‘WE ARE COSMIC CREATURES’

Krafft Ehricke and the Growth of the Noösphere

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Human reason is a cosmic force. This was expressed as a scientific observation in 1925 by the bio-geochemist V.I. Vernadsky in the opening to a paper titled “Human Autotrophy”:[1]

> There exists now on the terrestrial surface, a great geological force; perhaps cosmic. . . .
>
> This force does not seem to be a new manifestation or special form of energy, nor yet a pure and simple expression of known energy. But it exerts a profound and powerful influence on the course of energetic phenomena on the Earth’s surface, and consequently has repercussions—smaller but undeniable—beyond the surface, on the existence of the planet itself.
>
> This force is human reason, the directed and controlled will of social man.

The earliest modern expression of the coherence of human reason with the Cosmos comes from the work of Johannes Kepler (1571-1630). From the moment of the validation of Kepler’s discoveries, the Solar system was no longer a distant expanse, out of man’s reach, but was an object of *reason*; recreated, recast, as something coherent with the powers of the human mind.

In putting forward his hypothesis that the planets are not merely a collection of lights strewn across the celestial sphere whose movements can be observed, measured, and predicted by a model, but rather are moved by a knowable physical cause—a physical power based in the body of the Sun—Kepler created a new science, *astrophysics*, and transformed mankind’s relationship to the Solar system.

He further perfected that discovery by demonstrating that the Solar system is not a disorganized collection of bodies which happen to inhabit the same region of space; but while it is not a fixed system, it is a *coherent* system—each planet being “tuned” in its motions to every other, in the same way the coherence of a polyphonic musical composition is brought about when many voices come together in concert to express a single idea.[2]

And so, in the early 17th Century, the Solar system became—in potential—a part of man’s domain on which he could act.

However, humanity had to wait nearly 300 years before that potential could be actualized. It wasn’t until the early 20th Century, with advancements in our mastery of principles of chemistry and materials science, and the development of powered flight, that space travel came to be something within reach.

Around this time, rocket clubs and societies sprang into existence, as across Germany, the United States, and Russia. The members of these amateur organizations were primarily young men, many of them inspired by the 1929 German film, *Frau im Mond* (*The Woman*

1. https://www.21stcenturysciencetech.com/Articles_2013/Fall-Winter_2013/Human_Autotrophy.pdf

2. For more see science.larouchepac.com/kepler/harmony and https://www.youtube.com/watch?v=yV-KcB-nc_E

in the Moon),[3] who experimented with and developed technologies for rockets, rocket propulsion, and flight. The great visionary who would later be a foundation of the U.S. space program, Krafft Ehricke, was part of this exuberant expression of enthusiasm and optimism.

Vladimir Vernadsky, 1863-1945

Thought Transforms the Cosmos

Coincident with mankind's first steps toward spaceflight was the life and work of Vladimir Vernadsky. In 1926, Vernadsky published a work for which he is well known, *The Biosphere*.[4] The first section of this great work, "The Biosphere in the Cosmic Medium," begins,

> The face of the Earth viewed from celestial space presents a unique appearance, different from all other heavenly bodies. The surface which separates the planet from the cosmic medium is *the biosphere*. . .

Keep in mind that it would be decades before anyone actually did see the face of the Earth from space, but already Vernadsky looked inward upon the Earth from its context in the Cosmos.

He continues,

> A new character is imparted to the planet by this powerful cosmic force.[5] The radiations that pour upon the Earth cause the biosphere to take on properties unknown to lifeless planetary surfaces, and thus transform the face of the Earth. Activated by radiation, the matter of the biosphere collects and redistributes solar energy, and converts it ultimately into free energy capable of doing work on Earth.
>
> The outer layer of the Earth must, therefore, not be considered as a region of matter alone, but also a region of energy and a source of transformation of the planet. *To a great extent, exogenous cosmic forces shape the face of the Earth*, and as a result, the biosphere differs historically from other parts of the planet. This biosphere plays an extraordinary planetary role.[6]

With this thesis stated at the opening, *The Biosphere* is a rigorous documentation and elaboration of the powerful and extraterrestrial nature of life on Earth. Vernadsky, in the tradition of Kepler, abolishes the separation between life and the cosmos.

During the same period, Vernadsky was also considering the unique action of *human* life on the planet. He notes that while non-human life transforms the face of the planet via its metabolism—its nutrition and respiration—creating new chemical combinations and minerals via its body, and depositing these new minerals to shape the geochemistry of the planet, man's biology has not significantly changed for tens of thousands of years, if not longer.[7] However, over that time period, man-

3. Fritz Lang's *Frau im Mond* inspired many of Germany's space pioneers, then children or young men, with the idea that humans could use rockets to travel to and explore space. The key advisor to the film was the space visionary, and mentor of many later rocket scientists, Hermann Oberth, a teacher who spent much of his life developing the early ideas and technological concepts to make rocket flight and man's operation in space possible.

4. Vernadsky, V.I. *The Biosphere*. trans. D. B. Langmuir. Springer Science & Business Media, 2012.

5. Here Vernadsky is referring to the radiation, primarily solar radiation, which reaches the Earth from space.

6. Emphasis added.

7. In a 1938 work called "Scientific Thought as a Planetary Phenomenon," Vernadsky makes a rather amusing point, a jab at certain anthropologists, that the cranium of the human skull has been roughly the same size and structure for tens of thousands of years. So, it ain't the size of your brain that matters.

kind's effect on the planet has changed tremendously—in an unprecedented way.

Compare both the quantity and the quality of materials that we as a species create and interact with, and how that has changed over the past 1,000 years—or even the past few decades! Compare where mankind is able to live today and *how* he lives, versus several centuries ago. When you look at man, he has transformed himself as a species so profoundly as a result of the power of reason, that in the beginning of the 20th Century, as Vernadsky notes, the rate at which mankind is transforming the planet—due to the increase in the power of his scientific thought and activity—is beginning to overtake that of the biosphere, despite the fact that the biosphere has also been increasing its effect on the planet over evolutionary time.

The state of the planet where man's reason is the predominant factor of development Vernadsky called the noösphere. This led him to pose a question, included in a short work from 1945:

> Here a new riddle has arisen before us. Thought is not a form of energy. How then can it change material processes?[8]

Krafft Ehricke's View of Man in the Cosmos

Krafft Ehricke's own thinking and work was very much shaped by similar considerations. In a 1977 interview, Ehricke recalled his reaction to *Frau im Mond*, when he first considered that human life could evolve off of the planet. "It impressed me enormously. I was at that time twelve years old, and it shocked me into the awareness, all of a sudden: You might be able to leave this planet, to open a new world! And since my interest already at that time was in history and astronomy and the evolution of man, in a very simple way, it kind of gave me a tremendous impulse to interest myself in space. And after two or three years in reading books, and so forth, I became firmly determined that this is an area of technology I wanted to devote my life to."

In his later writings, Ehricke uses the "oxygen catastrophe" of the evolution of life to make a point about human society. Once life reached beyond the Earth for its sustenance, through the development of photosynthesis, taking nourishment from the light of the Sun, the oxygen produced by photosynthesis accumulated in the atmosphere. Oxygen, a highly reactive substance, was toxic to life, and its buildup was poisoning the ecology of the planet. But life developed a new technology: oxygen metabolism, whereby that waste product became a resource.

In a 1974 speech, "The Heritage of Apollo," Ehricke says of life's solution to the "oxygen catastrophe": "Oxygen . . . no longer was a waste product, but stimulated the evolution of animals, the creation of a stable biosphere through expansion into all regimes of the terrestrial environment, the development of sensors and the brain, and finally the emergence of the human lifeform."

Turning to mankind, Ehricke recognized that man, as an element of reason, is inherently not subject to any limitations which tie him to Earth, and is therefore, naturally, also an element of the cosmos. By reaching for the cosmos through his aspirations for rocket flight, mankind was doing that which was necessary, and completely natural.

Ehricke says:

> We are cosmic creatures by substance, by the energy on which we operate, and by the restless mind that ceaselessly metabolizes information from the infinitesimal to the infinite; and, on the infrastructure of knowledge, pursues its moral and social aspirations for a larger and better world against many odds. Through intelligences like ourselves, the universe, and we in it, move into the focus of self-recognition. Metal ore is turned into information-processing computers, satellites, and deep-space probes; and atoms are fused as in stars. I cannot imagine a more foreboding, apocalyptic vision of the future than a mankind endowed with cosmic powers but condemned to solitary confinement on one small planet.

Realizing an Extraterrestrial Imperative

But how to begin actualizing mankind's destiny as a cosmic species? Ehricke realized that man does not become a space-faring species by simply hopping on a rocket and zooming through the void of empty space, or by merely setting foot on an alien planet; it is quite the opposite. Man does not move out into empty space; man brings extraterrestrial space—beginning with the Moon and cislunar space—into his domain, into the

8. "Some Words About the Noösphere," http://www.21stcenturysciencetech.com/translations/The_Noosphere.pdf

Chris Sloan

An artist's rendition of a Moon colony based on Ehricke's idea of "Selenopolis."

noösphere. Under the influence of human reason, mankind must transform extraterrestrial space into an expanse suitable for man's life and work. In doing this, not only does he begin to transform extraterrestrial space by our action, but in turn, mankind is itself transformed in ways which cannot be fully predicted or anticipated.

Ehricke spent the latter decades of his life concentrating on proposals for a policy of extending the noösphere (though he never used that term) into cislunar and lunar space. At the time of his death in 1984, he was still at work on a program for lunar industrialization, and a posthumously published paper called, "Lunar Industrialization & Settlement: The Birth of Polyglobal Civilization"[9] details some of his proposals.

In that paper, Ehricke puts forward this idea about the Moon:

> It is a seventh continent, almost as large as the Americas. It is large enough to support a civilization. It alone offers the opportunity to create a strong exo-industrial economy, based on highly advanced nuclear, cybernetic, and material processing technologies, ultimately turning large parts of the once-barren lunar surface into a lush oasis of life, capable eventually of exporting even foodstuffs to orbiting installations, if not to Earth.

Under the section "Lunar Development Strategy," Ehricke states that, "Lunar industry should be viewed as an organism that, over time, evolves to progressively more complex capabilities, and generates sufficiently strong foundations for expansion. Lunar industry must be broad-based and diverse if it is to last. The need for economic feasibility and early returns will require a skillful interplay between market/customer-oriented products and services, and infrastructural investments such as transportation, energy, and surface/space installations that expand food production and diversify industrial productivity."

After enumerating several guiding principles of a development strategy, Ehricke writes, "These principles… are designed to ensure steady progress; early economic viability through ongoing productivity; and supply crisis resistance. (The latter ensures that lunar personnel do not have to return to Earth because they cannot sustain their lunar existence without basic inputs from Earth.)"

This is a long-term perspective, based on moving the noösphere and man's self-sufficiency and power of development out from the planet and onto the lunar surface. To accomplish that, he lays out five stages of development, the final stage of which is the establishment of Selenopolis.[10]

Krafft describes Selenopolis thus:

> [It is a] city-state of lunar civilization…[with a] network of enclosures, gradually expanding to cover many square miles of surface and subsurface… It embodies urban, rural, agricultural, industrial, and resort areas… Selenopolis and the selenosphere are a fully developed lunar world with a large population underwritten by indus-

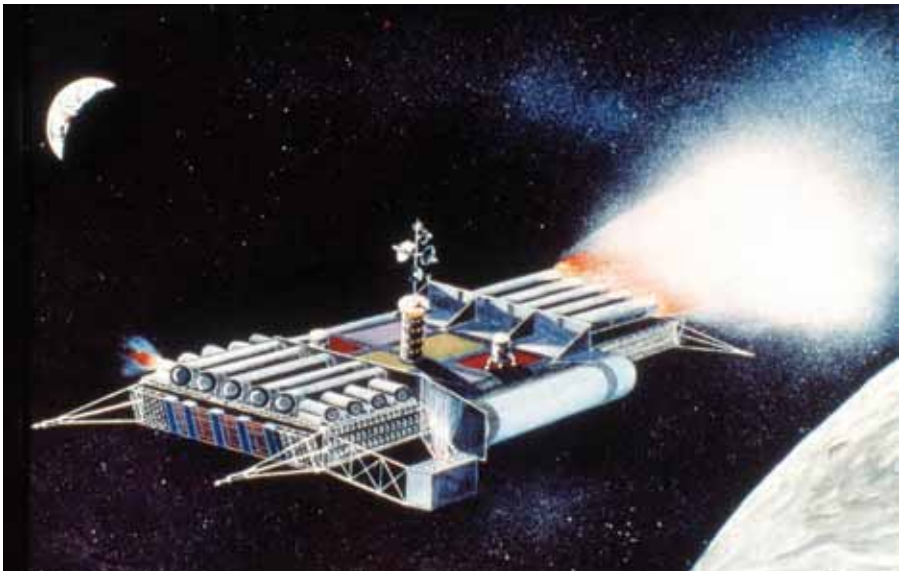
9. http://www.lpi.usra.edu/publications/books/lunar_bases/LSBchapter12.pdf

10. Selene was the ancient Greek goddess of the Moon.

try. This stage [of development] is contingent upon a strong economic foundation, a very high degree of self sufficiency, particularly in food production, and a powerful fusion energy base.

Because, as Ehricke envisions, lunar civilization must largely be economically self-determined, he poses a challenging question:

"Will this be a colony of Earth, part of the common heritage of terrestrial mankind? Or will it be an independent political entity, with Selenians in control of their own world? On a foundation of fusion power, the vast potential of the lunar economy renders the latter alternative possible and hence likely."



Ehricke's painting shows a nuclear-powered lunar freighter, which uses materials on the Moon for fuel. This is to be part of the transportation infrastructure that will open the Solar System to mankind.

The establishment of such a lunar city-state doesn't come out of nowhere. The development of capabilities, divided among prior development stages, is necessary for the possibility of establishing Selenopolis. One crucial capability is the development of the full utilization of lunar resources. This ranges from the first development stage, which is simply the prospecting and discovery of what minerals are available on the lunar surface, to the establishment of automated mining facilities, which can be attended to by people living in lunar orbit. He calls for the early establishment of production centers for oxygen, necessary both for life-support systems and also for rocket propulsion.

The most advanced stage of development of lunar resources is the establishment of a Central Lunar Processing Complex (CLPC). The CLPC will be a processing center for raw materials, among them aluminum, silicon, iron, glass; intermediate materials such as silicon chips, solar panels, powered metals; and eventually finished products such as machinery, habitats, and so on. It will be supported by remote feeder stations, which will mine resources across the lunar surface and ship the raw materials directly to the CLPC. This will be done either via electric rail, or by a technology first proposed by Ehricke: taking advantage of the low-gravity environment and lack of atmosphere on the Moon, cargo deliveries could be catapulted on a ballistic trajectory to receiver craters.

Another prerequisite for lunar settlement is the securing of an abundant and reliable source of power. Ehricke, among others, concluded that the lunar power source must be nuclear fusion, for two primary reasons. The first is that the lunar night lasts for two weeks, so solar power is out of the question. Even more to the point are the high energy requirements for fuel, materials, and other resource processing, which cannot be met by lower-power regimes. He also implies in this paper, and in other places, that for a number of reasons commercial fusion might be more easily achieved on the Moon than on Earth.[11]

Another prerequisite is that of transportation. Extending man's presence from the Earth to the Moon requires establishing a network of transportation infrastructure. The initial stage called for by Ehricke is to use existing rocket and vehicle technology to create a fleet of ships to ferry the components necessary for a Circumlunar Space Station (CSS) and other communications infrastructure into lunar orbit, and to begin the assembly.[12] The CSS will be a laboratory, a habitat for scientists and engineers, a place of leisure, and a work space. Scientists will be able to descend to the lunar

11. Also see Ehricke's 1978 "The Extraterrestrial Imperative." http://www.au.af.mil/au/afri/aspj/airchronicles/aureview/1978/jan-feb/ehricke.html

12. Since Ehricke's time, the United States and other nations have had success at in-orbit assembly and maintenance, as seen in the International Space Station.

surface via a Moon Ferry for exploration and work. He also calls for the development of a fleet of geo-lunar freighters which could make regular deliveries of raw materials, products, and other cargo between Earth orbit and lunar orbit. Many fueling stations are to be positioned between the Earth and the Moon in cislunar space, such that most of the fuel needed to travel between the Earth and Moon would not have to be lifted from the Earth's surface, but could be obtained once in orbit. This is a concept still being discussed today.

Thoughts for the Future

These examples from Ehricke's vision are offered not because his program is exactly what we will implement in every detail, when we finally begin to industrialize the Moon (though, this author suspects, we will find many of Ehricke's proposals to be ahead of their time). They are offered because they are born of a mind committed to thinking of mankind's future as one of limitless growth. His vision is based on a rigorous and scientific understanding of principles of negentropic growth, as also seen in the work of Vladimir Vernadsky. It represents a way of thinking steeped in the same understanding of the nature of the human mind seen in Johannes Kepler.

This is what we must be committed to in a revival of the U.S. space program. Specific proposals aside, the commitment to the limitless progress of man, and nothing less, is primary.

In conclusion, reflect for a moment on Krafft Ehricke, and the great optimism for mankind that he projected. He lived through a very difficult time, in Germany during World War II under the Nazis, through a very uncertain future in the United States, and then had to fight against the environmentalist and other zero-growth attacks on the space program. Through it all, he had a complete optimism for mankind, and he saw man not as a being which fills space; but rather a necessary and beautiful part of the development of the Universe.

As we in the United States move, hopefully, to join the New Paradigm being offered by the nations of Eurasia, we should remember that Krafft Ehricke was born a German, but he was also an American. This is our heritage; it is something we have a responsibility to offer the rest of the world as we move forward into collaboration with China, Russia, and all other nations, with a firm commitment to mankind's unlimited progress.