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Thaddeus Francis Kycia

Thaddeus (Ted) Francis Kycia, a prominent particle physics experimenter, died on December 22, 1999 in Port Jefferson, New York, from complications of lymphoma. He was born on August 10, 1933 in Montreal, and received his BSc (1954) and MSc (1955) from McGill University. His PhD was from the University of California at Berkeley in 1959 for a study of K^+ -proton scattering at the Bevatron.

After joining Brookhaven National Laboratory in 1959, Ted spent the remainder of his career there, becoming a Senior Physicist and group leader. In the early 1960's he participated in some of the earliest measurements of hyperon magnetic moments. Among other innovations of this work was the deployment of a superconducting magnet in the first measurement of the Cascade Minus magnetic moment. In the 1960s he led a series of hadron-nucleon total cross section measurements at the AGS, pushing this deceptively simple technique to ever-increasing precision and thus ability to see small effects. In the process he discovered many new pion-nucleon and kaon-nucleus resonances; these entered the Particle Data tables, and subsequently were input to quark model calculations. The final measurements of this series were carried out at the newly operating Fermilab, where, achieving a precision of about a part in a thousand, he showed that all hadron-nucleon total cross sections had the same behavior: as the incident energy increases, the cross sections fall, reach a minimum, and then rise. Previously this had only been demonstrated in some isolated cases. This phenomenon is still not completely understood.

In the late 1960s, Ted embarked on studies of rare decays of kaons; the first experiment studied $K^\pm \rightarrow p^\pm p^0 g$ to help rule out the possibility of an electromagnetic origin of the CP-violation observed in $K_L \rightarrow 2p$ decay. It also established limits on some decay modes which are still the best to date. The second experiment, this time studying neutral kaons, discovered several new decay modes of the K_L , as well as a form factor dependence in the decay $K_L \rightarrow p^+ p^- g$ that has been confirmed but never really explained.

At the end of the 1970's Ted led a series of experiments to check predictions of various new particles, and/or claims of discoveries of such. These experiments did not confirm any new phenomena, but they left the situation considerably clearer than when they were launched.

In the mid-1980's Ted returned to the subject of rare kaon decays as one of the initiators of AGS Experiment 787, the search for $K^+ \rightarrow p^+ u\bar{u}$. This process is of

particular interest because it is highly sensitive to the otherwise elusive coupling of the top to the down quark, as well as to many varieties of possible new interactions. Ted's vision for that experiment was to design a detector whose basic structure was capable of detecting this process at the Standard Model level, which at the time of the proposal was some four orders of magnitude beyond what had been done. After many years, this decay mode was discovered by E787, opening up a new window into short distance physics. This work continues.

At the time of his death, Ted was working on a new experiment to make a precise measurement of the Cabibbo angle, one of the fundamental parameters of the Standard Model, through the study of $K^+ \rightarrow p^0 e^+ u$.

Ted was a leader in the design of Čerenkov counters, especially with gas radiators, for beam particle identification. He built several of these, impressing his colleagues with their performance, but unfortunately rarely describing them in print. At Fermilab, one of his counters cleanly separated pions and kaons at 340 GeV; a few years later, others made some modifications to it and achieved pion-kaon separation at 530 GeV. This is a record unlikely to be exceeded at any time in the foreseeable future.

Ted's expertise was in the design, planning, and execution of particle physics experiments, and he had an impressive record of obtaining correct and accurate results. We and many of our colleagues learned much through working with him.