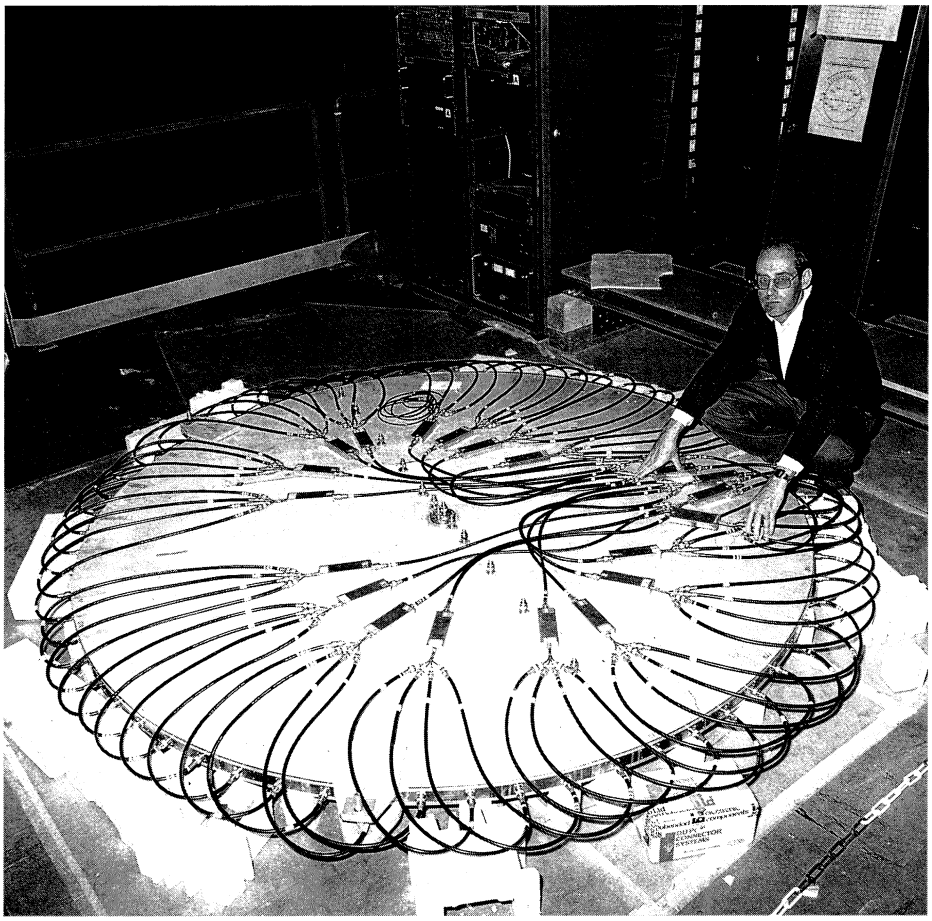
Looking at switched power possibilities. This scale model radial transformer built at CERN showed how pulses from the outer rim can give a compressed electric field towards the centre.

(Photo CERN X246.2.87)



Hincke at the University of Rochester.

F. Villa at the Stanford Linear Accelerator Center (SLAC) has proposed using high pressure gases as the switch, with a short laser pulse initiating the discharge.

The fourth method is an interesting attempt to create the short pulse directly by Fourier synthesis – adding together the outputs of around ten suitably phased frequency generators to produce a resultant short pulse in a cavity. It is being studied by H. Haseroth and F. Caspers at CERN, with a trial experiment now underway at Wuppertal.

Much attention centred on radial transmission lines, with a pulse at the outer radius of a disc structure giving an increased electric field as the pulse is compressed inwards. Additional gain could come from tapering the line along the beam direction (the common axis of the discs). F. Villa has proposed a clever method of close packing using twisted, tapered lines.

R. Palmer (Brookhaven/SLAC) proposed an initial application of switched power for a high brightness electron gun incorporating a photocathode, and using a 3 MV/m accelerating voltage, 2 mm gap, 10 ps accelerating pulse, and 100 fs electron pulse.

At the workshop, working groups looked into the switching methods to produce the pulse, the matching of the initial power supply circuitry to the transmission line, the design of the radiofrequency cavity and photocathode, and the production of a suitable short laser pulse.

Calculations showed the possibility of developing an electron gun up to a hundred times brighter than the design value of the radiofrequency gun now under test at Brookhaven's Accelerator Test Facility (April 1987, page 21). If this can be achieved, switched power may have an important role to play in future accelerator construction.

STANFORD
Internal targets

Of burgeoning interest to many nuclear and particle physicists is a storage ring technique for fixed target experiments. It hinges on the use of gas-jet targets, shooting a narrow stream of atoms (hydrogen, helium, argon, xenon, ...) through a circulating beam of electrons or protons.

Pioneered at CERN and the Soviet Novosibirsk Laboratory, more such 'internal targets' are being built or contemplated for storage rings in Europe, the Soviet Union, and the United States.

From 9-12 January, physicists from around the world met at the Stanford Linear Accelerator Center (SLAC) to discuss prospects and problems in this expanding field. Opening with a discussion of the physics possibilities at electron storage rings with internal targets, Stan Brodsky of SLAC noted that electroproduction continues to be the definitive path to explore the quark and gluon structure of nucleons (structure functions).

Recent surprising revelations by the European Muon Collaboration (EMC) at CERN, reviewed by Frank

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Department of Physics
1110 W. Green Street
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Completed applications should be received no later than January 15, 1990 in order to receive full consideration.

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Above, schematic of the PEGASYS internal target proposed for Stanford's PEP electron ring. Below, a gas jet internal target developed for beams stored in CERN's SPS ring.

(Photo CERN 347.12.82)

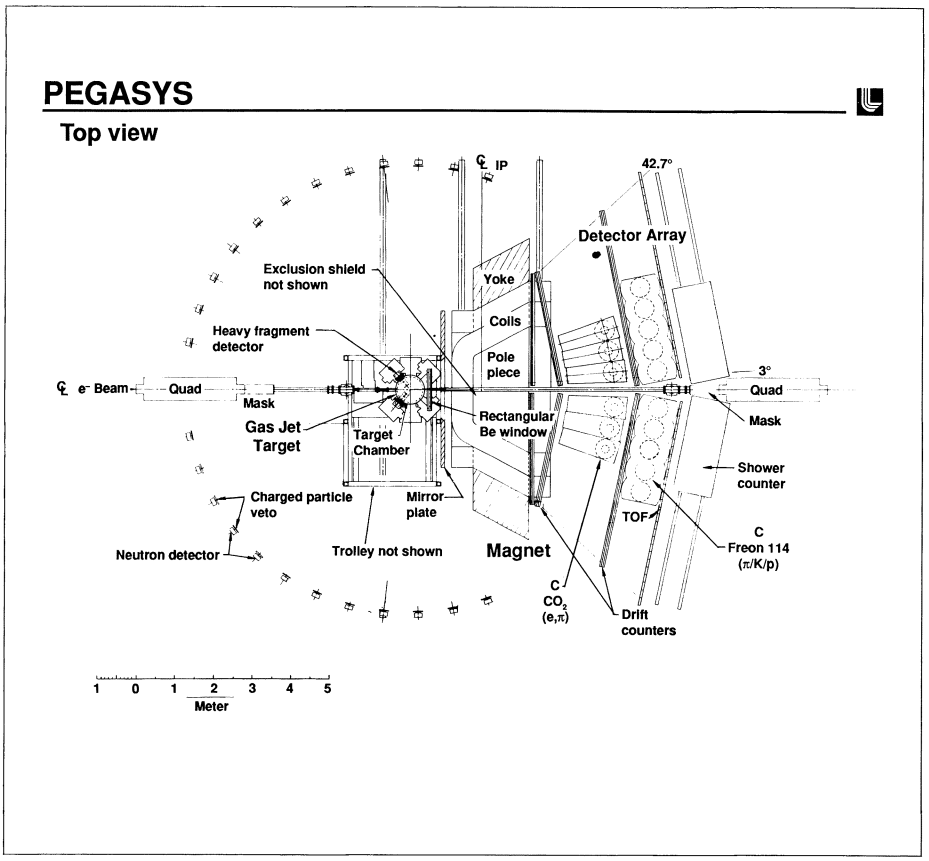
Close of Tennessee, suggest that the proton spin might not be due merely to the spin of the quarks (June 1988, page 9). Some theorists propose that the gluons are responsible, while others point to orbital motion of the quarks. Whatever the case, electron scattering from polarized targets should help provide some answers.

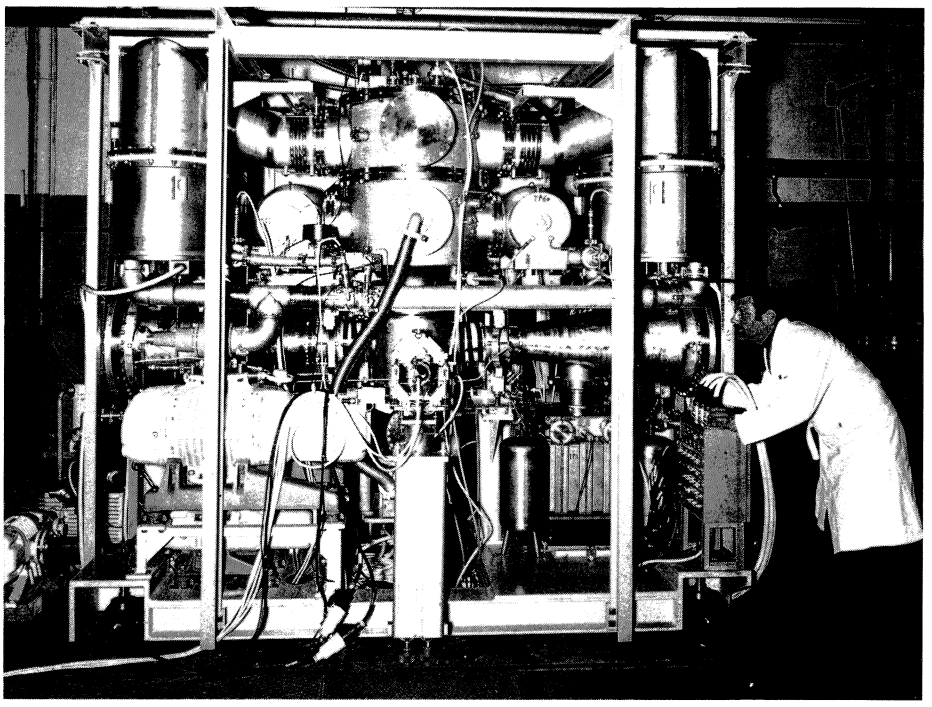
The subsequent 'hadronization' of a quark violently struck in deep inelastic scattering was another subject of strong interest. By studying the hadrons produced when leptons scatter from different nuclei, noted Andreas Bialas of Cracow, physicists can gain added insight into this poorly understood process. So far most of these experiments have used beams of muons and neutrinos at CERN and Fermilab. However the intense electron levels available from storage rings would open up the hadronization process in greater detail.

Providing high average currents that appear almost continuous to a particle detector, the circulating electron bunches in a storage ring are far better suited for detecting several secondaries in coincidence than are the short pulses extracted from most electron accelerators. A large-acceptance detector could analyse most of the spray of particles and nuclear fragments produced in electron-nucleus collisions.

Karl Van Bibber of Livermore described the PEGASYS internal target scheme proposed for SLAC's PEP storage ring. The PEGASYS collaboration aims to study both the fate of the struck quark as it hadronizes and the response of a nucleus to the sudden removal of one of its quarks.

Another advantage is that slow particles and heavy nuclear fragments are not absorbed in a 'thin'





People and things

internal target and can thus reach detectors. A whole new class of nuclear structure measurements therefore becomes possible, using heavy fragment 'tags' at low energy storage rings. Stan Kowalski outlined the 1 GeV electron stretcher ring and internal target facility under construction at the MIT-Bates accelerator, and Kees de Jager revealed similar plans for NIKHEF in Amsterdam.

Other potential internal-target dividends include polarized nuclear targets. The recent EMC surprises in muon scattering from polarized protons have whetted theorists' appetites for similar measurements on the neutron, requiring targets of polarized deuterium or helium-3.

Richard Milner of MIT discussed recent work on a novel polarized target of optically pumped helium-3 atoms and described a proposal to measure the quark spin structure of nucleons in the HERA electron-proton collider being built at the German DESY Laboratory in Hamburg.

Several other speakers, among them Louis Dick of CERN, described the wide range of plans to use internal targets in circulating proton or antiproton beams. Martin Perl of SLAC showed how PEGASYS might even be used to search for new particles.

Providing useful insights into the range of new experiments possible with internal targets, the Topical Conference on Electronuclear Physics with Internal Targets drew large contingents from CERN and MIT; Caltech, Fermilab, Frascati, Livermore and Novosibirsk were also well represented. The Conference was organized and chaired by Ray Arnold of American University, Coordinator of the NPAS (Nuclear Physics At SLAC) programme.

From Michael Riordan

On people

The Alexandre Joannides Prize, a major award of the French Academy of Sciences, goes this year to ***Raymond Stora*** *, research director at the French Centre National de la Recherche Scientifique working at LAPP (Annecy) and CERN, for his work in the renormalization of non-Abelian gauge theories, where with his students A. Rouet and C. Becci, he developed the BRS formulation, a cornerstone of modern quantum field theory. In other areas, his contributions to particle theory have been both profound and wide-ranging.*

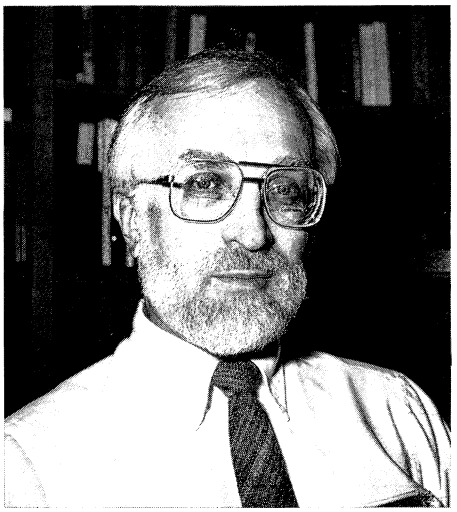
The 1989 J.J. Sakurai Prize for Theoretical Particle Physics goes to Italian theoretician ***Nicola Cabibbo*** *for his 'outstanding contribution to elucidating the structure of the hadronic weak neutral current'. In 1963, Cabibbo supplied a framework to describe the weak decays of particles carrying strange quarks, a vital step towards the current picture of three interrelated 'families' of leptons and quarks.*

Stan Schriber *takes over from Bob Jameson as Head of Los Alamos National Laboratory's Accelerator Technology Division.*

New Berkeley Director

Charles Vernon Shank, 45, currently Director of the Electronics Research Laboratory at AT and T Bell Laboratories in Holmdel, New Jersey, becomes Director of the Lawrence Berkeley Laboratory from 1 September, succeeding David A. Shirley, who will return to chemistry.

Stan Schriber is the new Head of Los Alamos National Laboratory's Accelerator Technology Division.



German Awards

Among the awards for this year by the Deutsche Physikalische Gesellschaft is its highest annual accolade, the Max Planck Medal, to Bruno Zumino of Berkeley, and the Robert Wichard Pohl Prize to Wolfgang Paul.

A member of CERN's Theory Division from 1969 to 1982 and for several years its Leader, Zumino is well known for his fundamental contributions to the field theory of elementary particles, characterized by deep insight and mathematical and logical rigour. In 1974 came his pioneer work with Julius Wess which led to the formulation of supersymmetry.

Wolfgang Paul, who celebrated his 75th birthday last year, has made numerous contributions to atomic and nuclear physics, including ingenious systems to handle electrically neutral particles, and was a driving force behind the Bonn electron synchrotron. At CERN from 1964-67, he was first joint Head of Nuclear Physics Division, then Director of Physics I Department. He was Chairman of CERN's Scientific Policy Committee from 1975-77.