Obituary

Richard Gershon, 1932–1983

from Martin C. Raff

RICHARD GERSHON died on 11 July 1983, less than a year after he was discovered to have lung cancer and arguably at the peak of his career. As Professor of Immunology and Biology, and Director of the Laboratory of Cellular Immunology of the Howard Hughes Medical Institute at Yale Medical School, he had created one of the largest and most productive immunology groups in the world.

He was born in New York City, attended Harvard College and then Yale Medical School. Apart from two years in Japan in 1961–63 and a year in London in 1967–68, he spent all of his scientific career in the Pathology Department at Yale.

He was a remarkably imaginative and far-sighted scientist whose discovery of suppressor T cells in the early 1970s revolutionized our understanding of how immune responses are controlled. In the following few years, he and his colleagues showed that suppressor T cells regulate both T-cell and B-cell responses and are responsible for some forms of immunological tolerance and genetic unresponsiveness to specific antigens. Together with Harvey Cantor and his colleagues, they went on to show that immune responses are regulated by complex circuits of interacting subclasses of suppressor and helper T cells, which interact with each other and with effector cells by recognizing antigen, major histocompatibility complex molecules and molecules encoded by genes linked to immunoglobulin heavy-chain genes.

His most recent findings were as original and provocative as anything that he and his colleagues had produced before — contra-suppressor cells that protect helper T cells from the effects of suppressor cells, T-cell regulation of antigen-presenting cells, a suppressor factor that is assembled from two different polypeptides, each secreted by a different subclass of T cell — to mention just a few examples. As was the case with most of his work when first presented, these recent results are controversial, but given his remarkable track record, one would be foolish to bet against them.

His greatest asset was an uncanny intuition, which allowed him to see the meaning of experiments well before others in the field. It was as if he knew all along how the immune system worked and was only looking for confirmation. His most fundamental insight was to recognize that there is more to immunity than clonal selection: individual lymphocyte clones do not respond autonomously to antigen, but instead are controlled by specialized regulatory T cells. It was this insight that led him to suppressor cells, rather than the other way round.

Because they often challenged existing

immunological dogma or extended it in disquieting ways, his experiments and ideas rarely had immediate impact. In fact, it was several years before his discovery of suppressor T cells was generally accepted, and then it was only after his findings had been confirmed in many other laboratories. But by the mid-1970s, suppressor T cells were turning up everywhere and they rapidly became a 'growth industry', which has

continued to grow ever since. In recognition of his contributions to immunology, he was elected to the National Academy of Sciences in 1980 and was awarded the Gairdner Foundation International Award and Thorn Award in 1983.

It is difficult to imagine an immunological world without Richard Gershon energizing it with his warmth, intellect and *joie de vivre*. He was the life of the immunological party and will be sorely missed. □

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High-energy physics

W and Z particles from CERN

from P.I. Kalms

FOLLOWING the discovery¹ and confirmation² of the existence of the charged intermediate vector bosons, W^+ and W^- , earlier this year, the UA1 Collaboration has recently published evidence^{3,4} for the discovery of the neutral partner of the above, the Z^0 particle.

The early results on the W came from several weeks of collider operation in late 1982, and although few events were found, the mass and event rate were, within experimental uncertainties, as predicted by the standard electroweak theory. The latest results, reported at a recent meeting*, have come from running the CERN proton-antiproton collider from April to July 1983, when the luminosity was higher, so that the number of observed collisions was approximately seven times the 1982 value. For the UA1 experiment this resulted in a total of six examples of the Z particle (four decaying into e^+e^- and two into $\mu^+\mu^-$) and 52 $W^\pm$ particles.

W events ($W^\pm \rightarrow e^\pm \nu$) have the following characteristics. A high-momentum electron passing through the central detector is bent only slightly in the 0.7 T magnetic dipole field. Its sign and approximate momentum can be determined from the track curvature. The track points to a particular cell of the electromagnetic calorimeter which displays a shower characteristic of an electron and gives a precise measurement of its energy. The hadron calorimeter cell behind this shows zero or almost zero energy. Furthermore, if the electron emits bremsstrahlung, for example in traversing the vacuum pipe wall, the photon will travel in almost the electron direction and its energy will be included in the calorimeter signal, which therefore gives a true measurement of the original electron energy.

The presence of the neutrino is found by

constructing a vector sum for the energy flow into all cells of the various calorimeters. The calorimeters cover the complete solid angle down to within 0.2° from the colliding beams. The only losses come from particles remaining within the vacuum pipe and from neutrinos. Muons are detected by chambers outside the calorimeters and thus their momenta can be added to the energy balance. In normal events, which are not expected to involve high-energy neutrinos, the components of energy flow transverse to the colliding beams balance well. The longitudinal component is affected by the particles flowing down the vacuum pipe and is of more limited use. A significant transverse energy imbalance is therefore characteristic of a high-energy neutrino.

The measurement of the electron energy and direction, and the transverse energy of the neutrino leads to the determination of the transverse momentum and 'transverse mass' of each W particle. The distribution of these quantities over a number of W events leads to the actual mass of the W. The transverse momentum distribution of W particles has been determined and is consistent with the production calculations which use quantum chromodynamics (QCD) with emission of hard and soft gluons.

One of the interesting features of W physics at a proton-antiproton collider is that the charge of the W labels the way in which it is produced. On the assumption that valence quarks dominate, a W^+ will be produced from an up quark in the proton and a down antiquark in the antiproton. It has therefore been possible to extract information on the distribution within the proton of those up and down quarks which are sampled by W production.

The angular distribution of the leptons from W decay shows the parity-violating asymmetry characteristic of the weak interaction, that is the positrons from W^+

*The International Europhysics Conference on High-Energy Physics was held at Brighton on 20–27 July.