

People and things

these pure glue states and quark-antiquark states with the same quantum numbers has not yet been computed and so it is not possible to make reliable mass predictions.

The electroweak sector has also received attention from lattice theorists. Brian Pendleton, also from Edinburgh, explained the paradox that non-perturbative methods can be needed to study weak interactions, where perturbation is normally a safe bet. The problem is in the Higgs sector (symmetry-breaking dynamics supplying mass) where the self-interaction of the Higgs particle can become strong if the Higgs particle is heavy.

Speculation has been rife for some time that very high energy heavy ion collisions might be able to produce energy densities sufficient to induce a phase transition from the usual state in which quarks and gluons are confined in conventional nuclear matter to a deconfined phase, creating the long-awaited quark-gluon plasma. Frithjof Karsch from CERN gave a review of recent theoretical developments. Observable consequences would be a large latent heat at the transition temperature and screening of the heavy quark-antiquark potential so that there would be no heavy quark bound states in the plasma phase. Recent lattice computations suggest that the transition temperature is reduced from its value of roughly 200 MeV in the quenched theory to perhaps 150 MeV, leading to a critical energy density of roughly 1 GeV per cubic fermi.

In the final talk Chris Sachrajda covered the progress towards the calculating hadron transitions using lattice QCD. Notable successes include obtaining values of some meson decay constants to within 15 % of experimental values, pion

form factor and structure function determinations, weak form factors of charmed mesons, and proton decay probabilities. More disappointing are efforts to understand isospin selection rules, where enormous numerical cancellations in the calculations obscure the results.

However the general message is an upbeat one; many fundamental quantities in strong interaction physics are being computed from first principles and meaningful phenomenology from the lattice is beginning to be possible. Reduction of systematic errors is the prime goal and that requires computational resources far in excess of what is currently available to individual research groups. The way forward needs international cooperation to establish facilities comparable to those enjoyed by experimentalists.

By Ken Bowler

Erwin Gabathuler of Liverpool and formerly CERN Research Director has been elected a Fellow of the Royal Society, London.

Finland joining CERN

At a specially-arranged session of CERN Council on 27 April, the delegates of CERN's 14 Member States voted unanimously in favour of admitting Finland as the Organization's 15th Member State. Ratification should be complete in time for Finland's accession to be effective from 1 January 1991. The country's contributions to the CERN budget will increase on a sliding scale, eventually reaching their full level in 1995. In the meantime the Finnish Government intends to increase substantially its support for the national programme in high energy physics research.

On people

Vernon Hughes of Yale has been selected for the 1990 Bonner Prize in recognition of his important work on polarized electron beams and his contributions toward measuring the spin dependence of the nucleon quark content (structure functions).



Visiting CERN on 25 April, Vladimir Shatalov (right), Director of the Soviet cosmonaut preparation centre, and V.A. Denissenko, Vice-Director of the Institute of the Earth, Moscow, had an inside view of the Delphi experiment at the LEP electron-positron collider. Accompanying them (left) was Delphi spokesman Ugo Amaldi.

(Photo CERN 135.4.90)

Fred Reines of Irvine is to receive the 1990 Michaelson-Morley Award from Case Western Reserve University in recognition of his 1956 discovery of the neutrino (with Clyde Cowan) and his continued forefront work in neutrino physics.

New Director for Swiss PSI Laboratory

On 1 April Anton Menth became Director of the Swiss Paul Scherrer Institute, Villigen – Würenlingen, succeeding Jean-Pierre Blaser. After beginning his physics career with solid-state research at ETH, Zurich, Menth moved into Swiss industry, taking on a series of key roles with first the Brown Boveri and then the Oerlikon concerns. He is now also Professor of Physics at ETH Zurich.

Jean-Pierre Blaser has been Director of the Schweizerische Institut für Nuklearforschung (SIN) since its inception as a meson factory in 1968. After presiding over the initial phase of the merger of SIN with the neighbouring Eidgenössisches Institut für Reaktorforschung (EIR) he became first Director of the combined Laboratory, renamed the Paul Scherrer Institute, in 1988. For several years he was also Swiss representative to CERN Council.

CEBAF injector operates at 5 MeV

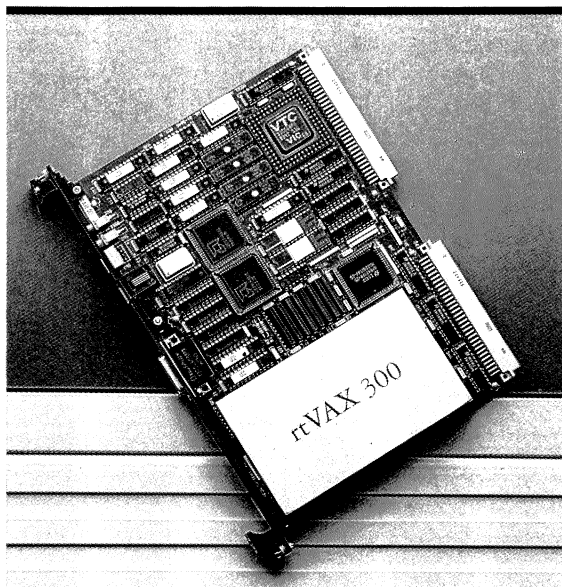
In an April 19 test, the initial 5 MeV superconducting section for the injector of the Continuous Electron Beam Accelerator Facility being built at Newport News, Virginia,

Anton Menth (left) becomes Director of the Swiss Paul Scherrer Institute, succeeding Jean-Pierre Blaser (right).



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accelerated an electron beam to design energy. This superconducting quarter-cryomodule – of the same design as the full cryomodules to be used in both the 4 GeV accelerator itself and the rest of the 45 MeV injector – contains a hermetically joined pair of accelerating cavities immersed in 2K helium. Continued 5 MeV operations will test beam current, position, and profile monitors as well as pre-production radiofrequency control units and associated hardware.

In another development earlier in April, Robert Gay Construction Company of Jacksonville, Florida, began building CEBAF's three end stations. Gay's \$11.8 million contract calls for circular, partially underground concrete halls 30, 46, and 53 metres in diameter.

Superconducting equipment for Brazil

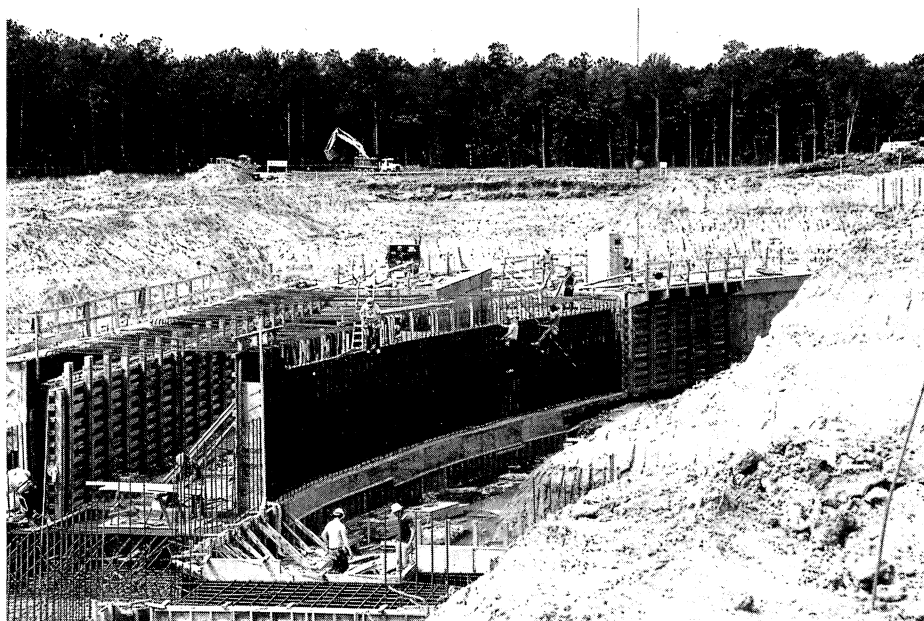
Thirteen superconducting niobium-sheathed radiofrequency accelerating modules of the type developed at Argonne for ATLAS (Argonne Tandem Linear Accelerator System) are to be supplied to Sao Paulo, Brazil, to upgrade the university's electrostatic accelerator.

Waiting for RHIC

With construction of the RHIC Relativistic Heavy Ion Collider expected to get underway at Brookhaven in October 1991 (April, page 16), preparations for the experimental programme move into top gear.

Oscar Sala (left) of Sao Paulo, Brazil, and Lowell Bollinger, head of Argonne's ATLAS accelerator, with one of the superconducting accelerating units developed at Argonne for ATLAS. 13 such units are to be supplied to upgrade Sao Paulo's electrostatic accelerator.

Construction work underway for the Continuous Electron Beam Accelerator Facility (CEBAF), Newport News, Virginia.



Discussing heavy ion physics results from the Alternating Gradient Synchrotron at Brookhaven – (left to right) Ole Hansen, Miklos Gyulassy and Flemming Videbaek.



The Fourth Workshop on Experiments and Detectors is scheduled for Brookhaven from 2-7 July, immediately following the International Conference on Particles and Nuclei (PANIC) in Cambridge, Massachusetts (further information from the RHIC office, bitnet rhicuser at bnl.dag).

Meanwhile accomplishments so far with heavy ion beams at Brookhaven's Alternating Gradient Synchrotron (which will act as the RHIC injector) were surveyed at a workshop at Brookhaven from 5-7 March.

At Berkeley, the Nuclear Science Division has set up a Relativistic Nuclear Collision Group under Art Poskanzer to cover preparations for RHIC and ongoing heavy ion studies at CERN and at the local Bevalac.

At CERN, supplier of the world's highest energy heavy ion beams (sulphur-32 ions at 200 GeV/nucleon), plans are being groomed for an international project to supply beams of lead ions. In addition, the LHC idea for a proton collider using the existing 27-kilometre LEP tun-

nel (December 1989, page 1) could take heavy ion beams on board.

Meetings

A workshop on tau neutrino physics to be held at Orsay from 24-27 September, organized jointly by the French IN2P3 (CNRS) and CEA, will cover experiment, theory, and ideas for the future. Attendance (about 100) is by invitation only. Contact Tau workshop, c/o Nicole Mathieu, Universite Paris-Sud, LAL Bat 200, 91405 Orsay Cedex, France, bitnet orsaytau at frcpn11

Top papers of the 1980s

In the analysis of a decade of particle physics papers to find the most frequently cited results of the 1980s (April, page 7), a big one unfortunately slipped through the net. The 1984 Reviews of Modern Physics paper by E. Eichten, I. Hinchliffe, K. Lane and C. Quigg stressed the importance of a physics programme exploring the 1 TeV (1000 GeV) scale for interac-

tions at the quark and lepton level and looked at the probable outcome, based on Standard Model physics. With 785 citations, this was the most referred-to phenomenology paper and should have been included in the top ten papers.

A misprint which hindered some subsequent citations obscured references to the 1985 Nuclear Physics B paper by L. Dixon, J.A. Harvey, C. Vafa and E. Witten on 'Strings on orbifolds', which looked at the 'compactification' of unwanted dimensions in superstring theory.

Our apologies to all the authors.

The amended top twenty in full

The initial figure is the citation score:

- 1102** P. Candelas et al: *Nuclear Physics B* 258 (1985) 46
- 969** D.J. Gross et al: *Nuclear Physics B* 256 (1985) 253
- 925** A.M. Polyakov: *Physics Letters* 103B (1981) 207
- 897** D.J. Gross et al: *Phys. Rev. Letters* 54 (1985) 502
- 893** Particle Data Group: *Physics Letters B* 170 (1986) 1
- 842** A.H. Guth: *Phys. Rev. D* 23 (1981) 347
- 828** M.B. Green, J.H. Schwarz: *Physics Letters* 149B (1984) 117
- 811** A.A. Belavin et al: *Nuclear Physics B* 241 (1984) 333
- 764** J.H. Schwarz: *Physics Reports* 89 (1982) 223
- 754** E. Eichten et al: *Rev. Mod. Phys.* 56 (1984) 579
- 652** E. Witten: *Nuclear Physics B* 223 (1983) 422
- 598** D. Friedan et al: *Nuclear Physics B* 271 (1986) 93
- 592** G. Arnison et al (UA1): *Physics Letters* 126B (1983) 398
- 585** P. Bagnaia et al (UA2): *Physics Letters* 129B (1983) 130

- 582** G. Arnison et al (UA1): *Physics Letters* 122B (1983) 103
542 A. Albrecht, P.J. Steinhart: *Phys. Rev. Letters* 48 (1982) 1220
537 A.D. Linde: *Physics Letters* 108B (1982) 389
523 M. Creutz: *Phys. Rev. D* 21 (1980) 2308
518 L. Dixon et al: *Nuclear Physics* B261 (1985) 678
507 D.J. Gross et al: *Nuclear Physics* B267 (1986) 75
505 E. Witten: *Nuclear Physics* B258 (1985) 75
495 M. Banner et al (UA2): *Physics Letters* 122B (1983) 476
478 E. Witten: *Commun. Math. Phys.* 92 (1984) 455
470 E. Witten: *Nuclear Physics* B268 (1986) 253
466 Particle Data Group: *Reviews of Modern Physics* 52 (1980) S1
446 A.M. Polyakov: *Physics Letters* 103B (1981) 211
426 H.P. Nilles: *Physics Reports* 110 (1984) 1
423 D. Friedan et al: *Phys. Rev. Letters* 52 (1984) 1575
413 L. Alvarez-Gaumé, E. Witten: *Nuclear Physics* B234 (1984) 269
408 E. Witten: *Nuclear Physics* B223 (1983) 433
406 Particle Data Group: *Physics Letters* B204 (1988) 1
404 P. van Nieuwenhuizen: *Physics Reports* 68 (1981) 189

Posters for schools

On the initiative of Meinhard Regler from the High Energy Physics Institute in Vienna, a series of thirteen posters on accelerators and particle physics have been printed for use in schools. They are in three sets: I-IV on Accelerators and Colliders, prepared by Brian Southworth; V-VIII on Detectors, prepared by Meinhard Regler; IX-XIII

on Theory prepared by Wolfgang Lucha with Herbert Pietschmann. Marcel Sturzingar helped with graphics and the posters were printed by Sappl in Kufstein, Austria.

The posters on accelerators take the historical route to high energies to cover the different techniques of particle acceleration. They begin with 'General principles' – definition of the electronvolt, TV tubes as an example of the basic elements of an accelerator, and the distinction between fixed target and colliding beams. They move on to 'DC machines and cyclotrons' – from Crookes' tube, via the Cockcroft-Walton and Van de Graaff to the cyclotron. Next come the machines for relativistic particles 'Synchro-cyclotrons, linacs, synchrotrons' with illustration of the principles of alternating gradient and of phase stability. They conclude with 'Colliders' covering electron-positron, proton-proton and proton-antiproton machines.

The posters on 'Detectors' concentrate on the most up-to-date techniques for particle detection. They begin with a comparison of 'Fixed target/collider experiments' using schematic representations of both types. 'Wire chambers' are covered moving from the Geiger counter and proportional chamber to drift chambers and time projection chambers. 'Particle identification' is illustrated via Cherenkov light devices and the energy loss methods. These posters conclude with 'Calorimeters' with diagrams of various types of such devices such as a sandwich structure calorimeter and a hadron calorimeter for a fixed target experiment.

The posters on 'Theory' begin with 'Fundamental particles' with their dual role as building blocks of matter and transmitters of force, their interactions via particle ex-

change, and the quantum mechanical understanding of atomic structure. 'Elementary particles' classifies particles into bosons and fermions and introduces the concepts of quantum numbers and of antiparticles. 'Standard theory' summarizes present knowledge of particles in the standard model. 'Quark model' explains the properties of the strongly interacting particles, the hadrons, in terms of their quark and gluon constituents. The final poster on 'Fundamental interactions' illustrates the fundamental interactions found in nature.

The posters are aimed at pre-university school classes and could also be useful in postgraduate education of teachers, introductory lectures in physics courses and in popular science lectures. They can also serve in other general presentations of particle physics and its associated technologies.

The posters are 70 x 100 cm in full colour. The English version is available from CERN at a cost of 350 Swiss francs for the full set. Requests should be addressed to Petra Pamblanco, Publications Section, CERN, 1211 Geneva 23, Switzerland. The German version is available from the printer at a cost of 4160 Austrian schillings for the full set. Requests should be sent to Paul Sappl, Eichelwang 15, 6332 Kufstein, Austria. (Reduced costs could be negotiated for large orders for either language version.) It is probable that a French version will be produced before the end of the year. People interested in helping to organize production in other languages should make contact with Brian Southworth at CERN.

Users' corner

The May issue (page 27) outlined how the European Committee for Future Accelerators (ECFA) has set up nine detector and three physics working groups for exploring in detail the physics possibilities for the Large Hadron Collider (LHC) proposed for CERN (December 1989, page 1).

To promote rapid dissemination of information from these working groups, a new news feature, LHCWG NEWS, will soon be installed on the CERNVM and CERNVAX computer systems.

LHCWG NEWS can be accessed at any time from CERNVM by typing NEWS (LHCWG To see this news regularly, add the line 'EXEC NEWS (LHCWG UNSEEN' at a suitable point in your PRO-

FILE EXEC file. This will show any such news issued since the previous login. On the central VAX cluster this news may be read by typing NEWS LHCWG

Those interested but not having an account on the CERN computers should send their electronic mail addresses to the CERN Users' Office – CERNVO at CERNVM or PATTISON at CERNVM mentioning LHCWG

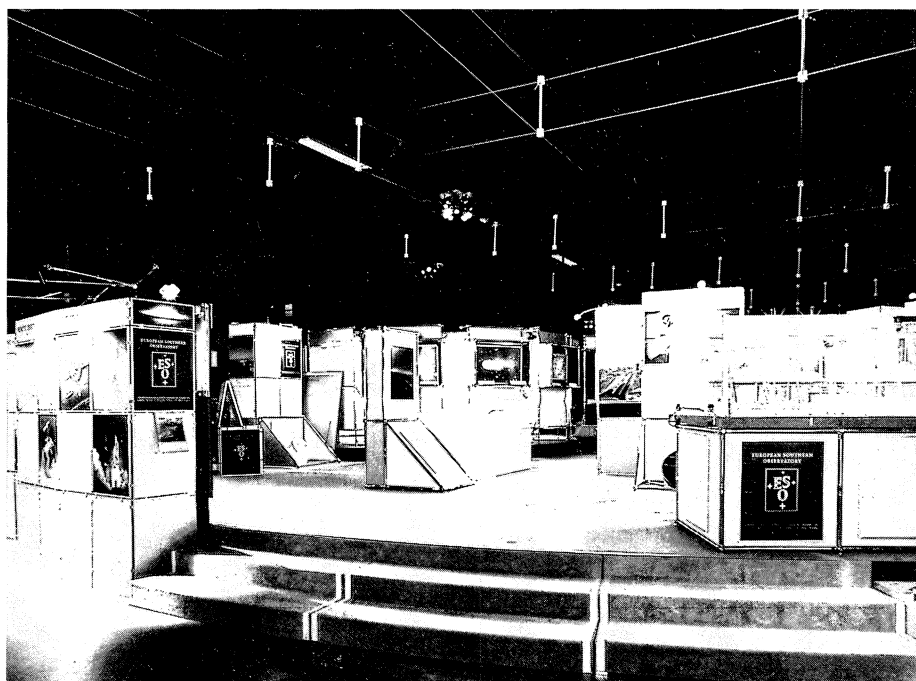
Those without access to electronic mail should write to Bryan Pattison, Users' Office, CERN, 1211 Geneva 23, Switzerland.

There will be an Intermediary Meeting of all the ECFA LHC Working Groups in the CERN Auditorium on 18-19 June.

Bernard D. Hyams

At the end of April, Bernard D. Hyams 'retired' after 32 years at CERN, only to continue his normal activities the next day. Joining CERN in 1958 after cosmic ray work at Manchester, his first experiment, conducted in the Löttschberg tunnel, showed that the nucleon lives longer than 2×10^{26} years, the significance of which was only recognized many years later. In one of the first experiments at the CERN PS, he demonstrated that in pion decay the muon spin behaved as expected. After a study of vector meson decays into muon pairs, he spent several years on precision pion measurements. With the discovery of charmed particles, he pioneered the application of the silicon microstrip technique for high precision vertex measurements, developing during a sabbatical year at SLAC the VLSI chip for microstrip readout. While continuing his research work, he was Leader of CERN's Experimental Physics Division from 1984-87.

From Peter Weilhammer
and Friedrich Dydak



The European Southern Observatory's travelling astronomy exhibition 'Discoveries in the Southern Sky' is spending six months at CERN's 'Microcosm' exhibition centre. The choice of ESO as Microcosm's first guest exhibitor is especially apt: new physics insights are finding increasing common ground between astronomy – the study of the large-scale structure of the Universe – and particle physics – which looks at the infinitely small; and ESO underlines its close links with CERN, where it had a temporary home while waiting for its Garching, near Munich, headquarters to be built.

(Photo CERN 529.3.90)

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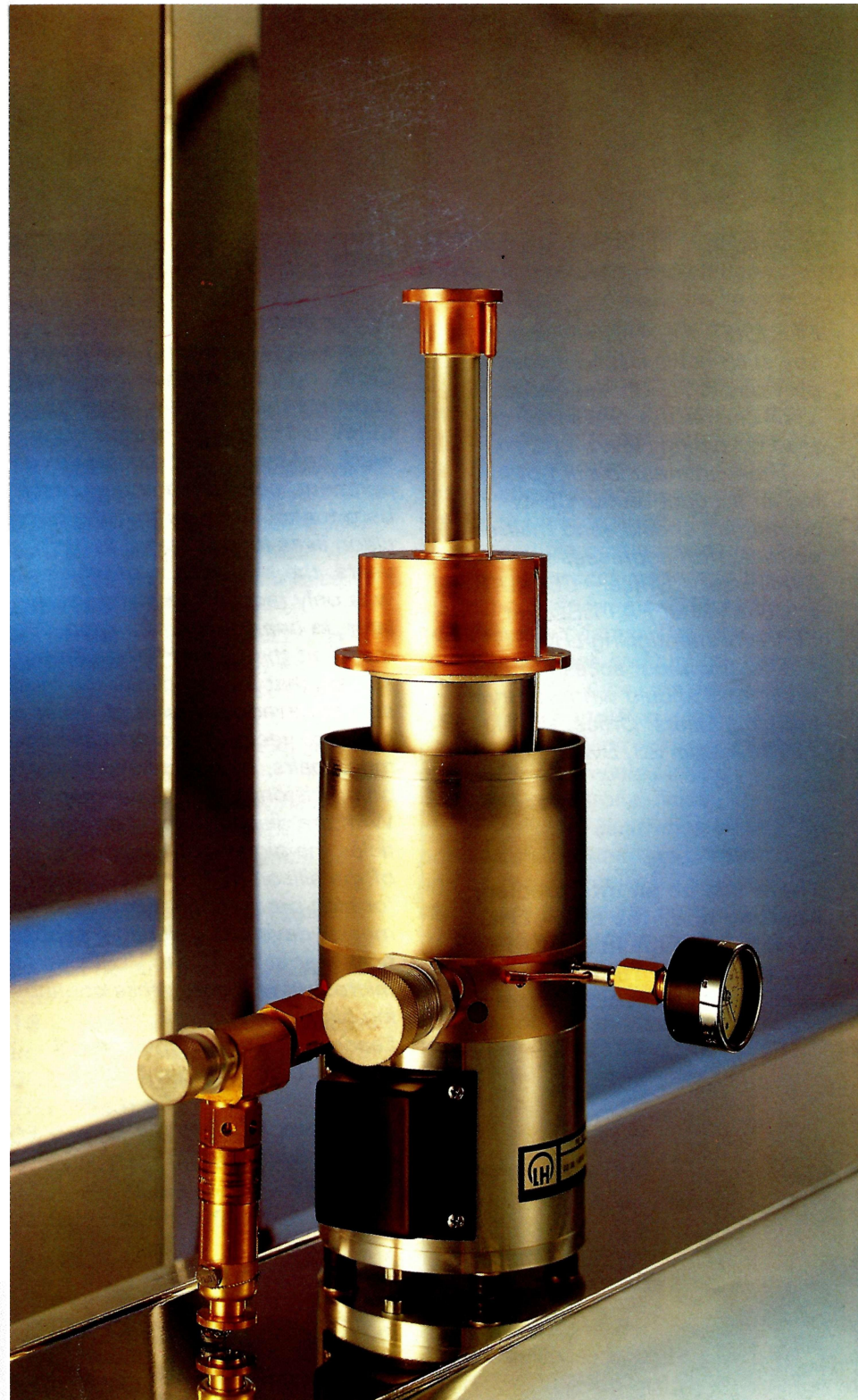
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