21st Century Science & Technology (ISSN 0895-6820) is published 4 times a year by 21st Century Science Associates, 60 Sycolin Road, Suite 203, Leesburg, Va. 20175. Tel. (703) 777-6943.

Address all correspondence to **21st Century**, P.O. Box 16285, Washington, D.C. 20041.

21st Century is dedicated to the promotion of unending scientific progress, all directed to serve the proper common aims of mankind.

Opinions expressed in articles are not necessarily those of 21st Century Science Associates or the scientific advisory board.

We are not responsible for unsolicited manuscripts.

Electronic subscriptions are $25 for 6 issues or $48 for 12 issues. Back issues (1988-2005) are $5 each ($8 foreign). Electronic issues from 2006 on are $5 each. Payments must be in U.S. currency.

ISSN 0895-682

www.21stcenturysciencetech.com

SCIENCE AND MORALITY

Celebrating Robert J. Moon at 100

There is much to celebrate about the life of Dr. Robert J. Moon (1911-1989), who would have been 100 years old on Feb. 14, 2011. Many of our readers are familiar with Moon and the extraordinary impact the work of this creative scientist had in the Manhattan Project, in physics, in biology, and in the education of young scientists and others, including the editors of *21st Century*. A just released 45-minute video with Oyang Teng and Laurence Hecht (larouchepac.com/node/17501) presents some highlights of Moon's impact, and a Fall 2004 special issue of *21st Century* covered in depth his life and work.*

In today's largely anti-science and materialist world, where the qualities that Moon exemplified are in short supply, it is important that Moon and what he represents be available as a model for future generations, and future scientists in particular.

Moon never sought fame or fortune as a scientist; he passionately sought the causes of phenomena and how to use his knowledge and insights to improve the conditions of life in the present, and for the future. He grew up at a time when electricity and automobiles were coming into widespread use, and as a child he explored how both of them worked, becoming a skilled electrician, auto mechanic, and experimentalist at an early age. He continued his experiments in physics and chemistry, graduating from Southwest Missouri State College in 1930.

The key to science, Moon said, is to define a problem and then develop the tools needed to tackle it, as he had. His advice to college students was not to get dependent on computers to solve problems, but to do hands-on experimentation in a laboratory. "The freedom to experiment in a laboratory is an essential part of a young scientists education," he said. "You can't learn to be a scientist by passively taking in what someone else accomplished."

When he came to the University of Chicago in 1930, at age 19, Moon wanted to work on a new idea—controlled nuclear fusion. This put him in the Department of Physical Chemistry, working with Prof. William Draper Harkins (1873-1951), who had proposed the idea of fusion and whose work on the neutron Moon had studied. Harkins was happy to have Moon, who began working on the necessary equipment for fusion experiments (he started with building the University's first Geiger counter), and at the same time studying and discussing the new ideas coming out on particles and waves, and the connections of frequency with energy.

Science and Optimism

Science in this period was exciting, full of new discoveries, and optimism about the future. Scientists were not afraid to question the commonly accepted laws of physics and rewrite them as needed. During this time, Moon designed and built a 50-inch cyclotron, to accelerate charged particles. It weighed about 50 tons, and was superior to the first cyclotron, built by Ernest O. Lawrence at the University of California. He also wrote his doctoral thesis on diffraction patterns created by electrons in the surface of oleic acid, by which he was able to see the structure of liquid surfaces, and find the structure of molecules. Moon often returned in his thoughts to this early work, which applied ideas first proposed by Louis de Broglie, and would often insist that every electron commu-

* Several articles from that issue are available at www.21stcenturysciencetech.com/moonsubpg.html. The entire issue can be purchased for $5 ($8 foreign).

nicated with every other.

When the Manhattan Project began during World War II, Moon's cyclotron was essential as a source of neutrons for transmuting and testing materials, in particular testing the ability of graphite to slow down (moderate) the neutrons which would be used to bombard and split uranium, releasing energy in the process. It was Moon who figured out how to get the necessary purity in the graphite blocks so that they could moderate the neutron speed, and thereby accelerate the uranium fission into a chain reaction.

For Moon, the Manhattan Project days were characterized by the frequent discussions that went on, probing ideas with scientists from different disciplines, having deep conversations about the moral implications of the nuclear energy they were producing. Moon pursued this kind of theoretical and experimental probing throughout his life. He loved teaching, especially teaching others how to think deeply about an idea, simply by talking with them. And having them do the basic experiments, for example in electrodynamics, that had laid the basis for his understanding of how things work. It was his constant probing of new ideas, combined with his wide knowledge of classical physical and chemical experimentation, that gave him the ability to view space and time with increasing insight and precision.

Moon was directly involved in bringing Harry Truman the petition of scientists urging the new President not to drop the bomb (which their Manhattan Project had developed) on civilians, but to demonstrate its destructiveness on a remote island. And after the bomb was dropped, Moon made the decision to leave nuclear physics and work in other areas. He became a professor at the University of Chicago's Institute of Radiobiology and Biophysics, from where he rapidly developed several new inventions. The first, in 1949, was a radioactive measuring device, small enough to be inserted in a human heart to detect abnormalities in heart function.

Then, Moon designed and built the first scanning X-ray device, which produced superior images to standard X-rays, at 1/2,000 of the then standard dose. Subsequently, he developed this into an electron gun apparatus, that projected a sharp image of difficult-to-reach internal organs, like the stomach or lower intestines, onto a screen for medical diagnosis. (This was a precursor to the CT scan.) The device was also used for detecting flaws in metals, for example in nuclear reactors.

Philip Ulanowsky/EIRNS

Dr. Moon teaching youth in a summer camp near Leesburg.

Moon also created what was called a neutron thermometer, which was designed to transform the heat of a nuclear reactor into electricity.

Work with the LaRouche Movement

In the early 1970s, Moon began to collaborate in Chicago with the political movement of Lyndon LaRouche. He ran for the post of alderman in Chicago, participated in national conferences, taught classes, and, in 1974 was a founding member of the Fusion Energy Foundation in New York City. He also served as an advisory editor to the Foundation's *Fusion* magazine, the predecessor of *21st Century,* and became the editor-in-chief of the Foundation's theoretical journal, *The International Journal of Fusion Energy.*

If I were to summarize Moon's work from the early 1970s until his death in 1989, I would say that most of the time he was just having fun, thinking and hypothesizing about the quantization of space and time, and teaching science to people of all ages. You can get a sense of this in his own words in a transcript of a class he gave in September 1987, in Leesburg, Virginia, which is published in the Fall 2004 issue of *21st Century*, where he discusses the evolution of his thinking about space and time, and how it led to his ordering of the Platonic solids into what we now call the Moon Model.

When the Fusion Energy Foundation (along with two other LaRouche publishing entities) was put into forced bankruptcy in April 1987, by a faction of the government out to "get LaRouche," it hit Moon very hard. Without any warning, the Foundation office, including Moon's desk and files, was locked up, along with all our books, papers, and file cabinets.

At the time, Moon was working on a proposal to set up a new science university, based on the principles of teaching science that he had elaborated over the years.

We soon established *21st Century Science & Technology* as a successor to *Fusion* magazine, and Moon persevered, beginning new work on biophysics and the process of aging, developing his ideas on the atomic nucleus, teaching, and advising. Moon died in October 1989, just after the forced bankruptcy was reversed by a Federal bankruptcy judge.

I cannot help but think of Dr. Moon now as being in God's time, *Kairos,* and perhaps still contemplating the nature of space, as he did when he lived in *Chronos,* man's time.

—Marjorie Mazel Hecht