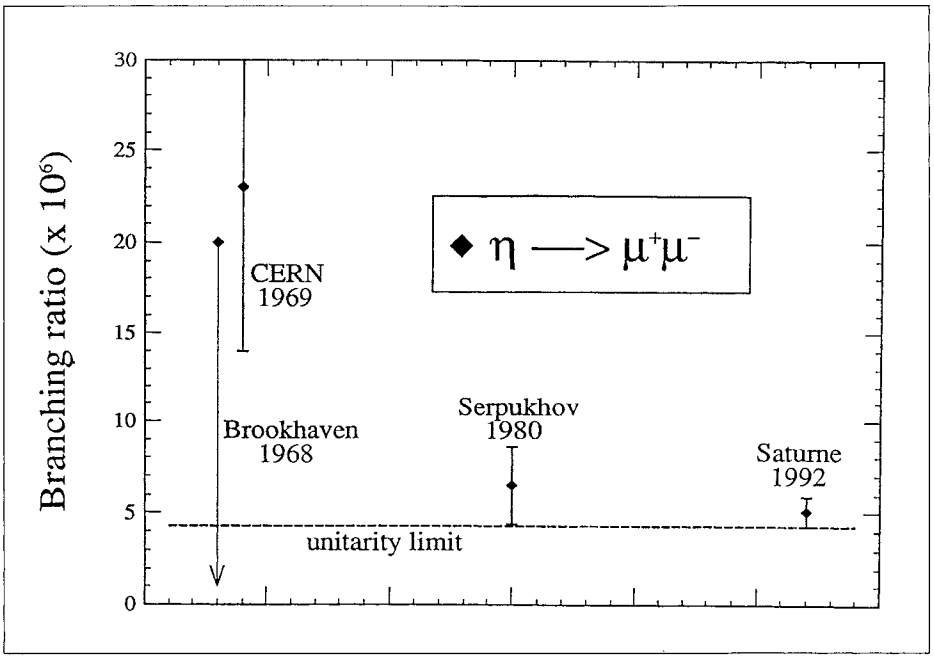
New limits on the branching ratio for the rare decay of an eta meson into a muon of charged muons measured at the French National Saturne Laboratory's new eta decay facility.



bidden eta decays, such as the muon-electron channel, which are a modest improvement over existing upper limits.

Plans are being made, though not yet funded, for a novel large acceptance spectrometer to measure many of the known and unknown eta decays to a level of 10^{-8} - 10^{-9}. For instance etas going to a neutral pion and a pair of muons or electrons test charge conjugation invariance at the level of a one-photon intermediate state; etas decaying into electron-positron pairs are an (indirect) test of the existence of leptoquarks, and eta going to a muon and an electron tests lepton family violation.

The eta factory also makes possible new and detailed measurements of the eta electromagnetic transition form factor in the decay of etas into muon pairs plus a photon, and can probe perturbation theory in measurements of eta going to a neutral pion and two photons.

Artificial intelligence

A vivid example of the growing need for frontier physics experiments to make use of frontier technology is in the field of artificial intelligence and related themes. This was reflected in the second international workshop on 'Software Engineering, Artificial Intelligence and Expert Systems in High Energy and Nuclear Physics' which took place from 13-18 January at France Telecom's Agelonde site at La Londe des Maures, Provence. It was the second in a series, the first having been held at Lyon in 1990.

Four closely related sectors were covered - software engineering, expert systems, neural networks and symbolic manipulation techniques.

The magnitude and complexity of the experiments on the horizon for the end of the century clearly calls for the application of artificial intelligence techniques. However there are common problems in different areas (high energy, nuclear and plasma physics, space, telecommunications,...), and solutions are sought through research-industry collaboration in an international collaboration framework.

From an identification of the real needs of fundamental research using large installations, this approach leads on one hand to the development of new products or techniques which will find a place in industry, and on the other to improved artificial intelligence methods.

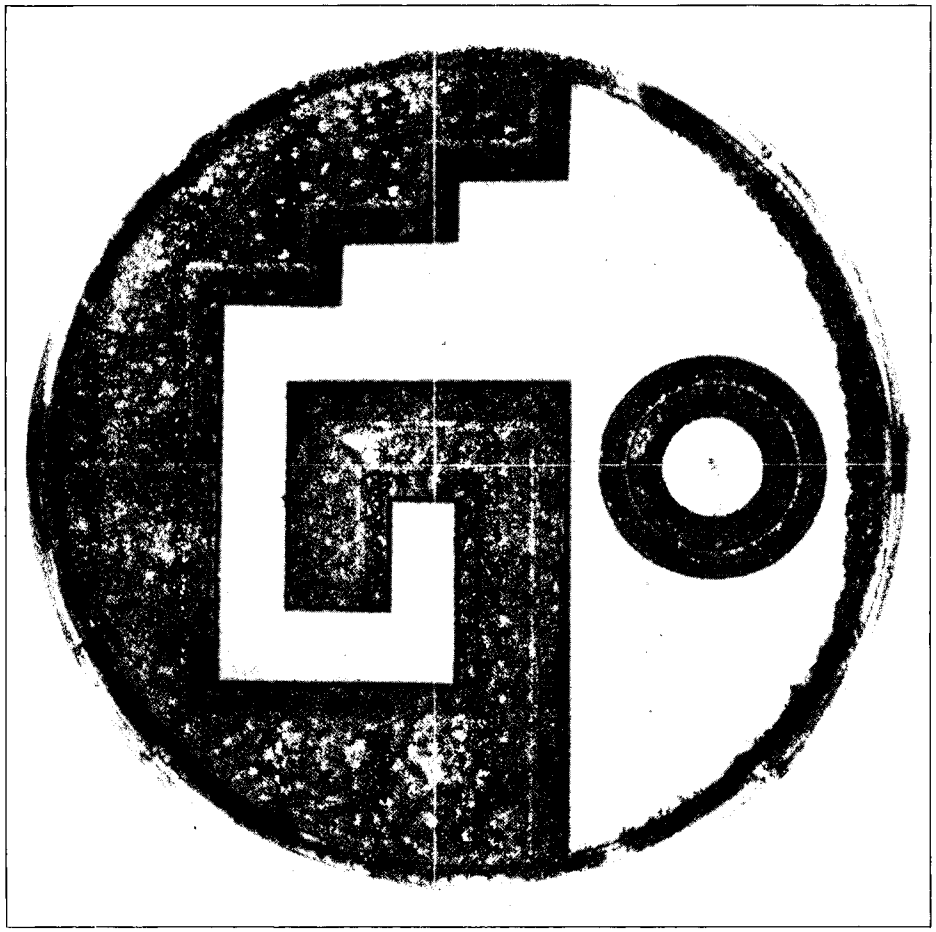
Many experts from outside particle physics took part in the workshop, including several having made pioneer contributions to the field. Coursework covered the logic of the method components of software engineering, object-oriented languages (EIFFEL), and applications using a variety of languages.

An introduction to artificial intelligence and expert systems was followed by a description of the PROLOG III language, the possibilities for genetic algorithms, and the use of neural networks for pattern recognition, together with their application in high energy physics.

Plenary sessions summarized three days of parallel streams, including several ongoing physics projects. Relations with industry play an important role. The programme continued with results and ongoing projects in neural network applications in particle physics and related sectors.

Symbolic manipulation techniques allow algebraic evaluation of measurable quantities to be introduced into computing, avoiding the otherwise tiresome and onerous aspects of precision calculations using numerical methods, notably in Feynman diagrams and accelerator parameters. MAPLE, REDUCE, FORM, SCHOONSCHIP and ASHMEDAI were among the codes described.

The 'ASTEC' symbol adopted by the community pushing for increased use of artificial intelligence techniques in particle physics.



Several industrial concerns, notably France-Telecom and France's National Centre for Telecommunications, contributed presentations and exhibits. A Numeris link allowed applications work.

A major outcome was the setting up of working groups (under the acronym ASTEC) covering four major themes:

1 - to establish and maintain world contacts between groups working on all subjects and to help integrate small units in larger projects;

2 - to organize relations with industry and other research areas through common projects;

3 - to contribute to the education in new techniques;

4 - to develop ideas for software standardization and interface protocols between different applications.

LISTSERV servers are installed at CERNVM (ASTEC at CERNVM) for information exchange between these groups and to reach out to the high energy and nuclear physics communities at large. A 'White Book' summarizing the results of this work will be published after the next workshop in the series, to be held in Germany in fall 1993.

The proceedings of the 1992 meeting will be published by World Scientific. Held under the auspices of the European Physical Society, CNET (the French centre for telecommunications studies), the French Atomic Energy Commission, the Ministry of Research and Technology, the Ministry of Foreign Affairs, and LAPP (Annecy), more than 250 participants from 18 countries took part.

From D. Perret-Gallix

KEK Deuterons

At the end of January, the 12 GeV Proton Synchrotron (PS) at the Japanese KEK Laboratory successfully accelerated deuterons to 11.2 GeV (5.6 GeV/nucleon), the limiting energy for deuterons with this ring. Beam intensity in this test exceeded 3×10^{11} particles per pulse.

With PS protons and with electrons and positrons for the TRISTAN collider, the advent of deuterons adds another important option to the KEK beam menu.

Since its completion in 1976, the KEK PS has been continuously improved, supplying proton beams for a variety of experiments. When many KEK high energy physics users were attracted to the TRISTAN project in the mid-80s, the PS experimental program underwent a transition and nowadays covers a wide field of research, including particle, hadron, nuclear and atomic physics as well as nuclear chemistry. Hence a recent request for a high energy deuteron beam.

The KEK PS chain consists of a 750 keV Cockcroft-Walton preaccelerator, a 40 MeV Alvarez linac and a 500 MeV booster synchrotron feeding the 12 GeV main ring. Extra beam from the booster is used for neutron scattering and muon science as well as for cancer therapy.