reserve's readiness to head back toward zero rates was extraordinary, considering that in May the Fed itself issued a report, and Powell a statement on it, about the growing danger of high-risk corporate debt which, it warned, is at levels relative to GDP, higher than immediately before the 2008 crash. An article in *Forbes* June 3, showed that the volume of leveraged loans in the U.S. economy has nearly tripled since 2007, while that of junk bonds (still the larger amount) has more than doubled. Between them, they are $3.5 trillion of the $14 trillion in U.S. non-financial corporate debt, with additional corporate debt steadily falling into these "junk debt" categories.

It is this bubble that the Federal Reserve is most concerned to "sustain" by now heading back toward QE.

But the so-called "central bank of central banks," the Basel, Switzerland-based Bank for International Settlements (BIS), warned again of a bank crash from corporate over-indebtedness in the advanced economies, in its Annual Economic Report released June 30. The *Guardian*'s headline about the report, "Corporate Debt Could Be the Next Sub-Prime Crisis, Warns Banking Body," was typical; it added a blurb: "Group for central banks says borrowing by firms with low credit scores is growing alarmingly, especially in U.S. and U.K."

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The Bank for International Settlements headquarters in Basel, Switzerland.

Unlike the many other warnings by regulators about the bubble of "leveraged loans" and their financial derivatives—which claim the major banks are safe and only the "shadow banks" are threatened with this bubble imploding—the BIS June 30 report directly stated that the megabanks are in danger. It said the $3.5 trillion market in what are leveraged loans—loans to already over-indebted corporations, now dominating whole economic sectors such as oil/gas and retail in the United States—is greatly "overheated," and could lead to a "bank panic" as

did the sub-prime mortgage bubble in the 2007-08 global financial crash.

The BIS report adds that, even though major banks insist they own only the safest tranches of the collateralized loan obligations (CLOs) made up of these over-leveraged corporate debts, those major banks will be hit hard if there are large numbers of defaults in these sectors.

That is exactly what is now coming on. The big London and Wall Street banks also thought they were playing it safe with the collateralized debt obligations (CDOs) made up of sub-prime mortgage securities in the 2004-07 period, when they kept only the AAA- or AA-rated tranches of those CDOs. When the mortgage securities bubble imploded, Morgan Stanley infamously led the way by suddenly losing $14 billion in this manner.

wikimedia

Deutsche Bank headquarters in Frankfurt, Germany.

The BIS report concluded,

> Already, the [global] slowdown appears to be worsening and spreading. There are signs of weak consumption and investment.… Should the leveraged loans sector deteriorate [with defaults—ed.], the economic impact could be amplified through the banking system and other parts of the financial system that hold leveraged loans and CLOs. There could be sharp price adjustments and funding tensions. These risks should be seen in the broader context of the longer-term deterioration in credit quality and the generally high corporate leverage in many advanced economies.

What Will Central Bank Panic Do?

Hardly discussed at all, however, is that the biggest central banks' turn back to money-printing and quantitative easing—in fear of the return to global economic recession and defaults—will bring the big banks' blowout on. This is seen with Deutsche Bank, currently the blowout's potential "Lehman," or first domino. The world's biggest financial derivatives bank, trying to survive with its stock down 95%, has just laid off 20% of its banking employees worldwide and tried to form a "bad bank" to offload a large mass of its derivatives contracts onto some other institutions, or even governments. It claims it can hold its new losses in the process to "just" 7.4 billion euros, and has the liquidity easily to cover them. That estimate of losses in creating the "bad bank," is widely doubted.

As pointed out in an astute comment by Alhambra Investments on July 9, these financial derivatives contracts, made over the 11 years since the 2008 crash, were overwhelmingly bets that conditions created by the central banks would "normalize" and both economic growth and interest rates would rise. (Derivatives are largely bets based on interest rates.) Because of the failure of the central banks' super-easy money policies since the crash, "normalization" has never happened in more than a decade. Still, well over $10 trillion in debt assets worldwide have interest rates below zero; and this even includes some corporate *junk bonds* for which the *buyer* of the bonds pays interest instead of the *issuer!*

And now, *central bank discount rates are heading back towards, and/or below, zero again*. So the long-held derivatives contracts of the likes of Deutsche Bank—perhaps especially Deutsche Bank, which has more of them than any other bank in the world—will keep piling up margin calls and losses, becoming more and more "toxic." Its "bad bank" is unlikely to save it from becoming the Lehman of this crash.

The lesson suggested by Alhambra Investments' Jeffrey Snyder, Head of Global Research: "Don't bet on economists and central bankers. They really have no idea what they are doing."

The trigger of the coming severe problems of the Wall Street- and London-centered banks, however, while it may lie with toxic derivatives contracts as in 2007-08, will also involve the waves of defaults now coming in the industrial and related real estate sectors of the trans-Atlantic countries, as the global manufacturing recession has begun.

SCHILLER INSTITUTE CONFERENCE

France and the Maritime Silk Road: Past, Present and Future

by Christine Bierre

PARIS, July 3—The July 2 Schiller Institute conference, "France and the Maritime Silk Road: Past, Present, and Future," held in Nantes, was a major intervention on a hot topic: France has a maritime Exclusive Economic Zone (EEZ) of 10 million square kilometers and the world's second largest maritime economic area. Nantes—a port city of 900,000 on the Atlantic Ocean and the birthplace of the visionary Jules Verne—has a place in France's "blue economy."

The four-hour conference with nine speakers was part of an international maritime exposition, La Mer XXL, that drew 38,000 visitors. Several of the speakers at the Schiller event had important institutional roles in France and all of the speakers were passionate about their subjects and conveyed a sense of optimism and mobilization. The creative ideas and science-driver perspective of Lyndon LaRouche, for the common good of mankind, were very much present.

CC/Eric Brosselin

A view of the port city of Nantes, on the Loire River in France.

The Expo was organized by one of the largest media groups in France, the Group Ouest-France; the Maritime Credit Bank; and the French Maritime Cluster, a business association encompassing all ocean-related enterprises—ports, transport to and from ports, shipbuilding, fishing, aquaculture, and deep-water research institutions in biology and mining (oil, rare earths).

Schiller Institute/Chérine Sultan

Schiller Institute booth at the La Mer XXL Exposition in Nantes, France on June 30, 2019.

For twelve days, June 28 to July 10, the Schiller Institute manned an exhibit at the Expo. At least 200 exhibitors—associations, companies, research institutions—had booths to present their work. Schiller Institute representatives were able to present the full spectrum of the Institute's activities and the 484-page French edition of the Institute's World

Schiller Institute/Chérine Sultan

Prof. Michel Cantal-Dupart (left) and Karel Vereycken, two of the speakers at the Schiller Institute Conference in Nantes, France on July 2, 2019.

Land-Bridge report released in November 2018. In the months preceding the event, the Schiller Institute had sent out mailings to regional industrialists and companies; French and Chinese engineers and scientists; and its own contact lists, and followed up with personal contact.

The four-hour, in-depth Schiller conference drew 60 people including representatives from the Friends of the Maritime Museum of La Rochelle, and the Maritime Cluster of Luxembourg, who were eager to get copies of the Land-Bridge report. People came from as far as Provence and Switzerland to participate.

Several copies of the Land-Bridge report were sold on the spot and more during the book dedication event set up at the Expo library. A professor from Africa, who attended the conference, when passing our booth the next day, said he was so excited that he persuaded his university to order five copies.

The Schiller Institute's Karel Vereycken, who has studied the maritime domain for several years, was the moderator, and opened the floor to greetings: André Sobczak, a Nantes city councilman and the 15th Vice-President for International Relations of the Nantes Metropolitan Area, warmly welcomed the participants; Anne Lettrée, CEO of China's Silk Road Business University and co-organizer of the event; two Minister Counselors of the Chinese embassy who were unable to attend at the last minute, and Minghong Chen, Chairman of the French-Chinese Intercultural Center.

Maritime Silk Road: Ancient and Modern

Vereycken presented the idea that the Maritime Silk Road in history—in China and other countries—has always been a space of cooperation and not of confrontation. With images of beautiful pottery, other ceramics, and other artistic or mechanical objects and utensils, he showed how each one, produced in one area, had designs and decorations coming from elsewhere, thanks to trade on the Maritime Silk Road. He presented another example of the high degree of development of that trade, the shipwreck of an Arab vessel made in Oman, from 826 AD, which was discovered recently on the sea floor near Java, Indonesia complete with the 60,000 pieces of ceramics and manufactured goods, in-

Schiller Institute/Chérine Sultan

Karel Vereycken speaks on the Maritime Silk Road.

Schiller Institute/Chérine Sultan

On a map in the Schiller Institute's booth at the La Mer Expo, a Schiller Institute member points out the route of the Maritime Silk Road to visitors.

cluding some with Persian motifs.

University Professor Antoine Cid followed, on Zheng He's maritime expeditions to the Gulf and eastern Africa in the early 15th century and China's peaceful and diplomatic objectives of cooperation. This activity was not limited to Zheng He, or to that period of time. Prof. Cid hypothesized that the Chinese, in the early part of the 20th century, decided to make this excellent story a positive epic narrative to convey the message that China is not a conquering power, on sea or on land.

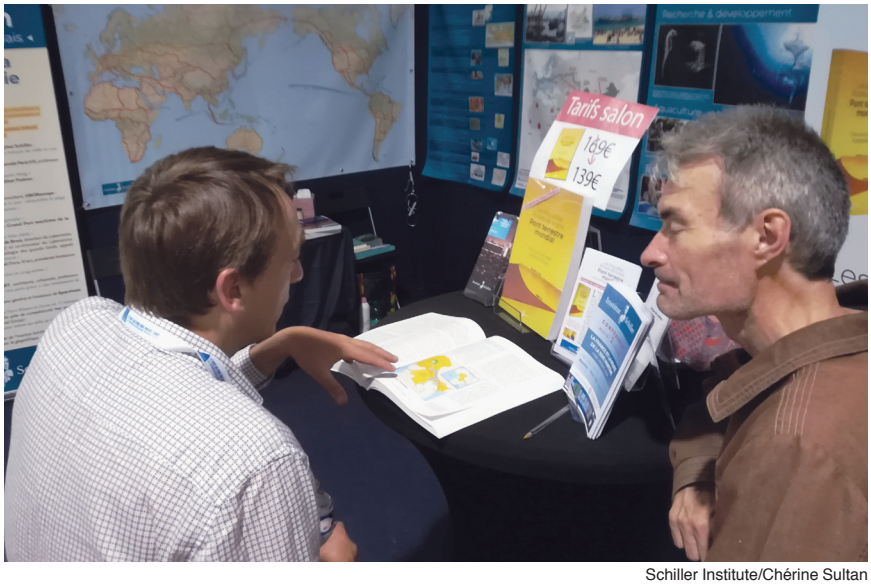
Henri Tsiang, a former researcher at the Pasteur Institute, who also played an important role in mediating between France and China after World War II, went through what is happening in the South China Sea, the issues and the actors, and how the withdrawal of the United States from the Trans Pacific Partnership (TPP) has led to the expansion of other peaceful trade initiatives in the zone, a good way of solving disputes that had been used by geopolitical forces to harass China.

Sebastien Goulard, a public affairs consultant, and founder and coordinator of OBOREurope, countered the fake "debt trap" narrative and other false stories circulated to slander China. He made clear that problems can and do arise here and there, due to changes in political power in participating countries, and due to differing conceptions of investment terms: for the Chinese it's the long term, while for the West it's the time of an election cycle.

He showed that the Chinese are quick to find new solutions: The sale of Sri Lanka's Hambantota port to a Chinese company, with the possibility offered to the state to acquire up to 50% ownership in 20 years, protects that port from political changes created in the country by competitors to China, in this case, India. Chinese investments, he showed, improve competition in a good way. After the Chinese financed the port, the Indians decided to build an airport, which in the meantime has become complementary to the port!

Sébastien Périmony of the Schiller Institute Africa Desk spoke about projects of the African terrestrial and maritime "silk roads," and reported on his recent experiences in Ivory Coast and Angola. (See *EIR* July 5, 2019.)

Contributions followed from people actively involved in New Silk Road cooperation.



Schiller Institute/Chérine Sultan

A Schiller Institute organizer at La Mer Expo.

Schiller Institute/Chérine Sultan

Odile Mojon at the literature table during the La Mer Expo.

The Silk Road Today and Tomorrow

The next speaker, Professor Mohamed Jebbar, held the audience in rapt attention. He is a professor of microbiology at Brest University, Director of the Microbiology Laboratory of Extreme Environments (LM2E) and co-director of the French-Chinese Laboratory of Deep-Sea Microbiology, called MICROBSEA, which he fought for several years to establish. The laboratory's objective is to study the conditions of ocean life at a depth of 5,000 meters—where the total absence of light had led people to believe that life was not possible, or that it was determined by life above those limits. Prof. Jebbar explained that life does exist at those depths, and that it is organized by bacteria that accomplish through chemosynthesis what the Sun accomplishes on the Earth's surface through photosynthesis. He explained to the audience how this works.

His Franco-Chinese research center collaborates with the astrobiologists of the European Space Agency (ESA) and other space agencies to see what those extreme conditions can teach us about the existence of life in space. The first test carried out in a joint effort between the Chinese and ESA was to see if the microalgae called spirulina, sent in satellites, could grow in space.

Anne Lettrée spoke on "Earth, innovation, technologies, art, nature and health, a whole program." She is an executive of the Silk Road Business School (Paris and Xi'an) who has become impassioned with China and fully supports the New Silk Road. She is creating a large holistic park, the Garden of Titans, in Normandy, with spaces for research, artwork, and theater, combined with ecology. Jane Han, the official representative in France of China's largest photovoltaic company, confirmed China's interest in this park conception.

Two important French figures spoke in the last section on the future of the New Silk Road. Michel Cantal-Dupart, architect, urban planner, and professor at CNAM (*Conservatoire Nationale des Arts et Métiers*—School of Industrial Arts and Crafts) is engaged in large urban architectural projects and territorial infrastructure—inland waterways, rapid transport—and works with the UN to develop these programs in developing countries. He was clear in his anger at the lack of vision by successive French governments for the development of France's waterways and canals—the largest set of inland waterways in Europe, which are all totally disconnected today. Instead of having a system, France has a series of dead ends.

He was followed by Bernard Planchais, the recently retired operational Director General at the National Naval Construction Company (formerly DCNS and today the Naval Group), producing civilian ocean liners and military vessels such as the *Mistral* and submarines. Planchais presented a "war plan" for France to develop its maritime economy, since France commands, after all, the second largest maritime zone in the world. While at the DCNS, Planchais worked with the nuclear sector to develop Flex Blue, a program using nuclear submarine technology to build small nuclear plants operating on the ocean floor—a great idea which, like many others, was never developed at all by our successive governments.

The conference concluded with Odile Mojon's presentation of the Schiller Institute's Land-Bridge report, in the context of the ongoing fight by Helga Zepp-LaRouche today to bring about a just new world economic order.

The organizers of the Expo were impressed by the size of the group gathered for such a four-hour, in-depth conference and requested three minutes of video footage of our event to use in their Expo publicity.

Schiller Institute Participates in Symposium with Egyptian Consulate in Houston

July 15—At the request of the Egyptian Consulate in Houston, Texas, the Schiller Institute was invited to co-sponsor a symposium at the Arab American Cultural & Community Center on the evening of June 27. The theme of the symposium was "Egypt After the Revolution."

Attending were consular guests from several countries, including Mexico, Greece, and Russia; several friends and guests of the Schiller Institute; and representatives from the World Affairs Council, the Arab community in Houston, the Caribbean American Chamber of Commerce, and a number of people representing Houston's energy sector.

The two speakers were the Houston Consul General of Egypt, the Honorable Khaled Rizk, and Brian Lantz, the Houston Schiller Institute representative. The Schiller Institute's bold perspective and strategic briefing was greatly appreciated by both the audience and the conference organizers.

Kesha Rogers

Egyptian Consul General in Houston Khaled Rizk (right), and Brian Lantz of the Schiller Institute share the speakers' table at a symposium titled "Egypt After the Revolution."

Following an introduction, Consul General Rizk delivered prepared remarks, reviewing the efforts of the Egyptian government, led by President Abdel Fattah el-Sisi, to stabilize and rapidly develop Egypt's economy after the so-called "Second Revolution," in which the Muslim Brotherhood's Mohamed Morsi was ousted as President of Egypt.

Consul General Rizk reviewed the ensuing, rapid pace of economic developments since 2013, with major projects now underway, including the new and as yet unnamed administrative capital, located 45 kilometers east of Cairo, major new industrial zones along the Suez Canal, and new offshore natural gas discoveries and prospects for natural gas exports. He added that Egypt welcomed the Russian investment in the El Dabaa nuclear power complex 130 km northwest of Cairo and China's cooperation, as in construction of the new administrative capital. Egypt also welcomes the cooperation of the United States, while pursuing its own sovereign policy of economic development.

The symposium was held on the eve of the G20 Summit in Osaka, Japan. Lantz briefed the assembled guests on the importance of the upcoming summit meetings between Presidents Donald Trump, Vladimir Putin and Xi Jinping. These meetings would potentially be a turning point, given the existing tensions over trade, nuclear weapons, and the crisis over Iran. President el-Sisi's diplomatic role with all three of these leaders is an important factor for Egypt as a key participant in the development of the New Silk Road into West Asia and Africa. The emerging new paradigm of world economic development became an important subject for future discussion. The Schiller Institute's reports on the subject, including its 2017 report, *Extending the New Silk Road to West Asia and Africa*, develop this in great depth.

In the spirit of Egypt's earlier leading role in the 1955 Bandung Conference and the creation of the Non-Aligned Movement in 1961 under President Gamal Abdel Nasser, Lantz said, Egypt is now, once again, playing a leading role in South-South relations and world affairs. He pointed out the importance of Egypt's

diplomatic efforts, working among all the countries in West Asia and North Africa in particular, for peace and economic development. Lantz cited some of Egypt's initiatives in Africa and el-Sisi's role as the new chairman of the African Union. The African Union is deeply involved in cooperation with the Belt and Road and promoting African integration.

Kesha Rogers

Audience participants in the symposium.

Lantz stressed the importance of getting the economics right—outlining Lyndon LaRouche's principles of physical economy. Africa's emerging renaissance was discussed in that context, highlighting its population potential and mega-projects: the proposal for a continent-wide system of highways and rail; the Grand Inga Dam, a proposed hydroelectric dam on the Congo River at Inga Falls in the Democratic Republic of the Congo; and the Transaqua Project, a major water diversion scheme to replenish Lake Chad.

Kesha Rogers

Hon. Khaled Rizk (left) and Brian Lantz.

Lively discussion began at the reception before the presentations and continued more intensely afterwards. Recognition of, and great respect for Lyndon LaRouche were expressed by many people. A community leader told Lantz that he had been reading LaRouche's material for years, exclaiming, "He is a genius!" An engineer was very happy to hear of the Schiller Institute's work in support of the Belt and Road Initiative (BRI) and volunteered his respect for LaRouche over the years. A business woman was excited to relate that she had participated in an art contest as a student, and won first prize for a drawing based on the original photograph of the Silk Road and the camels, as pictured on the 2014 report, *The New Silk Road Becomes the World Land-Bridge*.

Left to right: Kesha Rogers; Mirna Chaanine, Egyptian Consulate in Houston; and Jeanette Rodriguez, event attendee.

Ahmed F. Morsey, Egyptian Consulate in Houston, with Kesha Rogers.

The Schiller Institute was also invited to provide a speaker at a Chinese consular event in Houston last week, before an audience of high school students, with teachers, media, and consular officials attending.

The Schiller Institute's participation in this symposium clearly marks the rapid pace of BRI developments, and, as we have seen with the recent events throughout the United States and abroad, there is a growing recognition of Lyndon and Helga LaRouche's role in bringing about this beautiful, and urgently needed, new economic paradigm.

EDITORIAL

THE LEAKED DARROCH CABLES

Brits' Plot for a U.S. War with Iran May Backfire to Finish British Empire

by Harley Schlanger

July 12—Cables sent from British Ambassador to Washington, Sir Kim Darroch, to the British Foreign and Commonwealth Office, which were leaked to the U.K. *Daily Mail* and published July 7, show that while Darroch was wining and dining associates of President Donald Trump, he was working on a strategy to contain Trump, or remove him from office. When viewed together with the discredited anti-Trump dossier compiled by former MI6 operative Christopher Steele, which was used by Obama intelligence officials to justify a regime-change coup against him, the deployment of British oligarchic circles against Trump—and against his efforts to break decisively with the dangerous adherence to British geopolitics—becomes unmistakably clear: These were features of a desperate campaign to keep the United States engaged in wars around the globe, wars directed for the benefit of a collapsing British Empire.

At the same time, the exposure of these operations provides the basis for putting an end to the direction of U.S. policy by those oligarchic financial circles. As author Rowan Scarborough usefully points out in a July 9 article in the *Washington Times*, even before the Darroch cables were leaked, "President Trump was deeply suspicious of the British government's role in investigating him and his allies about Russian interference in the 2016 election," as indicated by his tweets about the Steele dossier. Scarborough adds that the release of this second British anti-Trump "dossier" has deepened "the President's suspicions about the U.S.-U.K. special relationship." With American statesman Lyndon LaRouche's long-standing polemics against the British Empire, and its continuing commitment to use the U.S. as the "brawn" directed by the "brains" of City of London imperialists being now so publicly validated, there is no longer any excuse for Americans to blindly enforce the dictates of this degenerate, immoral gang of genocidalists.

But it also must be understood that mankind has now entered a dangerous transitional moment, defined by the collapse of the Old Paradigm associated with the City of London and its Wall Street neocon/neo-liberal allies, and the emergence of a New Paradigm, centered around the ambitious global infrastructure policies of China's Belt and Road Initiative (BRI), one which is open to participation by the United States under President Trump. Helga Zepp-LaRouche pointed out that it can be an "extremely dangerous" situation when the power of the British Empire is threatened, as "the British always like to have a 'splendid little war' when they don't get their way." The British role in provoking Iran, while at the same time goading Trump to strike against Iran, as demonstrated in the Darroch cables, is a prime example of this danger.

Darroch and the Cables

Darroch was appointed Ambassador to the United States in January 2016, after a career that combined intelligence and diplomacy, with an emphasis on Europe and the Middle East. He served as European Union advisor to Prime Minister Tony Blair from 2004 to 2007. From 2007 until 2011, he was Blair's Ambassador to

the European Union. From 2012 until September 2015, he was the National Security Advisor to Prime Minister David Cameron. During the Blair and Cameron governments, the British steered the Bush and Obama administrations into regime change wars in the Middle East (Iraq, Libya, and Syria) and Ukraine. For his service, Darroch received the title "Sir" when the Queen knighted him as a Knight Commander of the Order of St. Michael and St. George, and made him a Commander of the British Empire.

While the cables released thus far include little from his first year in Washington, one comment submitted by Darroch shortly after Trump's victory in the November 2016 election provides a preview of what was to come. In that message, he refers to Trump's "inexperience," as he is "above all an outsider and unknown quantity." As such, Darroch advises that he will "surely evolve and particularly, be open to outside influence if pitched right.... We should be well placed to do this."

Early on, Darroch reports that he believes that the British-concocted narrative of Russiagate is true, writing that on the matter of Trump-Russia collusion, "The worst cannot be ruled out," as Trump may be indebted to the "dodgy Russians." On key policy matters, he says it is likely that Trump "will do or say things we oppose." Among potential points of contention, he refers to Trump's denunciations of the World Trade Organization, stating that he is "tearing up existing trade details." Another matter dear to the British is Trump's rejection of the Green nonsense of man-made climate change, about which Darroch reports that President Trump is likely to "undermine international action on climate change."

Darroch's cables provide an ongoing psychological profile of Trump and his administration, as part of the British effort to define a strategy which is "pitched right" to contain the American President.

He described Trump as "incompetent," and as "radiating insecurity." The White House, he wrote, is "uniquely dysfunctional" and Trump's presidency could "crash and burn," and that "we could be at the beginning of a downward spiral ... that leads to disgrace and downfall." Trump's administration is unlikely to become "more normal; less dysfunctional; less unpredictable; less faction riven; less diplomatically clumsy and inept."

However, Darroch continued—relying on Hollywood imagery to make his point more dramatic—in spite of these weaknesses, Trump may nevertheless "emerge from the flames, battered but intact, like [Arnold] Schwarzenegger in the final scenes of the Terminator.... Do not write him off."

As Trump seems to have "emerge[d] from the flames," not defeated by Russiagate, the British cables increasingly take up the question of how to manipulate the administration to stick to the special relationship. Darroch notes that the President spends his evenings phoning his friends outside the administration, "seeking reinforcement or a different take." The British Ambassador referred to those who have his ear as "Trump Whisperers," whom he boasts have been "cultivated" by the British. Referring to these assets, he writes that "we have spent years building the relationships; they are the gatekeepers ... the individuals we rely upon to ensure the U.K. voice is heard in the West Wing."

For this to succeed, he wrote, "It's important to 'flood the zone': you want as many as possible of those who Trump consults to give him the same answer. So we need to be creative in using all the channels available to us through our relationships with his Cabinet, the White House staff, and our contacts among his outside friends." Among those being "cultivated" were former White House Chief of Staff Gen. John Kelly and John Bolton, the war hawk now serving as Trump's National Security Advisor.

A 'Splendid Little War' Against Iran

This strategy is being applied to get President Trump to go to war against Iran, a favorite target of both Bolton and the British. After the President refused at the last minute to authorize a strike against Iran on June 21, Darroch wrote that Trump's Iran policy is "incoherent, chaotic." Trump, he believes, was not "fully onboard" with an attack on Iran, likely out of concern that such an action would violate his 2016 campaign pledge against new wars. However, the British Ambassador writes, hopefully, Trump is now "surrounded by a more hawkish group of advisers.... Just one more Iranian attack somewhere in the region could trigger yet another Trump U-turn," forcing him to deploy military attacks against Iran.

Two weeks after sending this cable, British Royal Marines boarded and impounded an Iranian oil tanker, and towed it to port in the British colony of Gibraltar, an action hailed by Bolton. An Iranian official responded by saying that if the British did not release the tanker,

Iran would seize a British tanker. On July 10, the British accused Iran of trying to seize a British tanker moving through the Strait of Hormuz. While this has not yet escalated, it provides yet another example of British recklessness, in pursuit of entangling the United States in another "splendid little war."

Useful Idiots

On July 10, following a series of tweets by President Trump, in which he refers to Darroch as "wacky" and a "very stupid guy," and states that the United States will "no longer deal with him," the British Ambassador resigned. The British press was filled with quotes from U.K. government officials praising Darroch, but expressing concern that the incident threatens the "special relationship," which Darroch had recently said had been reaffirmed, following Trump's visit to London. Typical of these comments is that of Foreign Secretary Jeremy Hunt, one of the two Tory candidates vying to replace Prime Minister Theresa May. Hunt praised Darroch as exhibiting "an unswerving devotion to upholding the interests of the United Kingdom, in the best tradition of British diplomacy." Indeed, in the tradition of continuing the efforts of his predecessors, such as Foreign Minister Palmerston, who backed the Confederacy in 1861, to subvert the anti-imperial tradition of the American revolution and Constitution!

While such British response is to be expected, Americans should take note of comments from several U.S. officials who wish to see Trump entangle the U.S. in another war. Republican Senator Lindsey Graham, who has defended Trump during Russiagate, turned on the President on the Darroch affair. Darroch "got a raw deal from the press," Graham stated; he "did an outstanding job," and he is "sorry to see" him resign. These sentiments were seconded by Democratic Senator Tim Kaine, who was Hillary Clinton's runningmate in 2016. Instead of focusing on Darroch's dirty operations against the U.S., Kaine blasted Trump, saying: "What this President does is he fights with our allies, and he cozies up to dictators all around the world." Richard Haas, the President of the Council of Foreign Relations, which was established to support the special relationship, chimed in, saying Darroch "did nothing wrong."

When combined with the still unraveling details of the illegal use of the lying Steele dossier to run a coup against President Trump, the Darroch cables shine a bright spotlight on the true intent of the British. Their view of an alliance with the United States is to use American military power to enforce British geopolitical doctrines, especially against the emergence of the new, inherently pro-American Eurasian alliance for economic development. Were Trump to follow his instincts, and bring the United States onboard the worldwide Belt and Road Initiative, the days of the domination of British imperial geopolitics—using wars and coups to enforce a Pax Britannica—would be ended, giving way to a new era of peaceful cooperation. That certainly is a prospect much desired by most of the world's population.

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