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NCSU PHYSICIST ELECTED POSTHUMOUSLY
TO NATIONAL INVENTORS HALL OF FAME

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An internationally known physicist who spent the final years of his career in research and teaching at North Carolina State University is among eight eminent inventors who will be inducted Friday, May 17, into the National Inventors Hall of Fame, Akron, Ohio.

Dr. Willard H. Bennett was Burlington Professor of Physics at NCSU from 1961 to 1976 and, as professor emeritus, continued to pursue his research interests until his death in 1987 at the age of 84. Areas of research to which his work made important contributions include plasma physics, astrophysics, geophysics, surface physics, and physical chemistry.

Bennett held nearly 70 U.S. and foreign patents; however, the invention for which he is receiving hall-of-fame honors is the Bennett radio frequency mass spectrometer patented in 1955.

The Bennett spectrometer, which did not employ the heavy magnets common to other mass spectrometers at that time, was designed to measure the mass of atoms in gases. The device's light weight and small size made it ideal for use on early U.S. and Soviet satellites in determining the chemical composition of gases in space.

The Bennett spectrometer's maiden voyage into space was made aboard Sputnik III in 1958. The Soviets built their own device from Bennett's design but acknowledged their debt to him by giving the instrument his name in their technical publications about the flight.

Ten years later, during a trip Bennett made to the Soviet Union to attend an international conference on plasma physics and thermonuclear energy, he found his spectrometer prominently

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displayed at a Soviet space science exhibit.

Dr. Wesley O. Doggett, NCSU professor of physics who collaborated with Bennett on many research projects in plasma physics, recalled that "Bennett had as a guiding force to be first in whatever he did, and one of his philosophies -- often repeated -- was: 'The only way to be on time is to be early.'

"He was first and ahead of his time with many of his inventions, some of which were later rediscovered by other scientists, only to find out that Bennett had a patent on them," Doggett said.

A case in point was the tandem Van de Graaff nuclear accelerator. In 1935, Bennett conceived and patented the basic concept for a more powerful, tandem version of an early atom-splitting device. Fifteen years later, another physicist announced his invention of a tandem accelerator but soon discovered, to his chagrin, that Bennett had been there before him.

Bennett, born in Findlay, Ohio, in 1903, graduated cum laude from Ohio State University in 1924, received a master's degree in physical chemistry from the University of Wisconsin in 1926 and was awarded his doctorate in physics by Ohio State in 1928. Under a National Research Fellowship in Physics, he pursued further studies at the California Institute of Technology from 1928 to 1930.

In 1934, while serving as professor of physics at Ohio State, Bennett propounded a theory, later to be known as the "pinch effect," related to the behavior of extremely high-temperature, high-density ionized gases. This paper, and additional publications in 1958 further developing the theory, laid the groundwork for much early work on nuclear fusion both in the United States and abroad.

"All plasma physicists know the 'Bennett pinch effect,'" Doggett said. "It has served as the basis for a line of research in plasma physics for many years."

In 1938, Bennett left Ohio State for a position as director of research for the Electronics Research Corp., where his chief responsibility was to develop as many patents as possible. "As a

result of this experience," Doggett said, "for the rest of his life he would look at ideas from a different viewpoint: Is this original? Is this novel enough that I could get a patent for it?"

With the advent of World War II, Bennett exchanged his Army Reserve status for active duty. He served in the Southwest Pacific on both research and signal intelligence assignments and emerged from the war with the rank of lieutenant colonel.

On his return to civilian life, Bennett worked first as chief of the Physical Electronics Section at the National Bureau of Standards, then spent a year as professor of physics at the University of Arkansas. In 1951 he became branch head and division consultant at the U.S. Naval Research Laboratory.

While at the naval laboratory, Bennett developed an experimental model of elements of the solar system (the sun; the charged particles of outer space; and the Earth, with its magnetic poles) in a glass vacuum tube. He called his model the "Stormertron," after Carl Stormer -- a Norwegian scientist who in 1905 had calculated the orbits of charged particles around a dipole.

In the Stormertron, the "sun" was an electronic gun that discharged electrons to simulate the bursts of charged particles accompanying solar eruptions. The "Earth" was a golfball-sized, magnetized sphere held at the center of the basketball-sized glass tube.

The model reproduced the behavior of streams of charged particles approaching the Earth from different directions, as well as some intricate impact patterns that explained many features of the aurora borealis. The model also demonstrated doughnut-shaped rings of charged particles around the earth that were verified five years later by data collected by space satellite and that are now known as the Van Allen radiation belts.

In 1961, Bennett returned to academia as Burlington Professor of Physics at NCSU.

"Coming to NCSU gave him an opportunity to follow up ideas in a way he couldn't at the Naval Research Laboratory," Doggett

said. "The idea of making intense beams of charged particles had continued to permeate his interest, and new machines became available in the 1960s that allowed exploration of this area in different ways."

Doggett collaborated with Bennett in much of this work, the ultimate goal of which was creation of controlled nuclear fusion by bombarding small, solid targets with high-energy beams of electrons.

"Achieving fusion has been an elusive venture," said Doggett, "and achieving it in a way that you can produce practical energy is still decades away. But Bennett had optimism that success was closer at hand."

Bennett's final research efforts -- still aimed at achieving nuclear fusion -- focused on developing ways to accelerate very dense aggregates of ions to achieve higher energies per ion. He received his 67th and final patent for this work in 1987, the year of his death.

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NOTE TO EDITORS: Also being inducted into the National Inventors Hall of Fame on May 17 will be Gertrude B. Elion, scientist emeritus at Burroughs Wellcome Co., Research Triangle Park, N.C., who shared in the 1988 Nobel Prize in Medicine. She is being honored for synthesizing drugs crucial to cancer treatment, and for her antiviral research.

Other inductees are Gordon Gould, who developed the breakthrough ideas needed to create the first laser; Leonard M. Greene, whose stall warning indicator is standard on aircraft throughout the world; W.E. "Butch" Hanford and Donald F. Holmes, who hold the patent for polyurethane; Elmer A. Sperry, inventor of the gyrocompass; and Robert R. Williams, discoverer of vitamin B1 and inventor of a way to synthesize it.

Dr. Willard Bennett's wife, Douglas, and his daughters Barbara and Becky (Mrs. Scott Hanner), all of whom live in Raleigh, will attend the May 17 induction ceremony and accept for Bennett the medallion presented to new Hall of Fame members. The induction ceremony will take place in E.J. Thomas Performing Arts Hall, University of Akron, 7-8:30 p.m.

The new inductees will join 86 distinguished inventors and scientists previously elected to membership -- among them, Thomas A. Edison, the Wright Brothers, Louis Pasteur and Enrico Fermi.

Detailed information about the National Inventors Hall of Fame, the induction ceremony, and other special events planned in connection with it is available from Rich Barnett, (216) 762-4463.