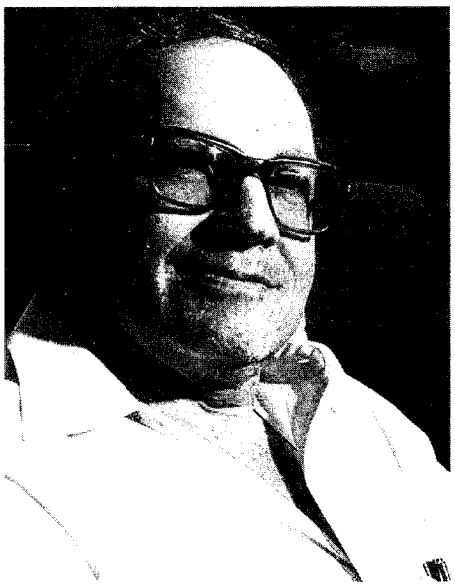
Yuval Ne'eman - group theory in depth (Photo Kathleen Blumenfeld)



Group therapy

In his review 'Genesis of Unified Gauge Theories' at the symposium in Honour of Abdus Salam (June, page 23), Tom Kibble of Imperial College, London, looked back to the physics events around Salam from 1959-67.

He described how, in the early 1960s, people were pushing to enlarge the symmetry of strong interactions beyond the SU(2) of isospin and incorporate the additional strangeness quantum number.

Kibble wrote - 'Salam had students working on every conceivable symmetry group. One of these was Yuval Ne'eman, who had the good fortune and/or prescience to work on SU(3). From that work, and of course from the independent work of Murray Gell-Mann, stemmed the Eightfold Way, with its triumphant vindication in the discovery of the omega-minus in 1964.'

Yuval Ne'eman writes - 'I was the Defence Attaché at the Israeli Embassy in London and was admitted by Salam as a part-time graduate student when I arrived in 1958. I started research after resigning from the Embassy in May 1960.

Salam suggested a problem: provide vector mesons with mass - the problem which was eventually solved by Higgs, Guralnik, Kibble,.... (as described by Kibble in his article). I explained to Salam that I had become interested in symmetry. Nobody at Imperial College at the time, other than Salam himself, was doing anything in groups, and attention further afield was focused on the rotation - SO(N) - groups. Reacting to my own half-baked schemes, Salam told me to forget about the rotation groups he taught us, and study group theory in depth, directing me to Eugene Dynkin's classification of Lie subalgebras, about which he had heard from Morton Hamermesh.

I found Dynkin incomprehensible without first learning about Lie algebras from Henri Cartan's thesis, which luckily had been reproduced by Dynkin in his 1946 thesis, using his diagram method.

From a copy of a translation of Dynkin's thesis which I found in the British Museum Library, I learned my group theory and studied the classification of semi-simple Lie algebras. I found SU(3) and chose the octet for the baryons in October 1960.

Showing it to Salam on his return from the Rochester Conference, he told me the group had just been proposed by Ohnuki for the Sakata Model (which tried to explain particles as combinations of protons, neutrons and lambdas). However the octet assignment was new and worth publishing. I also explained to Salam what I had learned about Lie algebras, and immediately other Imperial students were channeled in this direction. From the Spring of 1961 groups were everywhere.'

Crisis - Weisskopf's view

'We are facing a crisis, not only in particle physics but in the whole of fundamental science', said Victor Weisskopf, doyen of quantum physics, during his traditional summer CERN stopover. 'Basic science - science for its own sake - and especially high energy physics, is really in danger.'

As well as explaining how this has come about, the former CERN Director General (1961-5) proposed action to reverse the trend.

Rather than dividing science into the conventional 'big' and 'small' camps, he slices across another axis. On one hand there is obviously applicable 'terrestrial science' - biology, medicine, solid state, much of the nuclear sector, nonlinear behaviour, chaos,....all directly connected with processes that happen on Earth. On the other there is 'cosmic science' - astronomy, astrophysics, particle physics and some of the nuclear sector - addressing deeper issues, not attainable naturally on this planet at all, and where applications are less immediately obvious. (This classification is not completely watertight - even cosmic science can, and does, foster immediate spinoff, Weisskopf points out, citing Georges Charpak's detector work.)

Tracing the evolution of science in this century, Weisskopf sees the rapid evolution of American influence in the 1930s as a turning point. Before then, the United States had not been in the front line, and it had been important for US researchers to spend some time in Europe.

During the Second World War, other factors came into play. The development and skilled application of radar in the UK showed how scientific talent could be harnessed. The Manhattan Project for the development of the Bomb showed how