MEMORIAL RESOLUTION
Robert E. Pollock
(1936-2018)

Robert Elwood Pollock was born on March 2, 1936 in Regina, Saskatchewan, Canada. He spent the majority of his professional career in the Physics Department of Indiana University, implementing innovative concepts for accelerators and nuclear physics experiments as the guiding spirit behind the successes of the Indiana University Cyclotron Facility (IUCF). After a period of decline, Pollock died peacefully at a retirement facility in Bloomington, Indiana on August 28, 2018, survived by Jean, his wife of 59 years, four children and two grandchildren.

When he was twelve, Pollock's family moved to Winnipeg, Manitoba. After his undergraduate education at the University of Manitoba, Pollock went to Princeton University, earning his PhD in Nuclear Physics in 1963, using the old 18 MeV cyclotron in the basement of Palmer Hall. After a postdoctoral stay at AERE Harwell in England, Bob returned to Princeton in 1964 to join a small group building a new 50 MeV cyclotron, similar to one nearing completion at Michigan State University. The new cyclotron produced its first beam on New Year's Eve, 1968.

Since the late 1960s, Indiana University had been working toward an ambitious project to replace the cyclotron in Swain Hall with a larger one of an innovative design by Professor Martin Rickey that would enable IU to compete in the emerging field of intermediate-energy nuclear physics. Pollock, with his growing reputation as a cyclotron expert, was asked to come and complete the realization of the new machine. Bob arrived with his wife and four small children in the summer of 1970 … and stayed the rest of his life in Bloomington.

Pollock not only successfully oversaw the construction of the new cyclotron, producing the first 200 MeV beam for experiments in 1976, but also served as the first Director of IUCF from 1972 to 1979. During that period, with feedback from the Program Advisory Committee, Bob was responsible for directing the scientific output of the facility. He was instrumental in establishing the new facility as a premier NSF-funded laboratory that attracted researchers from around the world and brought a first-rate international reputation to the IU nuclear physics research group. He was promoted to Professor in 1973.

Pollock alternated periods of accelerator development with the application of the produced beams to research topics in nuclear physics. He worked with students and colleagues on some of the most elegant early experiments with the new accelerator, studying the creation of pions –the particles that mediate the longest-range part of the nuclear force – in nuclear reactions near the threshold where this becomes energetically allowed. With that work, he set forth an intellectual theme – particle production near threshold – that played a major role in all of the laboratory's subsequent development.

Keeping abreast of new advances in accelerator physics, Pollock was well aware of 'electron cooling' of stored beams, a technique that had been invented and tested at low energies in Novosibirsk, USSR. In this process, a proton beam, orbiting in a magnetic storage ring, is partly immersed in an electron beam of the same velocity. The interaction between the two beams results in a vast improvement of the lifetime of the stored proton beam and its momentum spread, allowing it to survive even after billions of passes through a thin internal target. Pollock had the vision that this would yield a completely new, high-resolution and low-background, environment for nuclear physics experiments. When the feasibility

of electron cooling was demonstrated at 200 MeV in 1980 at Fermilab, Illinois, Pollock decided to resign as IUCF director in order to devote himself to the task of creating a facility to exploit electron cooling.

After initial planning, a proposal was accepted by the NSF in 1981 and construction of the 'Indiana Cooler' began in the spring of 1983, with Indiana University contributing a new building adjacent to IUCF. In the following years, Pollock was at the helm of a team of about 30 physicists, engineers and technicians. Their work culminated in 1988 with the first-ever cooled beam interacting with an internal target. Since the storage ring could also act as an accelerating synchrotron, the range of proton beam energies was extended to 500 MeV.

The Indiana Cooler demonstrated, for the first time, how nuclear physics research can benefit from stored, cooled beams. Pollock himself took part in the exploitation of the new technology to address open questions in nuclear physics by participating in about half a dozen active experiments. His creativity and innovations provided a stimulating atmosphere at IUCF in which his colleagues might come up with some of their best ideas, adding to a string of 'world's firsts' that marked research with the Cooler, up until its shutdown in 2002.

The new facility in Indiana caught the attention of the world-wide scientific community and sparked the construction of a number of similar small rings at laboratories in Europe and Japan, stimulating a vigorous interchange of ideas and results between IU and the world. The ongoing professional exchange and many invitations to speak at national and international conferences led Bob Pollock on numerous trips in the US and to countries such as Germany, Japan, South Africa, the USSR, Sweden and Switzerland, for him a welcome side effect since he cherished travel to foreign places.

Pollock's work was widely recognized. He was awarded a Humboldt Research Award from the German Alexander von Humboldt Foundation in 1985 and he is the co-recipient of the 1992 Tom W. Bonner prize, the highest American Physical Society honor in nuclear physics. The citation for the Bonner prize reads: "For pioneering development of innovative accelerator configurations which have allowed new levels of precision and flexibility for nuclear physics research." At home, Indiana University recognized Pollock's contributions with a Distinguished Professorship (1984), an invitation as the Distinguished Research Lecturer (1991) and the award of the President's Medal (2011).

Around 1990 Pollock embarked on his new venture of constructing a charged particle trap. The objective was to use intricate electric fields inside a strong magnetic solenoid field to accumulate electrons into a small region (in a vacuum) despite their mutual repulsion. Such a device could be placed in the Cooler beam to provide an internal electron 'plasma' target. To pursue this development effort, Pollock started a small research group with a few students and independent funding. Successful exposure of an electron plasma to the Cooler beam (another first) took place in 1996. Subsequent activity involved plasmas of *positively* charged nuclei and the commissioning of a superconducting solenoid. Work with traps continued for the rest of Pollock's research career.

Pollock's thoughtful insights, conveyed quietly and collegially, were highly valued by his peers in the field. He served, for example, on the Nuclear Science Advisory Committee (NSAC) when it was first formed in 1977 and on a number of NSAC subcommittees since that time. His expertise has also been utilized, in the US and abroad, by funding agencies at facility reviews, on program committees selecting experiments for accelerators and on conference program committees.

Pollock was a man of many talents, who at once excelled in nuclear physics, in the physics of beams

and in electrical engineering, but he derived perhaps his greatest pleasure from sitting in his office or laboratory, sometimes with a student at his side, building a new electronics circuit or improvising a small tabletop-scale device to confront his science with the material world.

As a person, Bob Pollock had a friendly and calm demeanor and an understated, but ever-present sense of humor. We all remember, for instance, how he, eyes twinkling, would complete a calculation with his well-worn slide rule while we were still entering numbers on our calculators. Bob will be fondly remembered by his colleagues. He leaves behind a legacy of intellectual integrity, creativity, attention to detail and completed ambitious undertakings.

We request that this memorial resolution be presented to a meeting of the Bloomington Faculty Council, and be preserved in its minutes and archive. We also request that after its presentation, copies be sent to members of Prof. Pollock's family.

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