

ASME LECTURE SERIES

Presents

Former Senator and Astronaut

Harrison H. Schmitt *"Return to the Moon"*

Dr. Schmitt was the only geologist and scientist to walk on the Moon. He flew in space as part of the Apollo 17 crew that explored the valley of Taurus-Littrow in December 1972. He later became the only Apollo moonwalker to be elected to the United States Senate and the only natural scientist to serve there since Thomas Jefferson. In his current career as a space exploration leader, Harrison has advocated a return to the moon funded by private enterprise. His initiative would use private funds to establish permanent settlements and the economic return would come from mining helium-3 on the moon, using it to fuel electrostatic confinement fusion reactors on earth. His book on this subject, "Return to the Moon," will be published this fall. Harrison would like an interactive audience as he discusses using a return to the moon to enhance our lives on earth.



Fuller Lodge, Saturday, October 15th

SOCIAL TIME: 5:00-5:30 DINNER: 5:30-6:15

LECTURE: 6:15-7:15

COST: \$13 for members and guests, \$17 nonmembers

MENU: Southwest Stuffed Chicken Breast, BBQ Beef Brisket, Rice Pilaf, Mashed Potatoes, Salad, Roll. Cash bar available (beer and wine).

RSVP by October 12 to Brian Smith, bsmith@lanl.gov, or phone 665-2666. Seating is limited so please make plans early!

Sorry, [autograph requests cannot be honored](#) on this evening..

**Sponsored by the
Northern New Mexico Section of ASME**



RETURN TO THE MOON: ABSTRACT

Harrison H. Schmitt

The United States has two basic options for both assuring results from and continuation of a "sustained commitment" to deep space exploration and settlement. On the one hand, it could find a means to restructure and revitalize NASA and to provide it with a guarantee of continued funding sufficient to do the job. A tough order in the current national political environment, but one the President has directed NASA and its new Administrator to undertake. Alternatively, the country's entrepreneurial sector could persuade national and international investors to make sustaining commitments based on the economic potential of lunar resources. Not easy, but at least predictable in terms of what conditions investors require to be met relative to other uses of their capital. The option of rebuilding NASA is highly unpredictable and its sustainability may depend on the appearance of a set of world circumstances comparable to those facing the Congress and Presidents Eisenhower, Kennedy, and Johnson in the late 1950s and throughout the 1960s.

Although it fundamentally has an investor-driven economy, America has a tradition of parallel commercial and public technological endeavors, ranging from transportation to agriculture to communication to medicine. Such activities have often involved international partnerships and investors. Private and public endeavors operating together clearly have been far more productive than either would have been acting alone. In this vein, private space-related initiatives can benefit from the research and technology development funded by NASA and vice versa. The Twentieth Century, particularly since World War II and American stimulation of European and Asian post-war economic development, has seen research and technology development in other nations become positioned to participate in a privately led Return to the Moon initiative. That initiative also can supplement, support, and, if necessary, pick up the baton of space settlement if not carried forward by government.

The financial, environmental, and national security carrot for a Return to the Moon consists of access to low cost lunar helium-3 fusion power. Helium-3 fusion represents an environmentally benign means of helping to meet an anticipated eight-fold or higher increase in energy demand by 2050. Not available in other than research quantities on Earth, this light isotope of ordinary helium-4 reaches the Moon as a component of the solar wind, along with hydrogen, helium-4, carbon and nitrogen. Embedded continuously in the lunar dust over almost four billion years of time, concentrations have reached levels that can legitimately be considered to be of economic interest. Two square kilometers of large portions of the lunar surface, to a depth of three meters, contains 100 kg (220 pounds) of helium-3, i.e., more than enough to power a 1000 megawatt (one gigawatt) fusion power plant for a year. In 2003, helium-3's energy equivalent value relative to \$1.25 per million BTU industrial coal equaled about \$700 million a metric tonne and appears to be increasing to over twice that value by 2010. One metric tonne (2200 pounds) of helium-3, fused with deuterium, a heavy isotope of hydrogen, has enough energy to supply a city of 10 million or one-sixth of the United Kingdom with a year's worth of electricity or over 10 gigawatts of power for that year.

The initial financial threshold for a private sector initiative is low: about \$15 million. This investment would initiate the first fusion-based bridging business, that is, production of medical isotopes for point-of-use support of diagnostic procedures using

positron-emission tomography (PET). In contrast, the funding threshold for the United States government would be significantly higher: \$800 million proposed for 2005 and building to an average annual addition of close to \$1 billion. This latter estimate assumes both a repetitively willing Congress and a space agency capable of efficiency using this money as well as re-programmed funds. The Government, of course, would not benefit directly from the retained earnings of the fusion-based bridging businesses that are a natural consequence of the private sector approach.

The entrepreneurial private sector has an obligation to support a return to the Moon to stay, as articulated by President Bush. We also have an obligation to follow our own path to get there in order to be additive to the overall goals of settling the Solar System and improving lives for those who remain on Earth. Whenever and however a Return to the Moon occurs, one thing is certain: that return will be historically comparable to the movement of our species out of Africa about 150,000 years ago. Further, if led by an entity representing the democracies of the Earth, a return to the Moon to stay will be politically comparable to the first permanent settlement of North America by European immigrants.



Harrison Schmitt collects lunar specimens during the Apollo 17 mission.

http://en.wikipedia.org/wiki/Harrison_Schmitt

Harrison Hagan Schmitt, a native of Silver City, NM, has the diverse experience of a geologist, pilot, astronaut, administrator, businessman, writer, and U. S. Senator. He received his B. S. from Caltech, studied as a Fulbright Scholar at Oslo, and attended graduate school at Harvard. His Ph.D. in geology in 1964 is based on geological field studies in Norway. As a civilian, Schmitt received Air Force jet pilot wings in 1965 and Navy helicopter wings in 1967.

Selected for the Scientist-Astronaut program in 1965, Schmitt organized the lunar science training for the Apollo Astronauts, represented the crews during the development of hardware and procedures for lunar surface exploration, and oversaw the final preparation of the Apollo 11 Lunar Module Descent Stage. He was designated Mission Scientist in support of the Apollo 11 mission. After training as back-up Lunar Module Pilot for Apollo 15, Schmitt served as Lunar Module Pilot for Apollo 17 - the last Apollo mission to the moon. On December 11, 1972, he landed in the Valley of Taurus-Littrow as the only scientist and the last of 12 men to step on the Moon.

In 1975, after two years managing NASA's Energy Program Office, Schmitt fulfilled a long-standing personal commitment by entering politics. Elected in 1976, and he served a six year term in the U.S. Senate beginning in 1977. Senator Schmitt, the only "natural scientist" in the Senate since Thomas Jefferson was Vice-President of the United States, was a member of the Senate Commerce, Banking, Appropriations, Intelligence, and Ethics Committees. In his last two years in the Senate, Schmitt held the position of Chairman of the Commerce Subcommittee on Science, Technology, and Space and of the Appropriations Subcommittee on Labor, Health and Human Services, and Education. He later served on the President's Foreign Intelligence Advisory Board, the President's Commission on Ethics Law Reform, the Army Science Board, as Co-Chairman of the International Observer Group for the 1992 Romanian elections, and as Vice Chairman of the U.S. delegation to the 1992 World Administrative Radio Conference in Spain.

Harrison Schmitt consults, speaks, and writes on policy issues of the future, the science of the Moon and Planets, and the American Southwest. His scientific research concentrates primarily on the synthesis of data related to the origin and evolution of the Moon and the terrestrial planets and on the economic geology of the lunar regolith and its resources. Schmitt presently is Chair Emeritus of The Annapolis Center (risk assessment) and is Adjunct Professor of Engineering, University of Wisconsin-Madison, teaching "Resources from Space." His current board memberships include Orbital Sciences Corporation, Edenspace Systems Corporation, and PhDx Systems, Inc., and, as a retired Director, he is a Member of the Corporation of the Draper Laboratory. He is a member of the Energy Department's Laboratory Operations Board, the Maguire Energy Institute's Board of Advisors and served as co-chair of NASA's Human Planetary Landing Systems Capabilities Road-mapping effort in 2004-05. Schmitt founded and is Chairman of Interlune-Intermars Initiative, Inc., advancing the private sector's acquisition of lunar resources and Helium-3 fusion power and clinical use of medical isotopes produced by fusion-related processes.

Schmitt's honors include 1973 Arthur S. Fleming Award, 1973 Distinguished Graduate of Caltech, 1973 Caltech Sherman Fairchild Scholar, NASA Distinguished Service Award, Fellow of the AIAA, Honorary Member of the Norwegian Geographical Society and Geological Association of Canada, 1989 Lovelace Award (space biomedicine), 1989 G.K. Gilbert Award (planetology), and Honorary Fellow of the Geological Society of America, American Institute of Mining, and Geological Society of London. Dr. Schmitt has received honorary degrees from several U.S. and Canadian Universities. In recognition of past service, the U.S. Department of State in July 2003 established the Harrison H. Schmitt Leadership Award for U.S. Fulbright Fellowship awardees.