Remembering a pioneer of supersymmetry

Thu, Jun 29, 2006

The influential work of Irish physicist Lochlainn O'Raifeartaigh (1933-2000) was celebrated in Budapest last week, reports Dick Ahlstrom.

An international symposium was convened in Budapest last week to celebrate the life and work of Irish physicist Lochlainn O'Raifeartaigh. He made world-class discoveries in theoretical physics and is known by physicists around the world for his accomplishments.

O'Raifeartaigh (1933-2000) made "decisive contributions" in a range of theoretical areas including supersymmetry, according to Prof Werner Nahm, of the Dublin Institute for Advanced Study (Dias) School of Theoretical Physics. Nahm now holds the Dias chair vacated by the death of O'Raifeartaigh, a chair first held by the father of quantum mechanics, Erwin Schrödinger.

The symposium was organised by KFKI Central Research Institute for Physics in Budapest, in association with Dias and the Hamilton Mathematics Institute of Trinity College Dublin.

The programme for the O'Raifeartaigh Symposium on Non-Perturbative and Symmetry Methods in Field Theory featured presentations by physicists from no fewer than 12 countries.

"There are very few people with this kind of international standing," says Nahm. "Every physicist in the world who works on the deep structures of matter would know his name and his work would frequently be cited."

Throughout his long career at Dias, O'Raifeartaigh was recognised as a leading international figure in the field of particle physics. In particular, he focused on the application of mathematical symmetry methods to the description of elementary particles and their interactions.

He was awarded the Eugene Wigner Medal, a prestigious international award in theoretical physics, in 2000, for his "pioneering contributions to particle physics".

He published more than 200 research papers during his career, some of which became seminal papers in the field. His monograph, The Group Structure of Gauge Theories, published by Cambridge University Press, is a standard textbook in graduate courses in theoretical physics.

The theory of supersymmetry was a radical new idea in elementary particle physics in the 1970s, and O'Raifeartaigh was a key researcher in this field. The theory proposes that there are two kinds of matter, typical "hard" matter and another "gregarious" matter where the particles in this matter like to all share the same state, explained Nahm. The theory holds that there is a one-to-one relationship between these two types of matter, but that the gregarious matter is quickly lost and we no longer see it in our universe.

"This one-to-one correspondence is not a perfect symmetry of matter," explains Nahm. "It is a kind of symmetry that must be broken. Lochlainn made decisive contributions to how this can be broken."

O'Raifeartaigh's work may now see validation through experimental results when the powerful new particle accelerator, the Large Hadron Collider, at the CERN physics laboratory near Geneva, comes on stream.

"Starting next year or maybe 2008, the big accelerator at CERN is supposed to produce data which for the first time will recreate the structures Lochlainn investigated. We hope it will produce supersymmetry

partners," says Nahm. Confirmation of these theories would be important. "Most of the matter in the universe we don't understand. Only a few per cent of the universe is made up of the hard matter we can see as stars and planets and dust." Much more is made up of an unknown "dark matter".

"The leading contender for what dark matter could be is supersymmetry particles," Nahm says.

• The symposium website is www.kfki.hu/~lor2006