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received the Stalin Prize and an award of 200,000 rubles. As was customary, he sent half of the sum back to be used for the war effort. He also penned a note to Stalin: "Dear Joseph Vissarionovich, I request that 100,000 rubles of the prize named for you, which I have received, be directed to defense needs, wherever you see fit. Our cause is just, and at the present time it spontaneously coincides with the onset of the Noösphere—a new state of the domain of life, the Biosphere—the foundation of a historic process, when the human mind becomes an enormous geological planetary force. Academician Vernadsky."

Later that year, when he had completed "Some Words About the Noösphere," he sent his article to two addresses: to the editorial board of *Pravda*, and, to be sure, to Stalin personally.

Here is what he wrote in an accompanying note: "Borovoye, 27 July, 1943. Dear Joseph Vissarionovich, I am sending you the text of my article, which I have simultaneously submitted to the editors of *Pravda*, and which it would be useful to publish in the newspaper, because I identify a spontaneous natural process, which will ensure our fundamental victory in this world war. In the telegram I sent you, donating to the Red Army half of the prize named for you, which I received, I indicate the significance of the Noösphere. With deep respect and devotion. V. Vernadsky. I am sending you the article, because I don't know if it will be published." The article was never published in *Pravda*, nor is Joseph Stalin known to

ever have replied—or received—Vernadsky's note.¹

The 'Book of Life'

The volume before us gives a tantalizing look at the powerful mind of a great scientist, but it leaves one looking for something more substantial, an elaboration of ideas that are only touched upon in these essays. We are encouraged to hear that the same publisher is considering also translating and publishing another book-length study by Vernadsky, *Scientific Thought and Scientific Work as a Geological Force in the Biosphere*.

Having read parts of the Russian edition of Vernadsky's final, and not fully edited work, *The Chemical Structure of the Earth's Biosphere and Its Surroundings*, I have great hope that this book, which Vernadsky himself considered the culmination of his life's work—"the book of life" as he called it—will also soon find the light of day in an English version.

In this work, Vernadsky does not simply expand on an earlier text, as he did with the various versions of *The Biosphere*, but rather approaches the entire issue from a somewhat higher standpoint, from the point of view of the Cosmos as a whole, incorporating all the new ideas that he had developed in the last decades of his most productive life. Vernadsky viewed this final work as his equivalent to the great "Cosmos" that final work of his beloved scientific forebear, Alexander von Humboldt, whose books had impelled the young Vernadsky on a career of science.

While *EIR* and *21st Century Science &*

Technology magazine have published two parts of a three-part project by Vernadsky dealing with the more comprehensive space-time issues provoked by his work in biogeochemistry, the third and final part of that series, "On the Conditions of Physical Space," still remains completely unavailable to non-Russian speakers. It is hoped that the present volume will indeed lead to a resurgence of interest in this remarkable scientist, and to more of his writings in the English language.

While, in this day and age of radar and satellite imaging, many of Vernadsky's "facts" may be somewhat dated (indeed he himself would underline the fact that with the progress of science that *must* be the case), his unique view of man and the universe would be of tremendous benefit to those working in fields about which Vernadsky could have only dreamed—from terraforming Mars to astrobiology.

More important, the fundamental humanist outlook of Vladimir Vernadsky, who viewed the human species and its productive activity as the most important "geological force in the development of the universe," might help revive in society at large, some of the optimism that has been so seriously undermined by the doomsday scenarios of the environmentalist lobby.

Footnotes

1. The text later reports that Vernadsky's article was published in a small Academy journal called *Achievements of Modern Biology*. Vernadsky read the proofs in the Fall of 1944, and lived to see the issue in which it appeared.

Mining the Moon for Helium-3 To Power Fusion Reactors

by Marsha Freeman

Return to the Moon: Exploration, Enterprise, and Energy in the Human Settlement of Space

by Harrison Schmitt
New York: Copernicus Books, 2006
Hardcover, 335 pp., \$25.00

Since President Bush presented his January 2004 initiative for America to return to the Moon, many comments, criticisms, and offers of advice have

been written by the science, engineering, and space communities. But few are as qualified to offer proposals on how this program should be carried out as geologist, Apollo 17 astronaut, former Senator, and professor of engineering, Harrison Schmitt.

When most former astronauts write books, they are usually memoirs of their lives and experiences in space. Harrison



Schmitt has worked, virtually since he was the last man to leave his footprints on the Moon in 1972, on the question of how astronauts will return. His new book lays out his plan.

For nearly 20 years, Dr. Schmitt has

worked with Dr. Gerald Kulcinski and other researchers at the Fusion Technology Institute at the University of Wisconsin in Madison, who are investigating the possibility of creating thermonuclear fusion energy using the rare isotope of helium-3.

The reason this particular program is of great interest to Schmitt, is that the nearest and most accessible reservoir of helium-3 is on the Moon.

Helium-3 as a fuel for fusion power has advantages over the heavy hydrogen isotopes deuterium and tritium, which are used in today's fusion experiments around the world. (See the Summer 1990 issue of *21st Century Science & Technology* magazine for a comprehensive discussion of fusion using helium-3.) There is enough helium-3 deposited by the solar wind on and near the surface of the Moon to power the world's economy for millennia.

The importance of the treasure-trove of helium-3 on the Moon as the fuel for fusion has been well recognized by other nations. Japan, Russia, and China stress obtaining the energy resources of the Moon as a goal of their exploration programs.

On Dec. 26, Nikolay Sevastiyarov, president of Russia's space enterprise, RSC Energia, stated: "One way or the other, we will have to go beyond our planet in the search for new, environmentally friendly power sources. A good candidate is the isotope helium-3 for nuclear power. It is available on the Moon" and "can fully meet the entire Earth's power demand for . . . more than 1,000 years."

Given that fusion power is necessary, and helium-3 powered fusion is a most desirable pathway, the task is to consider how this can be accomplished.

Is It 'Competitive'?

For more than three decades, the United States had no program to return to the Moon, nor an adequately funded, broad-ranging effort to develop fusion energy. In response to the lack of Federal support, the University of Wisconsin scientists have proposed to finance their fusion energy research through private funding, by offering spinoffs from their work as commercial products. These include the production of medical isotopes for diagnostic imag-

ing, and land-mine detection.

Similarly, Harrison Schmitt, after decades of watching a rudderless NASA, proposes that private investors be organized to fund space infrastructure—such as heavy lift rockets—and the helium-3 lunar mining and processes facilities.

The problem with such an approach is that high-risk, multidecade research and development programs such as the one proposed, should not, and in fact, cannot, be justified on the basis of the profit they will return to shareholders. Only a Federally funded long-term commitment will work.

Schmitt and the fusion scientists believe that fusion energy must be developed to provide the magnitude of energy that will be required by a growing world, at least by the middle of this century. But by trying to justify why private companies and utilities will order such plants in future decades, Schmitt ends up trying to prove that it will be competitive with coal.

But fusion energy must be developed, regardless of what private companies, utilities, or stockholders support. The same was the case for the development of the railroads, other transport infrastructure, nuclear power, and the Apollo program. The criterion should not be whether fusion power, or, for that matter, space exploration in general, is "competitive." They are urgent national needs.

In his book, Dr. Schmitt makes clear that he has put forward his private funding proposal because he does not believe this nation will make the necessary commitment to return to the Moon—but he has not given up hope.

When George Bush became President in 2001, Schmitt offered his views on the changes that should be made in space policy, and the space agency, for a long-term program to be viable.

On the policy level, decreasing risk, and increasing confidence in space assets, Schmitt advises, depends upon adequate support. Underfunding of the early Space Shuttle design, he states, led to high-risk compromises. "Service in the United States Senate [1977-1983] during this period allowed me to witness this irresponsible Congressional and Administrative behavior first hand," he reports.

For the space agency to be able to carry out a program with the breadth and scope of Apollo, a return to Apollo-style management is required, Schmitt states.

Youth Is the Key.

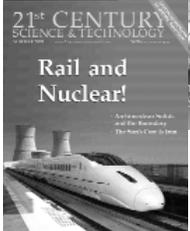
"The enthusiasm, imagination, and stamina of young men and women formed the heart and soul of Apollo," he says. His first proposal is "that most of NASA be made up of engineers and technicians in their 20s and managers in their 30s." This would return the space agency to the imagination and vitality that it took for the Apollo program to succeed.

Just as Harrison Schmitt's book was being released, near the end of 2005, he was appointed by NASA Administrator Mike Griffin to head the NASA Advisory Council. He is now in a position to use his well-earned scientific and political knowledge, experience, and prestige to help bring the space agency back to where it was, when it carried out the program that took Harrison Schmitt, and 11 other men, to the Moon.

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