

People and things

The camera of Jeanne Ting caught Burt Richter (left) and Sam Ting in in habitual splendour on the occasion of the Nobel Prize ceremony in December. Below is the text of Sam's speech at the Ceremony.

Heisenberg Medal

The Board of the High Energy and Particle Physics Division of the European Physical Society has decided to create a 'Heisenberg Medal' in memory of Werner Heisenberg who died in 1976. The medal will be awarded to a scientist or research group for a recent outstanding contribution to the understanding of the fundamental laws of Nature or for reshaping thinking about Nature. It will be given every second year on the occasion of the European Particle Physics Conference. The first award will therefore be at the next Conference in this series which will be held this year at Budapest from 4-9 July. Recommendations concerning the award should be forwarded to the Chairman of the Board of the EPS-HEPP Division, Professor George Marx, Department of Atomic Physics, Roland Eotvos University, 1088 Budapest, Puskin utca 5-7, Hungary.



Physics Film

A television documentary entitled 'The Key to the Universe' is now reaching the screens of viewers in four countries. The programme (two hours long) reports the recent excitement in high energy physics and relates it to the effort to understand the universe on its largest and smallest scales. It is possibly the most ambitious attempt ever made to present the discoveries and theories of modern physics to a wide lay audience.

In the preparation of the documentary during the whole of 1976, film crews travelled to Brookhaven, Brussels, CERN, Fermilab, SLAC and University College London, as well as various astronomy research centres. Theorists offering their opinions to the camera include Richard Feynman, Murray Gell-Mann,

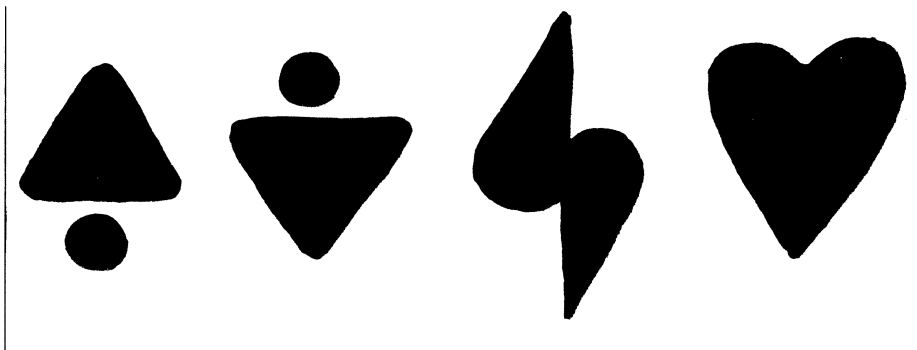
国王,皇后陛下,皇族们,各位朋友:

得到诺贝尔奖,是一个科学家最大的荣誉.我是在旧中国长大的,因此想借这个机会向在发展国家的青年们强调实验工作的重要性.

中国有一句古话:「劳心者治人,劳力者治于人」.这种落后的思想,对在发展国家的青年们有很大的害处.由于这种思想,很多在发展国家的学生们都倾向于理论的研究,而避免实验工作.

事实上,自然科学理论不能离开实验的基础.特别,物理学是从实验产生的.

我希望由于我这次得奖,能够唤起在发展国家的学生们的兴趣,而注意实验工作的重要性.



While working on the television film 'The Key to the Universe' the producer, Alec Nisbett, needed to invent some graphical representation of the four quarks. The result is (left to right) — up, down, strange, charmed.

Sheldon Glashow, Stephen Hawking, Gerard 't Hooft, David Politzer, Abdus Salam, Steven Weinberg and Kenneth Wilson. The programme attempts to deal in plain language with neutral currents, quarks, coloured gluons, charm, particle formation by the 'Big Bang' and black holes.

The documentary is the latest from the very successful British Broadcasting Corporation team of Nigel Calder (science writer) and Alec Nisbett (TV producer). It follows other 'science specials' such as 'The Violent Universe', 'The Restless Earth' and 'The Weather Machine'. As an international coproduction, the programme has been completed in three forms (though with only slight variations) — a Dutch-Flemish version for KRO (Netherlands) and BRT (Belgium) screened in both countries on 4 January, a BBC version screened on 27 January and an American version, made with WTTW (Chicago), which is expected to be networked by the Public Broadcasting System in the Spring.

First J/psis from the SPS

A Birmingham/Rutherford/CERN/Ecole Polytechnique/MPI Munich/Neuchâtel collaboration in experiment WA12 using the Omega spectrometer in the West Hall, spent the first two physics runs of the SPS setting up their detection system. A negative pion beam (3×10^6 particles/burst) is fired at a copper target 20 cm long and data is taken of muon pairs coming from the decay of resulting massive particles. At the time of writing, data from 4 hours of running has been processed and in this short time some 30 events corresponding to the decay of the J/psi have been seen, in excellent agreement with the predictions from the currently accepted cross sections. The experiment will compare J/psi cross section using positive and negative pions, kaons and protons with emphasis on

anti-protons which are not being studied elsewhere.

Computer network investigations

A Network Unit is working at the Rutherford Laboratory, under Mervyn Williams, studying the requirements of the UK Universities and the Science Research Council Laboratories as regards computer networks. It is being joined at Rutherford by the Secretariat of the Department of Industry's National Committee on Computer Networks under the chairmanship of Jack Howlett, former Director of the Atlas Computer Laboratory. This Committee has a broad mandate to look into national requirements for computer networks through to the 1980s.

Relativity confirmed again

Einstein's prediction on the bending of light in gravitational fields was confirmed to still higher accuracy on 25 November when radio signals were bounced off four spacecraft at Mars when the earth and the planet were about 100 million miles apart with the sun in between. The effect of the sun's gravitational field increased the path length of the waves. Irwin Shapiro of MIT reported at the Jet Propulsion Laboratory in Pasadena that the measurement (accurate to 5 foot in 200 million miles) was in excellent agreement with Einstein's theory of relativity.

Physics Inventory

The Office for History of Science and Technology at Berkeley is undertaking a world-wide survey of archival holdings related to physics in the 20th Century. The resulting inventory will record correspondence and unpublished papers of approximately a thousand physicists active between

1900 and 1950. Of particular interest is documentation on contacts between physicists and intellectuals outside the domain of academic physics.

Anyone with special knowledge of unpublished correspondence with physicists (particularly items in private hands or in archival collections associated primarily with non-physicists), of letters to or from a physicist published in journals or books not likely to be well known to historians of science, or of archival holdings of papers of little known physicists, are invited to relay this information to the 'Survey of Archives' Office for History of Science and Technology, 470 Stephens Hall, University of California, Berkeley, California 94720.

Serial CAMAC at the ISR

The ISR's first serial CAMAC highway has been in service since the last autumn shutdown; it is dedicated to the collection of data on the ultra high vacuum system. Ten CAMAC crates are used on a loop of total length 2.4 km operating in bit-serial mode at 5 MHz. Much of the hardware has been obtained from commercial sources following specifications prepared by ESONE and NIM committees. Some developments, a crate bypass unit and a line repeater with full galvanic isolation and de-skewing, were done at CERN.

Commissioning was not without its problems but a test module in each crate allowed steady progress to be made and since the ISR start-up there have been no faults or data errors. Use of the highway has been restricted to collection of some 3000 bits of digital status information and to driving associated displays in the control room but analog scanners and special processors for measurement of clearing current are being installed, together with facilities

Gerry Konrad stands alongside the prototype high power klystron, 3.6 m high, developed at the Stanford Linear Accelerator Center for the PEP electron-positron storage ring project. The magnet for focusing the electron beam is on the right. Twelve such tubes will be used on the ring. The operating voltage is 62 kV with a beam current of 12 A and an operating frequency of 353.2 MHz. A pulsed version has been operated up to 500 kW and the prototype in the photograph reached 400 kW c.w. on 14 January.

for handling interrupts (L.A.M. encoders).

The entire serial highway will be transferred from an Argus 500 computer to a Nord-10 and the Argus will then operate a second highway. The serial highway, with its very simple interconnecting cables, seems to be well suited to control system uses, and may prove important in widening the industrial acceptance of CAMAC.

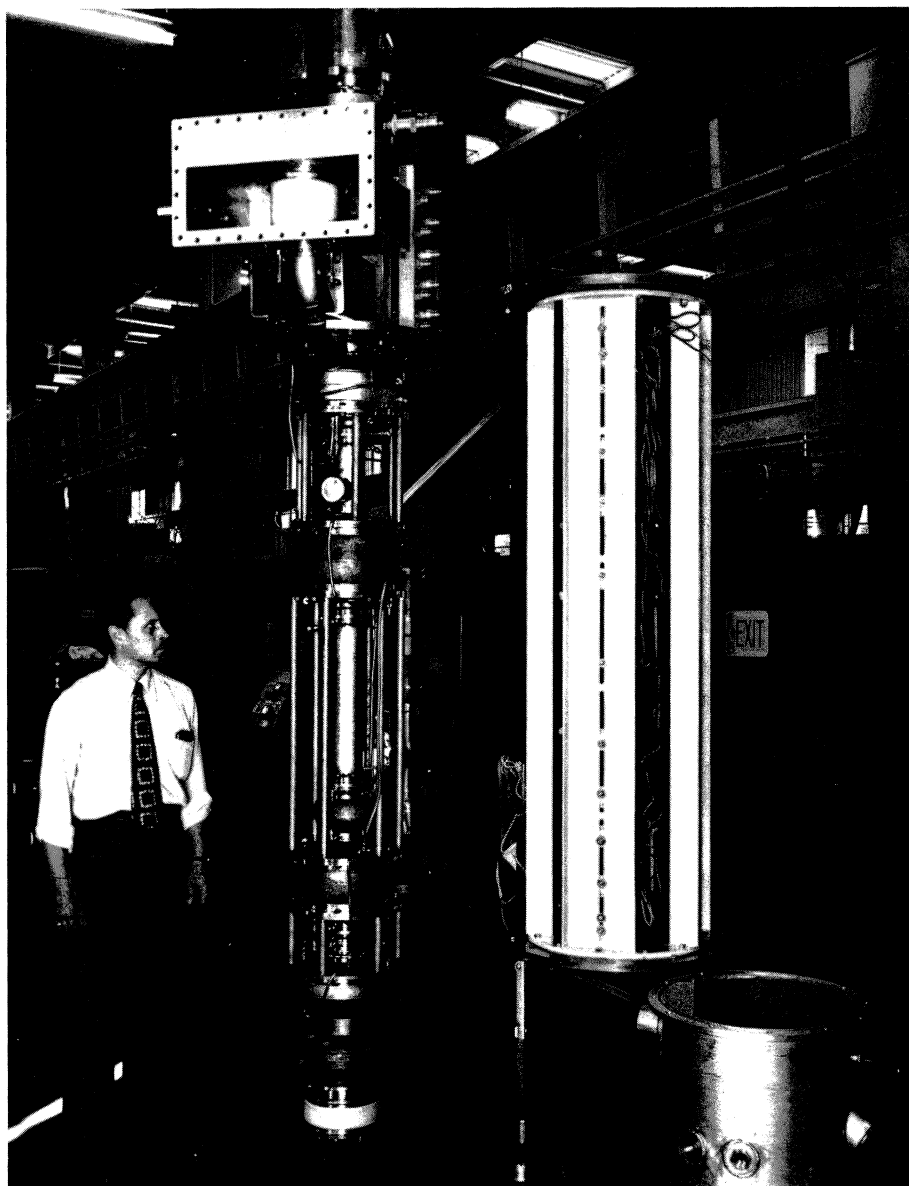
41 98 11 becomes 83 61 11

On 18 March there will be changes in the telephone system operating at CERN. Advantage has been taken of an offer by the Swiss PTT, who are installing new equipment for the Meyrin telephone exchange, to introduce direct entry to internal numbers. A number within CERN will be reached by composing 83 followed by the internal number; thus the COURIER Editor, with internal number 4103, will be reached by dialling 83 41 03. The CERN telephone exchange will be reached by dialling 83 61 11 (rather than 41 98 11 as at present).

The new system will benefit callers from outside CERN, both in time and in cost, and will reduce the work load on the CERN exchange. To help make good use of the new facilities a copy of the CERN telephone directory will be made available, on request, to the telephone exchanges of Laboratories and Organizations who have frequent contact with CERN. Requests should be sent to Leon Donnat-Bouillud, Mail Office, CERN, 1211 Geneva 23, Switzerland.

Bits and Pieces

A construction firm, Ammann and Whitney of New York City, has been selected for the proposed 200 GeV proton-proton storage rings, ISABELLE, at the Brookhaven Laboratory.



On 3 December a 100 GW neodymium glass laser was successfully operated in the Laser Division at the Rutherford Laboratory. The laser, from Quantel SA in France, was operated at half power (5 joules in a 5 ps pulse) for these first tests.

New intensity records at Fermilab in December. The 200 MeV linac reached 301 mA, the 8 GeV Booster fed 3×10^{13} protons per pulse to the Main Ring and, on 12 December, the Main Ring accelerated 2.47×10^{13} protons to 400 GeV.

The 2 m bubble chamber at CERN took a record number of pictures, 5359864, in eight months of operation in 1976 beating its previous record of 5251352 in eleven months of operation in 1971. This is an impressive swan song from the chamber prior to being closed down this year, by which time it will have

over 40 million pictures to its credit since it came into operation at the end of 1964.

On 22 December protons were accelerated to 12 GeV in the synchrotron of the Japanese National Laboratory for High Energy Physics, KEK. First acceleration to 10 GeV was reported in the April issue 1976.

The new 70 MeV proton linac built for the Nimrod synchrotron has achieved design intensity of 75 mA with a 500 μ s pulse length. The linac is included in the proposed Spallation Neutron Source as a negative hydrogen ion injector.

François-Xavier Ortoli, well known European politician, has remarked that, when assessing the cost of advanced scientific and technical projects, governments need to multiply the stated estimate by

1. Louis Leprince-Ringuet
2. Willi Jentschke

$\pi = 3.1416$. At the Council Meeting in December, Wolfgang Paul remarked (in relation to the SPS and other projects) that at CERN $\pi = 1$.

The Banff Summer Institute on Particles and Fields will be held at Banff, Alberta, Canada, from 25 August to 5 September. More information can be obtained from the Banff Organizing Committee, Physics Department, University of Alberta, Edmonton, Alberta, TGG 2J1, Canada.

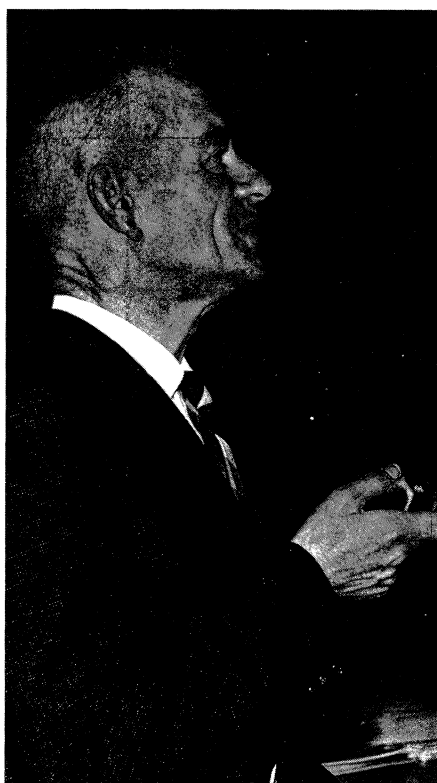
Heavy Ion Fusion Report

The 'Final Report' from the ERDA Study on Heavy Ions for Inertial Fusion, held at Berkeley in July of last year, was issued in December. The Report is edited by Roger Bangerter, Bill Herrmannsfeldt, Dave Judd and Lloyd Smith. Copies (\$ 5.50 printed, \$ 3 microfiche) are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151. A review of the ERDA study appeared in the September issue of CERN COURIER last year.

Mastering the Booster beam instabilities

A very sophisticated analysis and correction of longitudinal instabilities in the four-ring 800 MeV Booster at the CERN PS has been carried out by Fleming Pedersen and Frank Sacherer.

They have developed a full theory of the possible instabilities and have implemented an observation and feedback damping system. The five coupled bunch modes of the three lowest order (dipole, quadrupole and sextupole) can be effectively damped in all four rings with high beam intensities, 4×10^{12} protons per pulse, in each ring. The system can also be



1. used to drive the various modes for investigating beam stability limits.

On people

On 19 December, the Prime Minister of France awarded the medal of 'Grand Officier de la Légion d'Honneur' to Professor Leprince-Ringuet. Louis Leprince-Ringuet has had a distinguished career in high energy physics and is already well adorned with scientific and national honours.

On 11 January, a Fest-Kolloquium was given at the DESY Laboratory in honour of Professor Jentschke who celebrated his 65th birthday on 6 December 1976. Willi Jentschke has a long association with DESY, including a period as Director of the Laboratory, and is a former Director General of CERN. Nobel prize winner Sam Ting paid tribute to Professor Jentschke who helped him with his first series of experiments at the DESY synchrotron from 1960-65.

The following elections and appointments were made at the CERN Council session on 16 December: President of Council — P. Levaux, Vice-Presidents — B. Gregory/A.C. Pappas, Chairman of the Scientific Policy Committee — W. Paul, SPC Members — B. Gregory



2. (reappointed for one year)/ J.P. Blaser (for three years), Chairman of the Finance Committee — M. Gigliarelli Fiumi (in succession to M. Lemne who had reached the end of his three year term of office), Vice-Chairman of the Finance Committee — J. Beattie (appointed to a newly created post), Leader of the CERN SPS Division — M. Crowley-Milling (for three years), Leader of the CERN ISR Division — F. Ferger (reappointed for three years).

Jim Cronin of the University of Chicago has been appointed to head a new Colliding Beam Experiments Department at Fermilab. Jim Walker will be Associate Head. The Department will study proton-proton and proton-antiproton possibilities using the existing Main Ring and implement the construction of experimental facilities. The development of beam cooling techniques and beam storage systems remains in the Accelerator Division under Russ Huson. On 14 January, Jim Cronin was one of the recipients of the 1976 E.O. Lawrence Memorial Awards for 'major experimental contributions to particle physics including work on weak interactions culminating in the discovery of asymmetry under time reversal'.

On 8 February, William Fowler of Cal. Tech., President of the American Physical Society, presented the 1977

Leon and the Lady

Dannie Heineman Prize for Mathematical Physics to Steven Weinberg of Harvard University. The citation reads 'for his formulation of unified gauge theories of weak and electromagnetic interactions and his analyses of the role of spontaneous symmetry breaking in such theories, all represented by outstanding publications in the field of mathematical physics'.

ISR decisions

The CERN Research Board has approved the construction of superconducting magnets to give a low beta insertion on one of the Intersecting Storage Rings so as to study the techniques which have relevance also to any further storage ring projects. The possibility of repeating the exercise on the other ISR beam so as to have a complete high luminosity insertion will be considered later.

The Board also decided not to authorize construction of a second large general purpose magnet facility for one of the intersection regions.

High field ISABELLE magnet

In December, a high field version of an ISABELLE ring magnet was successfully tested at the Brookhaven Laboratory. The ISABELLE 200 GeV proton-proton storage ring project requires superconducting magnets providing fields up to 4.5 T. However higher field magnets have been considered and the prototype tested in December had a two layer coil structure with an 8.5 cm aperture. The magnet was 1 m long. After 23 quenches the magnet reached a field of 6.2 T with field as high as 7 T at the superconducting coil itself. Field harmonics were at the 10^{-4} level or less. The maximum critical current density was 29.2 kA/cm² and the maximum stored energy 261 kJ.

Leading a charmed particle search at the Fermilab, Leon Lederman of Columbia University, called for a large quantity of beryllium to act as a muon filter in preference to steel. Tracking the muon back to its point of origin can be more accurately done through beryllium than through steel. Locating and liberating two metric tons of beryllium was, however, not easy; it was finally obtained from Oak Ridge Tennessee. The search led to the following saga from the pen of Tim Toohig appearing in Fermilab's "The Village Crier" on 6 January:

Once upon a time in the far off land of Protonia there lived a troglodyte with the unlikely name of Leon. Now Leon was very troubled. Whenever he walked into his cave he sniffed the perfume of the seductive charmed quark, but of her he never managed to catch sight. He was in a frenzy.

One day Leon decided to set a trap. He went to the court of the Prince of the Troglodytes. Right up to the throne of the Prince he went and announced in a firm voice: "More beryllium." The court was shocked; the Prince was shocked. Finally the Prince gasped, "Leon wants more beryllium". The Royal Artificer had already provided Leon with all the beryllium in the kingdom.

The Prince knew that Leon dined often with the King and had performed many valorous deeds for the kingdom. And he knew that the vision of the Charmed Quark would make Leon deliriously happy beyond all his imaginings. So he wanted to help Leon. But, what to do? He decided to seek the help of the Grand Vizier of the Kingdom.

Now the Vizier was a very wise man whose caravans had travelled to most of the Kingdoms of the world. He had consulted with the Royal Wizard, Benjamin and the Sorcerer's Apprentice Christopher, and knew that if Leon were to trap the Charmed Quark he would need beryllium. Beryllium had just the ration of nucleon interaction length to radiation length the Wizard would recommend for his magic potion.

The Vizier wanted to help Leon, so he mounted his mighty stallion,

Studley, and rode out to see Squire John and his vassal, Norman. Squire John and Norman had served long in the crusades. They had many old comrades-in-arms in various kingdoms with whom they had warred and wenched. The call went out to all the old comrades, "Leon wants more beryllium."

One comrade recalled that in a long-ago campaign he had seen a veritable mountain of beryllium in a dusty cave in far away Tennessee. It was guarded by a fierce dragon homoensis bureaucraticus. But who would slay the dragon?

From high in the tower the Legate of the Emperor, Donald, espied the predicament of the Vizier's minions. "I shall slay the dragon," he proclaimed. With dexterity that revived the glorious memories of El Cid, the Legate drew his sword, and slew the dragon with one mighty stroke.

The dragon writhed in agony and finally collapsed in a great heap atop the trove of beryllium. The Vizier was at a loss as to how to proceed. Clearly the bulk of the dragon was too great even for Studley to move. Squire John surveyed the awesome scene. His Caravan Master, Raymond, with much experience in moving great loads, might be of help. Many weeks passed; the Caravan Master employed all of his ingenuity and skill. The great carcass slowly yielded and was finally dislodged from atop the beryllium.

So the beryllium was brought to Leon and he withdrew with it into his cave. Occasionally, even today, travellers to Protonia bring back tales of gleeful sounds issuing from deep within Leon's cave. The natives believe that Leon still dwells there in endless hot pursuit of his fair lady.

*Prince of the Troglodytes — Brad Cox
Royal Artificer — Bill Thomas
Grand Vizier — Rich Orr
Royal Wizard — Ben Lee
Sorcerer's Apprentice — Chris Quigg
Studley — played by himself
Squire John — John Colson
Norman — Norm Hill
Homoensis Burocraticus —
Federal bureaucracy
Legate of the Emperor — Don Bray,
ERDA
Caravan Master — Ray Lewandowski*