HEVESY NUCLEAR MEDICINE PIONEER LECTURE

William G. Myers

No one is more dedicated to nuclear medicine than William Graydon Myers, Ph.D., M.D., D.Sc. (honorary), and FACP. As he has often said, he has had a life full of "twinkling" atoms and "scintillating" people. The latest edition of Who's Who in America describes him as "physician, scientist, educator." He is all of these, but much more. The younger members of our Society will remember him best as our Historian, a position he has held since 1973. Among the aphorisms that he cherishes are: "Savoring the past enriches the present and presages the future"; and "History cements facts together." Lest we think he is being pretentious with these offerings, he adds: "Laughter lubricates life."

The history of nuclear medicine is reflected in the life of its historian. His pioneer spirit was evident early in his life—in 1928, he played the lead role in a play at the Ridgeville High School in his home town of Toledo, Ohio. The play was "The Go Getter." The role was that of Don Estaban Pompo, Alcade of Pagola, a small village in the principality of Casadonia, a fictitious country somewhere in southern Europe. We do not know why he never pursued the life of an actor after such great initial promise. We next encounter young Bill in 1932 when he wins the 125-pound intramural boxing championship in the Ohio State University Coliseum.

It is interesting to read the referee's instructions given the fighters in those bouts:

> In the case of a knock-down in which the contestant is in such a dazed or helpless condition that he would be unable to defend himself against a complete knockout, the round ends. After two minutes rest, the next round will be started.

Those of you who believe that Bill's life has always been a bed of roses should know that, from time to time, he has had to rebound after 2 minutes' rest. His early life included a newspaper route at age 5, a period of time in an orphanage, homesteading on the Canadian prairie, a job as a photographer in Denver, a waiter in Detroit, and a barber while attending college. He barbered his way through a Bachelor's degree in 1933, a Master's in 1937, a Ph.D. in 1939, and an M.D. in 1941, all from Ohio State. It wasn't that he liked Ohio State so much. It was just that he liked the barbershop in the old Starling Loving Hospital.

As a senior medical student in 1940, Bill began the fulfillment of his destiny. If Ernest Lawrence is the father of the cyclotron, Bill Myers is its godfather. Artificial radioactivity had been discovered in Paris only 6 years before when Ernest Lawrence's brother, John, gave a Sigma Xi lecture attended by Bill at Ohio State. When he heard John Lawrence's inspiring description of the early experiments with the first manmade "twinkling" atoms created in the Berkeley cyclotron, Bill decided then and there that nuclear medicine would be his special field of interest and endeavor. Together with his precious atoms, he himself began to "twinkle" and has done so continuously for 40 years.

His senior medical student thesis was "Applications of the Cyclotron and Its Products in Biomedicine." It was accepted in February 1941 by Professor Charles A. Doan, the distinguished Chairman of the Department of Medicine who was to prove subsequently to have an important, though little known, role in the development of our specialty.

The same year, 1941, Ohio State University got its own cyclotron, a 42-inch machine for use in both physics and medicine. While still a senior in medical school, and during his internship at Ohio State University Hospital, Bill generated phosphorus-32 to treat patients with polycythemia rubra vera, and sodium-24, potassium-42, and strontium-89 for physiological studies. From 1942–45 Bill was a Research Associate at the Ohio State University Research Foundation. In 1946 he traveled to the Pacific to serve as a Radiological Safety Officer for the atomic bomb tests at Bikini Atoll. By then he was a close friend of John Lawrence, and he recalls:

> We were sitting, geiger counters in hand, on the deck of a little gunboat when the bomb was detonated. It was awesome, more than a million tons of water were thrown a mile into the air. Battleships anchored near the blast site sank instantly. The Arkansas, all 25,000 tons of her, stood on end, and was tossed around like a toy.

He also remembers dreaming aloud at that time with other physicians working on the project. They shared ideas about what could be brought back home and put to use in laboratories and hospitals.

He began then and has continued his devotion to the chart of the nuclides. "I would look at the chart and imagine that this nuclide and this and this might be useful in medicine. I would say to my colleagues 'Here's one we ought to take a good look at.' " More often than not, his good looks paid off and a new nuclide was added to medicine.

A striking example can be seen in his laboratory notebook on August 6, 1945, the day the atomic bomb was dropped on Hiroshima. He describes bombardment of boric oxide with deuterons to produce carbon-11 monoxide. Only today, 36 years later, has carbon-11 achieved a preeminent place in nuclear medicine.

Just as nuclear medicine started with the cyclotron and was diverted by the nuclear reactor, only to return to the cyclotron as a major source of radionuclides, so also did Bill. During talks with people aboard ship at Bikini, from people such as his dear friend Paul Aebersold, he learned that cobalt-60 and gold-198 could be produced in tremendous quantities with the second reactor in the world, the graphite reactor at Oak Ridge National Laboratory. He immediately saw the advantages over radium-226 and radon-222 for cancer treatment.

In June 1948 he reported to the American Radium Society his initial findings with cobalt-60 and correctly predicted that thousands of cobalt-60 units would someday be installed in cancer treatment centers throughout the world.

In June 1952, again to the American Radium Society, he reported the use of gold-198 for permanent implantation into cancers, a second form of therapy that displaced radon-222 "seeds" in radiation therapy.

By 1954, about the time 12 persons were in a Spokane hotel agreeing to put up $10.00 each to start an atomic medical society that became the Society of Nuclear Medicine, Bill moved into a spacious new laboratory at Ohio State University, returned to his true love, the cyclotron, and began producing carbon-11 and fluorine-18, the nuclides of the 80's in nuclear medicine. First, he learned how to make carbon-11 glucose in a crude form by "feeding" $^{11}CO_2$ to bean leaves and algae.

Two other nuclides were developed by Bill—chromium-51 in 1958 and iodine-125, 2 years later. Reporting the seventh annual meeting of the Society of Nuclear Medicine in Estes Park, Colorado, *Time* magazine in its July 4, 1960 issue included an article on "Atoms and Man," part of which said:

> Last week Ohio State University's Dr. William G. Myers reported that a seventh isotope of iodine, iodine-125, shows promise as a convenient tracer to follow the metabolic pathways of ordinary iodine. But it has not yet been used in humans.

Today iodine-125 is the most widely used radionuclide in medicine, bearing out Bill's prediction of its value in the late 1950s. Hundreds of millions of iodine-125 tests are performed worldwide each year. He cherishes a handwritten note from Nobel laureate Rosalyn Yalow:

> With cordial greeting to Bill Myers—a fine friend for more than three decades—with fond memories of his suggestion in 1960 of the applicability of ^{125}I rather than ^{131}I for tracer labeling—a prediction that proved most valuable.

A second isotope of iodine, iodine-123, was strongly advocated by Bill in 1962. If it could be made available from Los Alamos or Brookhaven National Laboratory in large quantities, it could join carbon-11 and fluorine-18 as a major nuclide of the 80's.

In addition to his role in developing new radionuclides, Bill played a major, although little recognized, role in the development of the scintillation camera. Again it was the case of a prepared mind. Four years after Benedict Cassen had built the first rectilinear scanner, Mueller and Myers described an improved version—called the "Gammicon"—designed and built in the Department of Electrical Engineering of Ohio State University. Their report concluded: "New tools invariably provide new opportunities to accelerate progress." George Mueller, then Associate Professor of Electrical Engineering, later became Director of NASA's Manned Space Flight Program and was in charge of putting Neil Armstrong on the moon.

The story of how the Gammicon was invented illustrates how Bill has been able to inspire people all his life. Over lunch at the faculty club, Bill described to George Mueller what was needed to carry on his work with the "peaceful atom." They discussed the specifications. A year later, he invited Bill to visit his laboratory with the comment: "Why don't you stop by one of these days to see something that might interest you?" Dr. Myers walked into Dr. Mueller's office in the Caldwell Electrical Engineering Laboratory and there was the Gammicon—the machine the two had talked about a year before. To produce the scans, Mueller had used the Teledeltos system developed by Western Union to transmit pictures.

Meanwhile, Hal Anger, embodying in a single person a convergence of nuclear physics, electronics, optics, and information handling, was pursuing a completely different path from the rectilinear scanner. Working in the Donner Laboratory of Medical Physics of the Lawrence Berkeley Laboratory, he used a simple, pinhole collimator in front of a sodium iodide crystal 4 inches in diameter. Behind the crystal was an array of seven photomultiplier tubes. The output of the tubes was used in a way such that the location of each scintillation could be identified by grid coordinates and flashed on a cathode ray tube in the same relative position, which could then be photographed. The key was that the new camera provided a continuous measurement of the time course of the radioactivity in all regions simultaneously.

In June 1958 Anger first exhibited the scintillation camera at the Society of Nuclear Medicine meeting in Los Angeles and also at the AMA convention in San Francisco the next week. The potential value of the camera was recognized immediately by Dr. Myers, but by few others. In his characteristic way, he spent the next year trying to interest several manufacturers of nuclear medicine instruments to begin production of the Anger camera. He was unsuccessful. Subsequently, three of the companies that he approached became major manufacturers of scintillation cameras.

In 1960 with $17,500 supplied by Dr. Charles Doan, Chairman of Medicine at Ohio State University, Bill placed a special order for the first commercial Anger camera with the Nuclear Chicago Company. He had to threaten to sue to get them to finish and deliver it, but, indeed, in September 1962 the first industrially-fabricated scintillation camera was installed in his laboratory at the Ohio State University Hospital.

In 1964 at the International Atomic Energy Agency symposium on "Medical Radioisotope Scanning," Dr. Myers presented the only Anger camera paper on the program. In the publication that followed, he published the first images made with a commercial Anger camera, a series of images of a rat injected with [^{131}I] orthoiodohippurate. He concluded his paper: "The scintillation camera is shown to provide an elegant method for the study of dynamic processes in vivo that are not otherwise demonstrable."

Even in 1968, 10 years after the first presentation of the Anger camera, when David Kuhl and I presented a series of 48 lectures in Australia, the principal topic was the relative merits of cameras versus scanners. It takes a finite—sometimes surprisingly long—period of time for inertia to become momentum. People such as Bill Myers provide the direction and energy. Professor Kurt Scheer of Heidelberg, Germany, has stated: "It has been my observation that when Bill Myers sits and thinks, the whole world of nuclear medicine benefits."

Nuclear medicine has made it possible for Bill to develop bonds of mutual friendship and respect with people all over the world. When Professor Scheer was planning his new Institute for Nuclear Medicine in Heidelberg in 1962, Dr. Myers suggested that he should plan to install a cyclotron. He did and the cyclotron has now been producing neutron-deficient radionuclides for nearly a decade.

The Chinese philosopher, Lao-tzu said: "Leaders are best when people scarcely know they exist. When their work is done, their aim is fulfilled, the people will all say: 'We did this ourselves.'"

A final example. In November 1964 Bill received a phone call from a physicist in Berkeley—Alan Fleischer—who told him that he and others were thinking about establishing a company to build cyclotrons, chiefly for medicine. Bill's ideas about medical cyclotrons played an important role in their decision to go ahead with the venture.

Shortly after Bill retired from Ohio State in 1979, after being on the faculty for 46 years, he was appointed Visiting Professor of Biophysics at Sloan-Kettering in New York. He spent most of the next 2 years working with the first medical cyclotron fabricated by this company in 1967, carrying out experiments with potassium-38, carbon-11, and nitrogen-13. After four decades, he had come full-circle back to the cyclotron.

It has been my great fortune to be a friend of Bill Myers. Some persons are old at 50; others, like Bill, are young at 73. His studies of himself with cyclotron-produced radionuclides have proved without doubt that the blood flow to his brain continues to supply that extraordinarily sensitive structure with an abundant supply of oxygen and sugar, permitting his creative mental processes and pleasant social relations to continue full tilt. Not to say that he doesn't at times speak too long extolling the virtues of brevity at meetings of the Executive Committee of the Society of Nuclear Medicine. He is probably the only person ever to have written a fivepage article pointing out how few words there are in Lincoln's Gettysburg address.

Bill has been blessed by a good and long life—accompanied by his beautiful, devoted, and accomplished wife, Florence, also a medical graduate of Ohio State University. She wrote a paper with Bill in 1945, describing the first patient treated with penicillin in Columbus, Ohio. Ever since these early days he has developed one idea after another in natural progression. He has managed to avoid the administrative duties that so often decrease productivity. He has remained clear-headed and open-minded, keeping up with his field by constant reading and attendance at scientific meetings. A major factor in his continued productivity over 46 years is association with students to provide intellectual stimulation. In addition to his teaching at Ohio State, for over 25 years he taught a course in nuclear physics, chemistry, and medicine at the University of California at Berkeley.

Throughout his life, he has communicated to his students the joy in his mind. Inspired by Bill's single-minded love of radioactive indicators, his students brought him willing hands, new points of view, and enthusiasm. He gave them his insight and experience.

His honors are too numerous to mention, except for one that he especially cherishes. In 1973 he received the first Paul C. Aebersold Award for Outstanding Achievement in Basic Science Applied to Nuclear Medicine. He was presented the award by Mrs. Aebersold, a friend of long standing.

Now he joins the most elite group in the nuclear medicine world. He has been officially named as a Nuclear Medicine Pioneer, joining many other great scientists whom he knew personally—Ernest and John Lawrence, Lise Meitner, Paul Aebersold, Irene Curie, and most of all, his beloved Professor George de Hevesy, whom Bill has called the Father of Nuclear Medicine.

Bill, your numerous contributions to nuclear medicine have won for you the respect of all who honor excellence. You have taught us what true freedom is; you have fulfilled your individuality.

You can know that there will be continuing benefits long after your efforts have ceased. You have had the pleasures of discovery, the opportunity to spend your life doing what you wanted to do, the freedom to study and investigate, to develop friendships all over the world, and to know that your teaching and research have helped all mankind. All these satisfactions are yours. No one could ask for more.

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