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Editorial

Dr. George H. Miley

George Miley, Editor in Chief of *Laser and Particle Beams*, celebrated his 60th birthday on August 6, 1993. While born in Shreveport, Louisiana, he was raised in western Pennsylvania, in the heavily industrialized area around Pittsburgh. Influenced by his father's position as a chemist in an oil refinery, George Miley decided to pursue a career in chemical engineering. When he was admitted into Carnegie-Mellon University his junior year in high school, he immediately entered the Chemical Engineering Department. When he entered graduate school at the University of Michigan, his interests turned to nuclear sciences, and his PhD research dealt with the effect of radiation on chemical reactions. He graduated with a dual chemical/nuclear engineering degree.

It is a pleasure to see how George's career led him to the study of lasers and particle beams. Several plasma courses stimulated his interest in fusion, and his first job was in the advanced theory section of the Knolls Atomic Power Laboratory (KAPL), where he felt he would learn more about "practical" nuclear systems. (KAPL was renowned for its work on naval submarine fission reactors.) Although at KAPL for only 2 years, Dr. Miley gained a wide reputation for his work on burnable poisons to extend reactor core lifetimes and his development of calculational methods for lifetime estimates. Admiral Rickover took a special interest in the work of this young scientist because of its obvious importance to naval reactors. He even took the unusual step of requesting that Dr. Miley spend 1 week locked in one of the submarine simulators so that he would "fully appreciate the importance that the crew placed on the accuracy of lifetime calculations."

When he joined the faculty at the University of Illinois in 1961, his main interest was in fission reactor dynamics. He immediately set up a combined theoretical/experimental program on reactor kinetics and neutron wave propagation, publishing several pioneering articles on these topics, and reporting the first measurement and theory for neutron wave propagation in a moderating medium in response to a reactor pulse.

In 1963, he developed the concept for a nuclear-pumped laser after reading one of the first books on electrically pumped lasers. Later, he discovered that his concept had been anticipated by 6 months by another scientist, Lloyd Herwig of United Aircraft Corporation. But, by then his study of nuclear pumping had begun in earnest.

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Due to his decision to first work on the nuclear-pumped CO_2 laser, his vigorous efforts in this area failed to achieve the first demonstration of a nuclear-pumped laser. As he later learned, the unique charged-particle energy distribution in the radiation-induced laser medium unfortunately populates the lower level in the CO_2 laser. In those early days of laser science, the various collision rate constants were not well known enough to incorporate this effect into his theory of CO_2 pumping.

Later, he and his students developed a unique Ne–N_2 nuclear-pumped laser. That discovery led to the development of a series of so-called "impurity" nuclear-pumped lasers, which included the important carbon laser, based upon the dissociation of CO and CO_2. At that time, most nuclear-pumped lasers operated in the near-infrared range due to the lower threshold requirements at the longer wavelengths. Then, in collaboration with scientists at Sandia National Laboratory, he and his students developed the first visible nuclear-pumped laser, using He–Hg. Indeed, that work initiated a long-time search for visible nuclear-pumped lasers, with more accessible threshold requirements. Most recently, his group reported the discovery of a unique He–Ne–H_2 visible laser with a record low threshold requirement.

At the May 1992 International Meeting on Nuclear-Pumped Lasers in Obninsk, Russia, Russian scientists disclosed for the first time their extensive work in this area. Several of their key laser studies followed closely Prof. Miley's work. In fact, researchers at that meeting referred to him as the U.S. "father" of the field because he and his students hold the record for having developed the greatest variety of nuclear-pumped lasers.

Returning to the 1969–1970 period, Prof. Miley was the first to use high-energy electron beams to directly pump a laser, a significant achievement. This was done while he was on a visiting appointment at Cornell University. Prior to that time, the only electron beam-pumped experimental laser had used a complicated traveling wave arrangement, but Prof. Miley's experiment used the beam directly from a pulsed power diode. Shortly after having published this pioneering article, he returned to Illinois and to nuclear-pumped lasers; but, as is well known, the area of electron beam-pumped lasers expanded exponentially. Because he did not remain active in this area of research, his trailblazing contribution is often overlooked.

Prof. Miley has also had a continuing and growing involvement in both inertial and magnetic fusion research. Indeed, while at Cornell he tried, without success, an electron beam-imploded target experiment. Back at Illinois, he authored a seminal book, published by the American Nuclear Society under U.S. Department of Energy sponsorship, titled *Fusion Energy Conversion.* While initially dismissed as being too visionary, this book has had a long and deep influence on the fusion community, generating increasing interest and recognition of the importance of the concepts it first articulated. Thus, some have added the title of "Father of D–^{3}He Fusion" to his equivalent title in the field of nuclear-pumped lasers.

His deep interest and confidence in the importance of advanced fuels led Dr. Miley in a variety of new directions. In inertial confinement fusion (ICF), he pioneered the concept calculations for D–T-seeded deuterium fuel targets. That, in turn, led to several innovative experiments at the University of Rochester laser facility, where he and his students measured the energy of fusion products, both protons and alphas, escaping from deuterium-fueled targets. These experiments provided a basis for comparison with theoretical calculations of fusion product transport and ultimately of burn propagation, a key aspect of the D–T-seeded target concept.

This work then led to a most productive collaboration with the author on the exceedingly important alternative approach of ICF by use of volume burn and ignition for advanced fuels, not only D–^{3}He but also for P–^{11}B. He was the first to realize how exper-

iments on the time dependence of the temperature will distinguish volume ignition from the usually treated spark ignition. These interests translated into a series of theoretical studies in magnetic fusion, including fusion product transport instabilities and He ash transport. At the same time, Prof. Miley's attention turned to the issue of finding improved magnetic confinement concepts that might be suitable for burning advanced fuels. The field reverse configuration (FRC) drew special attention, and a series of theoretical studies of field reversal and transport in such plasmas ensued.

This work culminated in a recent reactor design study done jointly with a team of Japanese scientists, led by Prof. Momota (Nagoya University). It combines a D–^{3}He FRC reactor with a traveling wave-type direct energy convertor. It has been cited by several reviewers as the most attractive magnetic fusion reactor study reported to date.

The search for alternate confinement systems also led Prof. Miley to return to a concept that had lain dormant for a number of years: inertial electrostatic confinement. He currently has a significant theoretical and experimental program on this approach to fusion and has reported pioneering results using such a device to provide a unique low-level neutron source for diagnostic applications.

Prof. Miley has made a number of other contributions in service to his profession. He is a fellow of three scientific societies: the American Physical Society, the American Nuclear Society, and the Institute of Electrical and Electronic Engineers. He has received the NATO Award, the Guggenheim Award, the Distinguished Service Award of the American Nuclear Society, and the Outstanding Achievement Award for the Fusion Power Division of the American Nuclear Society. In 1981, he served as a founder of *Nuclear Technology/Fusion*, a publication of the American Nuclear Society devoted to fusion research and methodologies. While at first associated with the journal *Nuclear Technology, Fusion Technology* became a free-standing journal in 1984, with Dr. Miley as editor. It is currently one of the leading publications in the fusion field.

Prior to becoming Editor in Chief of *Laser and Particle Beams*, Prof. Miley served as U.S. editor and then managing editor since the inception of the journal. He assumed his present position as Editor in Chief last year upon the retirement of the author. In both journals, he has played a crucial role in identifying and publishing special issues and articles, as well as carrying out many of the routine editorial tasks.

Dr. Miley has held key positions in a variety of national and international meetings. Perhaps the best known is his role as codirector of the biennial international workshop series on "Laser Interaction and Related Plasma Phenomena." Proceedings from these meetings, edited by Prof. Miley and the author and published by Plenum Press, are widely recognized for bringing important new directions and research results to the attention of the laser community.

When in May 1979 the Society to Advance Fusion Energy by initiatives of Dr. George Brumlik and the author was founded with Luella LaMer Slaner and Alfred P. Slaner as Presidents and based upon the support of the Slaner Foundation, Prof. Miley kindly accepted to become the Executive Director of the Board, joining most of the top fusion physicists in the United States. This influential group succeeded in building an effective coalition that introduced and passed the Tsongas–McCormack bill, which authorized spending $20 billion within 10 years for fusion energy development. Although this legislation was signed by President Jimmy Carter, subsequent Congresses failed to authorize necessary funding for the program.

Other notable efforts include serving on the State of Illinois Governor's Special Review Team for Nuclear Reactors, commissioned shortly after the Three Mile Island accident. Dr. Miley is currently a key member of the safety review committee for the Illinois Power Company Clinton Power Station and chairs the Technical Advisory Committee for the Low-

Level Site Studies in Illinois. In that capacity, he helped undertake independent studies of groundwater transport for one of the sites proposed for this facility. He has also developed new mathematical methods for analyzing the statistical probability of accident paths in such a facility. At present, he also serves on the Governor's Radiation Protection Committee in Illinois and, at the national level, on the Air Force Studies Board of the National Academy of Science. In the latter capacity, he recently contributed to a key review of management methods used by the Air Force for research administration, one of the key topics identified by President Clinton for reducing expenses.

Several years ago, he was a founder of a small, high-tech business in Champaign-Urbana, Rockford Technology Associates, Inc. As Director of Research for this company, he has been instrumental in obtaining funding for several key research projects, which have led to a strong expansion of its activities. He served as chairman of the Department of Nuclear Engineering at the University of Illinois for 11 years and is currently Director of the Fusion Studies Laboratory. Over this period, he has directed over 48 PhD theses and 35 master's theses. Former students now hold high positions in both government and private laboratories, as well as other universities around the world.

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