
ing to Totsuka, the few candidate proton decay events seen in recent years are not clean enough and the accompanying neutrino background is too high. However more data is needed before proton decay can be ruled out.

Recent reports from underground experiments NUSEX (Mont-Blanc) and Soudan (Minnesota) had uncovered unexplained intense pulsed muon signals apparently coming from the star Cygnus X-3 (see September issue, page 264). Totsuka revealed that similar searches by the Kamioka (Japan) and Fréjus (France) experiments had found nothing, although their exposure time was shorter. A remark from the floor indicated that the big water detector operated by the Irvine/Brookhaven/Michigan team was also seeing nothing.

In another controversial area, Karl Bergkvist of Stockholm spent

a substantial part of his talk demolishing the claims of the Moscow experiments which for several years have been saying that the electron-type neutrino has a mass of a few tens of electronvolts. Nobody from the Moscow experiment was at Kyoto to react. Bergkvist also claimed that other odd neutrino results, like an unexplained heavy neutrino at 17 keV (see July/August issue, page 241), and possible neutrino oscillations seen in experiments at reactors are being 'anticonfirmed' by other studies.

Last year the UA1 experiment reported examples of a widely separated hadron jet and a lepton, accompanied by the missing energy of a neutrino. This suggested that the decay of the long-awaited heavy sixth 'top' quark was being seen. At Kyoto, Rubbia still pointed to such events clustered round a top quark mass of 40 GeV,

but looks forward to more data at higher collision rates and energies.

In his talk on heavy quarks, Jon Rosner of Chicago did not find this evidence too compelling and urged the CERN Collider experiments to fix better limits on the top quark mass. For his part, summarizer Schwitters admitted that a top quark in the mass range between 30 and 50 GeV is possible, but is 'not established'.

Kyoto speakers repeatedly underlined that while the Standard Model now looks very solid, it has too many free parameters to be the complete picture. There is no lack of deeper candidate theories, but as yet little or no evidence to go on. But new physics could be 'right round the corner in the TeV region,' declared Schwitters, gathering up his transparencies.

(A fuller report on the Kyoto meeting will feature in our next edition.)

Death at Bari

Summarizing the International Europhysics Conference held at Bari, Italy, from 18-24 July, theorist Alvaro De Rújula declared 'we have seen at this Conference a dozen wonderful, revolutionary discoveries die. The Conference would have been extraordinarily more optimistic (and cool) a few months ago'. (Participants at Bari had to contend, among other things, with temperatures of 42 degrees with minimal or no air conditioning.) However his comment was restricted to the experimental sector. In theory, new ideas are very much alive.

Among these experimental effects which seemed to be slipping off the map at Bari were the heavy neutrino (17 keV) from the analysis of tritium beta decay (see July/August issue, page 241), the 'zeta particle' once seen at 8.3 GeV in upsilon decays (see September 1984 issue, page 266), and several first indications reported last year by the big experiments at the CERN proton-antiproton Collider which do not seem to be standing the test of time. De Rújula proposed 'Parkinson's Law of Physics' - 'As the statistics increase the evidence decreases'.

The preliminary (and unexplained) Collider effects which are not being confirmed include a jet-jet resonance at 160 GeV, additional jet activity accompanying the production of Z bosons, excess signals of jet plus leptons, the highly energetic photons accompanying Z decays, and puzzles in the production of muon pairs of the same sign.

As if to counter the disappearance of so many potentially interesting phenomena, new enigmas have been provided by some underground experiments looking at particles coming from the binary

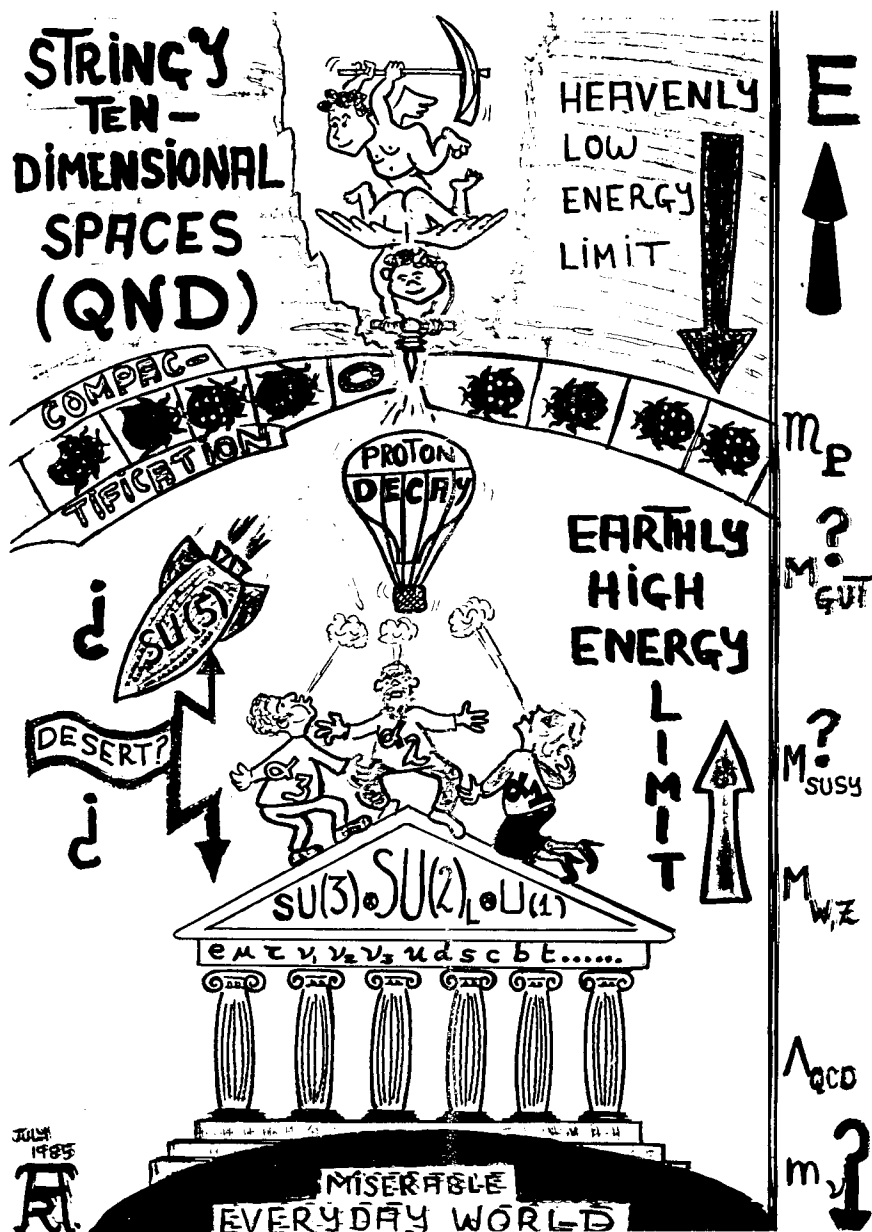
star Cygnus X-3 (see September issue, page 264). According to De Rújula, these data are either 'too peculiar and too few to be taken seriously in all of their implications' (the pessimistic viewpoint), or are 'absolutely mind-boggling, revolutionary' (the optimistic viewpoint).

Participants at Bari hoping to get more news on the unexplained 'monojet' events seen by the UA1 experiment at the CERN Collider (collisions apparently producing a spray of hadrons on one side and the 'missing energy' signal of a neutrino on the other) met only a stony silence. 'Why should UA1

submit to pressure and release their data before they are fully analysed?' maintained De Rújula.

Impressive now is the volume of data which confirms the Standard Model of the electroweak sector plus conventional quark theory (quantum chromodynamics). The electroweak mixing angle has been measured under a wide range of conditions and all results concur. Results from the CERN Collider now show that at the very most there can only be a few additional types of neutrinos beyond the three (electron, muon and tauon) already discovered.

However the Bari graveyard of odd experimental effects was in stark contrast to the optimism verging on hysteria of theorists succumbing to 'superstring fever' (see June issue, page 185). Superstrings are being widely heralded as the best ever contender for the theory of everything. De Rújula summarized the development of the ideas, but turned his audience's attention to Michael Faraday's premature enthusiasm of 150 years ago in trying valiantly but unsuccessfully to unify electricity and gravity. A remark made by Faraday nearly 150 years ago still applies to the theoretical physics effort of today - 'If the hope should be well-founded, how great and mighty and sublime is the force I am trying to deal with, and how large may be the new domain of knowledge that may be opened to the mind of man'.



Alvaro De Rújula's view of the present state of particle physics theory.