CERN/1750
16 June 1989

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE

CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

EIGHTY-SEVENTH SESSION OF THE COUNCIL

QUATRE-VINGT-SEPTIEME SESSION DU CONSEIL

Geneva - 23 June 1989

PROGRESS REPORTS PRESENTED TO COUNCIL

RAPPORTS D'ACTIVITE PRESENTES AU CONSEIL

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THEORETICAL PHYSICS DIVISION

The May 1989 list of the CERN Theory group had 122 names. A less global look at this document shows a significant growth of the numbers of "phenomenologists" and a corresponding shrinking of the numbers of "pure" theorists. This is to a large extent the result of an explicit effort from within the Division to "get ready" for the LEP startup.

During the first five months of 1989, 99 preprints were registered. An increasing fraction of these have been devoted to subjects directly relevant to particle physics phenomenology, but a sizable fraction this year still concerns a variety of issues in "theoretical theory". The remaining research is directed mainly in the lattice theory and cosmological fronts.

The purely theoretical work in the first months of 1989 is to a large extent a natural continuation of earlier work on string theory. This may not be apparent at first sight, since the string-inspired research is now largely concerned with the analysis and construction of conformal field theories, a subject that is known to have very interesting applications in statistical mechanics and justifiably thought to have great promise for particle physics and cosmology.

Contributions to the interface between particle physics and cosmology include further attempts to understand the phase transitions of the inflationary era and discussions of various aspects of a very topical subject: space-time wormholes and their relevance to the cosmological-constant problem and to the masses of fundamental particles.

Lattice gauge theorists continue to make good use of spare time on CERN's new Cray. Large-statistics calculations have been published of the phase-transition properties in QCD-like theories, and of "true" QCD. Work on the QCD plasma phase includes new results on its equation of state and on the heavy quark potential. Results on hadronic weak matrix elements have been extended to semileptonic decays of heavy-flavoured particles, with a view to a clean extraction of the KM matrix elements from experiment.

Much of the work on phenomenology concerned CERN experiments, past and future. LEP-related work included the development of strategies to 'feel' the effect of a hypothetical second Z^0 and improved calculations of $b \rightarrow s\gamma$ transitions. Discussion continued to be lively on the "second EMC effect", involving the carriers of the proton's spin. This also inspired a topological model of baryon production. Heavy-ion collisions were also a

source of theoretical work, including the development of a quark-gluon transport theory, continued discussion of the J/ψ suppression as a possible signature for a new state of matter, and the possibility of producing heavy Higgs particles in this kind of process. Very many other avenues in phenomenology were touched upon, considerable effort continuing to be devoted to spectroscopy in potential models, to name just one example.

In the second quarter a large number of experts on radiative corrections in e^+e^- collisions were gathered at CERN to put the finishing touches to calculations and programs which would enable the LEP Z° data to be interpreted accurately and promptly. A lecture series has been prepared to introduce experimentalists to this complex topic. Many theorists have been active in a working group with experimentalists which is preparing a new review book of physics at LEP.

Attention was paid, not only to the physics at future accelerators, but also to the machines themselves and even to their future practitioners. Indeed, members of the theory division computed pair production at bunch crossing in future e^+e^- machines, and participated in the CERN Accelerator School.

In the SIS group of the Theory Division the main new activity has been the introduction of a computer-based Integrated Library Management System. When fully installed later this year, it will enable the library to be managed much more efficiently, and users to obtain information and place orders electronically.

EXPERIMENTAL PHYSICS DIVISION

UA experiments

Both the UA1 and UA2 collaborations have been taking data since the start-up of the SPS collider in early March. Taking into account the data taken in the 1988 running period, an integrated luminosity of about 5 inverse pb has been logged by each experiment. The analysis of the data has concentrated on the signature of the top quark. No signal has yet been seen, resulting in a preliminary limit on the mass of the top quark of larger than 60 GeV. This result is consistent with a preliminary result reported by the CDF collaboration working at the Fermilab collider.

The upgrade programme on the UA1 calorimeter is proceeding with the series production of the U/TMP calorimeter modules. So far the production rate is slower than anticipated, since the bake-out procedure which ensures the necessary cleanliness has sometimes given rise to vacuum leaks. The programme is proceeding with a view to having the whole barrel region completed and operational for the collider run which is tentatively scheduled for the second half of 1990.

The UA6 collaboration, after having accumulated an integrated luminosity of 4 inverse pb in the proton-proton collision mode in 1988, have rotated their spectrometer and are currently taking data in the proton-antiproton collision mode. The analysis of their data is in progress, concentrating on the production of direct photons and lepton pairs.

LEP experiments

All four LEP experiments, ALEPH, DELPHI, L3 and OPAL, are making very good progress towards completion, and should be ready to take data during the LEP pilot physics run scheduled for the beginning of August. Although financial constraints will prevent the experiments from being fully completed, their state of readiness is impressive, and certainly such that valid physics data can be taken.

The most complete detector is OPAL, with all components installed. ALEPH is lacking the outer layer of muon chambers, and L3 the endcaps of its electromagnetic calorimeter, consisting of an array of BGO crystals. The DELPHI collaboration have overcome the difficulties caused by a vacuum leak in the cryostat of the superconducting coil, and were able to recuperate a good fraction of the time which had to be spent on its repair. With the exception of the barrel and forward RICH's, DELPHI have managed to install all their other detector components.

The status of preparedness for the data analysis is no less impressive: all four collaborations have their analysis software essentially in place, and are in the process of making the final tests both with Monte Carlo events and with cosmic ray events.

SPS fixed-target experiments

The NA31 collaboration, who have made the first report of a non-zero value of the CP violation parameter ε'/ε with a significance of three standard deviations, are busy with the analysis of the data taken in 1988, with a view to reducing the systematic errors of their earlier result. Two new results have been presented recently: a standard Higgs boson can be excluded in the mass range from 10 to 210 MeV, and the phase difference between the charged and neutral pion decay modes of the neutral kaon, 0.2 ± 2.6 degrees, is still compatible with zero, even at this improved level of precision.

The WA76 collaboration, who are studying centrally produced mesons in $pp \rightarrow pp + X^{\circ}$ reactions, found evidence for the $\theta/f_2(1720)$ seen before in radiative J/ψ decays, via its decay into K^+K^-. The spin-parity analysis favours $J^P = 2^+$ which reinforces the glueball hypothesis for this state.

The CHARM2 collaboration are currently analysing the data on elastic neutrino-electron scattering they have taken so far, with a view to presenting a first result on the electroweak mixing parameter, $\sin^2\theta_W$, in the summer of 1989.

The NA32 collaboration, who are studying the hadroproduction and decay of charmed particles, have completed the reconstruction of their full sample of 17 million triggers. Final results have been obtained for the masses and lifetimes of Λ_c^+, D_s^+, D^+ and D°, with the best measurements so far of the Λ_c^+ mass and lifetime. The existence of the charmed strange baryon Ξ_c^+ has been confirmed with the observation of two new decay modes.

Heavy ion experiments

The WA85 collaboration have continued the analysis of sulphur-tungsten collisions, with a view to studying strange baryon and antibaryon production in nucleus-nucleus interactions. They find a clear signal of Ξ^- production, in addition to the signals of Λ and $\bar{\Lambda}$ particles reported earlier.

The NA 35 collaboration gave a preliminary report on an unexpectedly large increase of the Λ yield with charged-track multiplicity observed in sulphur-sulphur collisions.

The NA38 collaboration have continued the analysis of the data from sulphur-uranium collisions. Preliminary results have confirmed the earlier observation of the suppression of the J/Ψ production rate with respect to the Drell-Yan continuum production, as compared to the collision of protons with heavy nuclei.

LEAR

LEAR has been operational since the end of March, enabling several collaborations (PS195 CP-LEAR, PS197 CRYSTAL BARREL, PS199 POLEX) to start setting up and debugging their apparatus, with a view to becoming fully operational later this year. The construction of two other large detectors, JETSET and OBELIX, is progressing according to schedule.

ISOLDE

The SC was run between February and May for a total of nine weeks with good efficiency. With the availability of ISOLDE 3 for routine operation, efficient use of the beam could be made by alternating between the two ISOLDE separators, thus reducing dead time from target changes. In total 24 groups were able to take data.

The highlight of this year's running was the discovery of a level structure in ^{34}Si that has many features of a doubly-magic nucleus.

By the use of a new high-temperature plasma ion source several new elements such as Be, Al and Mn could be made available as beams at ISOLDE.

EXPERIMENTAL PHYSICS FACILITIES DIVISION

1. SPS EXPERIMENTS

1.1 Omega Spectrometer

In view of the Hyperon Experiment WA89 the OMEGA spectrometer is undergoing a major upgrade. The data acquisition will be several times faster than before to cope with future high data rates. The ring image Cherenkov counter will be upgraded for better resolution in the central region [new mirrors (CERN) and new drift chambers (Heidelberg)] and with a novel multistep-drift chamber elsewhere, to be added later. The Omega spectrometer is now prepared for starting in July for various experiments.

1.2 Experiment WA 84

This experiment uses a detector with high spatial resolution designed and built by the EF Instrumentation Group. As tests had shown that the opto-electronic chain functioned correctly, attention was transferred to improving the target scintillating material. A new type of plastic scintillating micro-fibre developed as part of the LAA project gave better results than glass fibres, yielding the prospect of improved data-taking. In the meantime, tests in a PS-beam have shown that the hit density achieved with Plastic-scintillating fibres as well as their time resolution is sufficient for the requirement of the experiment, scheduled to start soon in the Omega spectrometer.

1.3 NA31

Both wire chambers of the experiment were rebuilt under the supervision of EF. The liquid argon calorimeter has been repaired outside its cryostat and is being prepared for the next run starting in July 1989.

1.4 PS195

Ef Division provided support during the installation of the various detectors and their gas systems. First particle beams were taken in May 1989.

1.5 NA34

Continuous technical support was given to the experiment.

1.5 UA1

The production of TMP ionization chambers (boxes) in the USA for the new calorimeter is operational. Reception of boxes at CERN and techniques of assembling the calorimeter modules with Uranium are mastered. A complete stack was tested in PS and SPS-beams and its resolution in energy matches the expectations. Excellent compensation is achieved. Production of the barrel calorimeter modules has started. During the 1988 p-pbar run a module was installed close to the circulating beams and clean data was recorded along with the rest of the UA1 apparatus which was accumulating muon-triggered events in view of a top search.

1.6 UA2

The UA2 experiment took data again from beginning of March this year on the p-pbar collider. Ef groups gave technical asistance to the collaboration.

2. PREPARATION OF LEP EXPERIMENTS

2.1 ALEPH

During the first months of 1989, the assembly of ALEPH has been completed mechanically; the cabling of the barrel part was made, as well as the cabling of the electromagnetic calorimter end-caps. Various services, like the fire detection in the electronic huts, different water circuits for the temperature control of the detector, the cooling down of fast bus racks, etc. has been brought in operation. Gas systems are now operational for the TPC and the calorimeters, the other gas system for ITC, luminosity monitors will be operational within the next few days. All electronics for the TPC, the EMCAL and the ITC are in place and the tests have started. Cosmic rays have been seen in the TPC after triggering by the hadronic calorimeter. The data read-out system is under tests with the cluster of VAX machines, now operational. The cool-down of the superconducting solenoid is in progress to continue cosmic-ray tests with the TPC at full magnetic field.

2.2 OPAL

The first five months of 1989 have seen the final assembly of many of the 14 sub-detector components and related infrastructures in the OPAL pit.

Early in the year cosmic and laser beam data in the Jet chamber were recorded in a combined run with the Vertex and "z" chambers, using parts of the final on-line data acquisition system. Following the cosmic ray run these chambers were transported to the I6 underground area and transfered into its pressure vessel. The magnet was closed and moved to the beam position where a successful pressure test of the central detectors was made.

All counters of the electromagnetic barrel detector were monitored with the gain tracking system. In order to keep the photomultiplier temperatures constant, ventilation and heat exchangers were installed, and the correct functioning of this system was observed.

The OPAL Slow Controls System supervises the running of the 14 subdetectors, the general infrastructure, and of safety aspects. These functions are performed by micro-processor based stations; a software frame has been implemented and is already in heavy use to control subdetectors in a stand-alone mode. At the moment the integration of the subsystem is in progress.

The detector is in beam position being connected to the LEP vacuum system. The Forward Detector calorimeters are being fixed on the low β quadrupole supports. Installation work on the final magnet cooling pipes and bus bars, the gas building and gas distribution network, safety devices continues. The aim is to power the magnet again in late June. It is planned to have at least two weeks of cosmic ray data before LEP starts in mid-July.

2.3 L3

All the detectors inside the support-tube, muon filter, hadron calorimeter and BGO have been mounted, aligned and cabled. The TEC (Time Expansion Chamber), after thorough calibration in a test beam, will be introduced in position at the very beginning of June, equipped with a 7-m long LEP beryllium vacuum chamber. This will end the assembly proper.
Outside the support tube, the two wheels of the muon spectrometer have been put in position inside the magnet, aligned and cabled. The connections between the two wheels have been succesfully done using the PAD (Personnel Access Device).
The cabling is 75% complete and the blockhouse and the counting rooms are being equipped with electronics. By mid July, L3 should be in the process of getting ready to register the first events during LEP start-up.

2.4 DELPHI

The He leak in the s.c. solenoid was successfully repaired by RAL and the magnet could be operated at full field for the first time by March 6th, with some 5 months delay on the original schedule. The field homogeneity proved to be excellent. Alignment of HPC modules to the field worked as expected.

Due to the delay with the solenoid, an extreme crash program had to be established for the installation and commissioning. Since March 10th, the rest of the HPC modules and the B-Muon Chambers, the Outer Detector, B-RICH, TPC, Inner Detector, F-Chambers A and B, the F-EM Calorimeter and 1/2 the F-RICH were installed, surveyed and cabled. Installation and commissioning of the front-end electronics is under way, being carried out mostly by the outside groups. One complete slice of the data acquisition chain has been exercised in a cosmics' test on the surface with parts of the TPC, Chamber A and Inner Detector. The on-line computer on site 8 is operational and connected both to the pit and the central laboratory.

2.5 Cryogenics

The BOL plant in the West Area provided cooling of LEP s.c. cavities for tests.

In the North Area LHe was provided for s.c. magnet development in the framework of LHC. The NA refrigeration plants were modified to allow computerized process control, and a general overhawl after 10 years of service was made.

Cryogenic installations for ALEPH and DELPHI are operational, and are under commissioning for the s.c. quadrupoles for L3 and OPAL.

2.6 Experimental Areas

The four LEP experiments are getting ready for the start-up of the machine in July. They all have their special vacuum chamber in place, and connection to the vacuum system of the LEP ring is in progress. Checks of the operation of the experiments solenoidal magnets are being made.

Cabling is almost complete on two experiments (OPAL and ALEPH) and is advancing rapidly on DELPHI and L3.

The use of flammable gas mixtures in the detectors will soon be authorized in the caverns. The collection and transmission of essential safety alarms (smoke, gas, temperature, flooding) from the experimental areas, which was assured during the installation phase by means of ad-hoc connections, is now in its final configuration.

3. TECHNICAL SUPPORT FOR THE CONSTRUCTION OF THE LEP MACHINE

RF-superconductivity

Two out of four Nb cavities had been assembled to form a module. The cryogenic tests, simulating the conditions in the LEP tunnel, were completely satisfactory. The construction of niobium-coated copper cavities continues. Recent tests allowed to reach acceleration fields of 9 MV/m. A new type of coupling mode was developed by the IRF/CEA group and tested at a frequency of 350 MHz. A mono-cell cavity coated with NbTiN has been measured and first result look encouraging. The installation of the cryogenic plant in LEP pit 2 for the first four s.c.-cavity test in LEP is progressing.

4. DETECTOR DEVELOPMENT

In the silicon and microelectronics group most effort is going into the design of CMOS integrated circuit building blocks for complicated detector readout architectures, and in particular for high resolution silicon pixel detectors. An experimental pixel readout structure is working at 10 MHz, at 40 μW per pixel.

Some evaluation of the radiation damage effects in the UA2 silicon detectors was undertaken, and it has been found that detectors can be recuperated by annealing to ~350°C.

DATA HANDLING DIVISION

Computer Centre.

- *IBM.*
  The first semester of this year saw once again very intensive activity in the Computer Centre, especially in the IBM area. A difficult and manpower-intensive system upgrade was performed very successfully between Christmas 1988 and the first week of this year: the upgrade of the system hardware (going to a 3090-600 six processor system with six vector features) and, simultaneously, of the software (going from VM/HPO to VM/XA/SP2). This major new version of the VM operating system provides support for the six processors and the full memory of the central IBM 3090. Until April, intensive efforts were needed to fix a number of bugs.
- *CRAY.*
  The Cray operating system was very successfully upgraded from Unicos 4 to Unicos 5 in April following an increase in disk capacity of 20 Gbytes at the beginning of the year. No interruption of any kind was seen on the X-MP/48 for 7 weeks after the software upgrade.
- *DEC.*
  The DEC NETSYSTEM communications control project was started in February, and the field tests of the TA90 concluded in March. The disk capacity of the VAX cluster was increased to 50 Gigabytes during the first quarter. The VAX services have also been brought up to the latest operating system release levels.
  Several new projects of joint development with DEC were finalised. These projects will help, financially and technically, the LEP experiments to complete their computing systems in time for the LEP start-up. A considerable amount of time and resources has been devoted to organize and coordinate the new DEC commercial, administrative and technical support structure for CERN. This has been done in close cooperation with Finance and other divisions.
  All the work mentioned above has been completed in good time for the beginning of LEP data processing and will enable us to avoid major system changes during the first year of LEP operation.
- *RELATED ACTIVITIES.*
  Following approval by the Finance Committee of the Automated Cartridge Library proposal, the preparations are going ahead for delivery of the hardware in the summer. The device should go into production by September 1 with an initial capacity of 14000 cartridges.
- *USER SUPPORT.*
  We have continued our endeavour to maintain and improve relations with the large user community and with the EP programming community.
  An important activity this year has been the successful start-up of the FATMEN project to provide a means of controlling the huge flow of LEP data. The continued development of the various components of the Program Library, especially of the PAW and GEANT packages, remained a vital activity, as is the support for the GTS-GRAL graphics software. Maintaining the central UNICOS, VM and VMS services required continuous attention. New utilities have been released. We are phasing out MVS, and transferring MSS data to 3480 cartridges.
  The direct support to users through the UCO is one of the pillars of our activities. The whole area of user registration, accounting and budgeting, using an ORACLE data base, continues to require attention.

Communications.

In the networking area, the cabling of CERN for Ethernet had to be stopped in May because of the budget situation. The number of devices connected to Ethernet grew to well over 1000, and the traffic grew correspondingly. External networking traffic also continued to grow rapidly, and new leased line connections were established to NIKHEF (Amsterdam) and PSI (Villigen) among others. Concrete progress towards very high speed connections to assist LEP data processing was limited, also for budgetary reasons.
The load on the telephone service continued to increase, and the contractual arrangements for the replacement of the old telephone exchange during 1990 were completed.

Support Activities.

- *PHYSICS SUPPORT.*
  Further improvements have been made to the MODEL data-acquisition software suite in response to user requests. The first implementation of a MODEL State Manager for run control is now working; this has been a joint development with the DELPHI collaboration. MODEL is now in wide use by experiments at LEP, LEAR and elsewhere. Work on the integration of Valet-Plus front-end systems with VAXes running MODEL is now well advanced and is already in use at some LEAR experiments and at the Omega spectrometer. Enhancements have also been made to the stand-alone Valet-Plus system; over 170 are now in service.
  Industrialisation of the CHI (CERN Host Interface) range of FASTBUS/VME/VAX interfaces was completed and interfaces installed in LEP experiments. Development of a 1.5km optical link (for use with the CHI or on its own) was also finished and examples were installed in DELPHI and ALEPH. Longer range development work on high-speed optical links was started. Software for the CHI and other online software depend on the Remote Procedure Call system which has been further enhanced.
  There has been a substantial software and hardware support in the run-up period to the LEP and LEAR experiments. Hardware support activities include advice on configurations and installation, follow-up of maintenance contracts. Administrative help is also provided, implying a substantial database management activity.
  The UA1 DAS is running at the maximum capacity with 12 3081E emulators for the search of the Top quark. The Rome and the MIT 3081E off-line farms are crunching nonstop MonteCarlo data, waiting for raw data for analysis. L3 and Delphi have installed their 3081E emulators in the data acquisition and are waiting for the software algorithm and a memory upgrade to fulfill the third and fourth level trigger respectively. The FASTBUS double port interface is still requiring attention, being the major integrative component in both experiments.
  The IBM/370 chip set processors mimicking emulators are expected this summer for evaluation.
  Tests of FORTRAN farming on transputers have been carried out with EP, in collaboration with INMOS and MEIKO and the results have been reported at the Oxford conference.
  Off-line support to physicists directly was provideed for ALEPH, UA2, OPAL and OMEGA.
- *COMPUTING SUPPORT TO ENGINEERING.*
  User Groups, as defined by the Management Committee for Computing Support to Engineering (MACCSE), were established in each field and are now helping to guide future work.
  - *Electronic CAE.*
    New software versions were installed and more design guidelines elaborated. Inter-system interfacing was improved. Specific design problems were studied. New software was introduced (SABER for analog simulation) and development plans in this and in the digital field were studied along with the users. No effort was available for informatics support of EM field calculation code.

- *Mechanical CAE.*
  Two activities have marked the CAD/CAM project over the last months:
  - Several hundred detailed layouts for the installation of the LEP collider were produced. Using the database defining the accelerator parameters and the Euclid CAD library of machine components, a dedicated Euclid application program produces 3D detailed assembly drawings (to a scale of 1/250) of the equipment, being installed in the machine tunnel. For each half-cell of LEP there is a 6 view assembly drawing amounting to 200'000 3D points, 160'000 facets and requiring 40 minutes of a VAX 8650 CPU time. They resolve possible conflicts in space occupation as early as possible.
  - An interface between Euclid and Oracle was implemented as a first step in the integration of computer-aided engineering software at CERN, required for the management of large engineering projects such as LEP. The main purpose of this interface is to encourage the coherent management of geometric, graphic, technical and administrative data produced by the design, manufacturing and installation phases of the work.

  No effort was available for informatics support of structural analysis code.
- *Microprocessor Support.*
  OS-9 support activities are growing, both in volume and complexity. The first half of 1989 saw the introduction of MC68030 support, a new TCP/IP package running on the same CPU as the OS-9 kernel and cross development support on UNIX systems running on VAXes and Apollos. A tender document for VMEbus OS-9 systems was prepared. A new mathematical library was released for PRIAM's cross compilers and MC68030 support added to the cross assembler. Motorola's VMEexec real-time system for the 68K processor was evaluated. Preparations for the introduction of Motorola's 88K CPU at CERN continued with the generation of a set of Fortran benchmarks. PRIAM continued its participation in the ORKID (Open Real-Time Kernel Interface Definition) working group and supervised the writing of the final draft document. The writing of the VICbus (VME Inter-Crate bus) draft standard progressed, aiming at a first public document by end June 1989.
- *Engineering Database Applications.*
  This field could only be observed through lack of manpower.
- *Wiring Workshop.*
  Operations went on as usual, serving four groups in DD and users from other divisions.

• *MANAGEMENT INFORMATION SYSTEMS.*

- *Text Processing.*
  Office systems have been installed and are operated in PE, FI and DD. LEP division follows in June. A TEX service was succesfully implemented. It runs since the beginning of November. In March, there were 160 different users, who submitted a total of 5100 different jobs.
  A long term plan for text processing at CERN has been established and is being implemented. Document interchange facilities are progressing. Electronic submission of publications is a longer term goal.
  Systems management is provided for two newly installed VAXes, one for ST division and one for the Library.
- *Personal Computers.*
  Many products were evaluated to consolidate our recommendations. A new tender for IBM compatible PCs is forthcoming. All MIS-type Macintosh requests are handled for all divisions, except EP and EF. Many courses on recommended products were organised.
- *Data Bases & Systems.*
  The Oracle Personnel data base is now linked to by several other data bases. A number of applications have been provided to facilitate access by the non-expert user. The CERN inventory data base is completed and remains to be filled. It is in operation in PS division.
  The User Office data base is well under way and will incorporate data from other existing bases (Grey Book, Personnel, Institution addresses).
  A strategy for powerful group office server computers is currently being investigated.
  EFP (Electronic Forms Processing) has been extended to allow introduction in DD and SPS divisions. Electronic data transfer to ADP is being implemented.

II TECHNICAL DIVISIONS

- **LEP Main Ring Division**
- **Proton Synchrotron Division**
- **Super Proton Synchrotron Division**
- **Technical Support Division**

LEP MAIN RING DIVISION

INTRODUCTION

One major milestone succeeds another in the run-up to the finishing post of the LEP Construction Project. On 21 February the 30 km monorail transport system installed in the main ring and side tunnels was completed, a vital factor in meeting the critical machine-equipment installation schedule. Installation of the copper RF cavities is complete and the last of the magnets is in place. Testing and commissioning of the thousands of components recently installed in the main and auxiliary tunnels and in the surface equipment buildings is now going on at a frantic pace so that the first runs with a circulating beam can take place as from mid-July.

LEP CONSTRUCTION

Underground construction work was brought to a close at the beginning of the year and the final sections, Jura and pit PZ33, handed over to the installation teams by 20 March. The final equipment building above this pit was then started while the remainder of the 71 surface buildings continued to schedule, 68 of them having been completed by the end of May.

Most of the theory effort was devoted to the preparation of LEP commissioning; parameters for initial operation at low intensity and energy were better defined, the corresponding files loaded into the control system, and documentation prepared. The results of recent measurements on components were also incorporated. Contributions were made to the application software for handling the LEP database and injection optimization while implementation of on-line modelling was started. Studies were also carried out on improvements for increased luminosity and energy, and for obtaining polarized beams.

The installation of the magnets was completed by the end of May and commissioning is in progress. In particular, the eight superconducting quadrupoles for the low-beta insertions are now in place and the two at point 4 have been put into service. The systems for the magnet protection and for the field display in the long dipole and quadrupole strings have been successfully tested.

The 13.5 km of vacuum chamber already installed and tested by the end of last year has been extended to 23.8 km and the remainder is on schedule for completion by the end of June. Commissioning, consisting of bakeout, NEG activation, final leak check and linking to the control room,

the remainder of the monitors will be installed before mid-June. The basic software for data transmission to the central LEP acquisition system is completed and the radiation data base installed on ORACLE.

PROTON SYNCHROTRON DIVISION

1989 has been a year of ups and downs from the record $\bar{p}$ performances of the Whitsun weekend to the 80 hours of breakdowns in four days at Easter. The steady CERN-wide reduction in resources, and the current severe personnel restrictions are being seriously felt throughout the Division, with the result that even essential and basic tasks, which directly involve accelerator operations are now being affected.

During the long January/February shutdown a number of maintainance and installation tasks were undertaken in the Division. On the SC machine several improvements were made in the ISOLDE3 beam lines. A lot of obsolete and unused equipment was removed from the PS BOOSTER to reduce possible harmful coupling impedances. The BOOSTER 1 GeV measurement line has also been completely realigned. The new PS slow extraction scheme has been partially installed, and a new beam profile detector using synchrotron light is now ready for use with electrons. The repairs to the corroded accelerating sections in the LEP Injection LINAC was completed.

On the two $\bar{p}$ machines, AAC and LEAR, a lot of time was devoted to improving still further the stochastic cooling systems. The third band of the AC cooling system was completed and the gains in all the AA cooling systems were increased, in order to increase the rate at which $\bar{p}$'s are pulled into the core of the $\bar{p}$ stack. The new low momentum pick ups for the LEAR variable energy stochastic cooling were installed along with a new "carbon jet" beam profile monitor. The improved cooling efficiencies in LEAR have resulted in a large improvement in the beam lifetime at 105 MeV/c. In the AC Target Area however it was decided not to install the 36 mm Lithium lens until April as more pulsing tests were needed outside the machine.

A study of the feasibility of running the ISOLDE facility at the PS BOOSTER has also been started. This has been motivated by the possible savings in both money and manpower, which could be obtained by closing down the SC. The renewal of the PS BOOSTER, LEAR and LINAC 2 controlled access system was completed in time for the normal safety checks at the end of February, and after these tests the PS complex was able to start with proton beams for the technical development week. During this time the SC was already up and running and supplying beam very reliably.

Although the PS start up went very quickly, there were still plenty of problems during March. By the second week of March $\bar{p}$'s were being accumulated in the AAC and the first tests for the $\bar{p}$ transfer to the SPS were able to start. However the start up of the SPS collision scheme was plagued by a series of timing and RF problems, which culminated during the long Easter weekend. Over this period everything which could go wrong did! An 18 kV transformer for AA/PS transfer loop had to be replaced (here credit must be given to the SPS and ST divisions who located a replacement, transported and installed it in under 24 hours). As if that was not enough a few hours later the Main Meyrin site transformer broke down. These breakdowns and the associated problems that they induced meant that the PS complex was down about 80 hours over the four day period!

Fortunately things calmed down a little by the beginning of April, and AAC stacking rates of 3 10^{10} $\bar{p}$'s/hour became normal, with the maximum stack intensity regularly topping 7 10^{11} $\bar{p}$'s. LEAR was also now using around 10% of the AAC $\bar{p}$ production/day initially for studies on the electron cooling of low energy $\bar{p}$ beams, and then for physics at 105 MeV/c. By the middle of the month the transfer efficiency for the now standard 6 shot $\bar{p}$ transfer from AA to SPS was around 80%, this increase was mainly due to the new 100 Mhz RF system in the SPS, and an improvement in the transfer from AA to PS. One major problem again troubled this relatively calm period, the cooling water flow rate through the AA injection/ejection septum began to drop, causing a number of $\bar{p}$ stack losses. Several solutions were tried, but the problem was only cured by cleaning the coils with acid, changing all the water in the main AA/AC circuit and adding a separate water station borrowed from LPI.

The SC ran throughout April in ^{3}He mode delivering beams to ISOLDE 2 and 3, and, although there are more RF discharges with ^{3}He than protons there was relatively little loss of physics time.

After a somewhat shaky start, where problems with the stochastic extraction efficiency and the beam lifetime at 105 MeV/c, severely limited the amount of physics which was achieved, by the end of April LEAR was supplying low momentum beams at 105 MeV/c with efficiencies 2 to 3 times better than in 1988. This improvement results from the running in of the new stochastic cooling hardware, designed specially for use at low momentum, which had been installed in the machine in the January/ February shutdown.

A series of improvements in the control of the PS supercycle, mean that it is now much easier to change the cycle configuration, and small 1 GeV cycles now replace the old 26 GeV cycles whenever these are not required for $\bar{p}$ production or the East Hall test beams, which results in a considerable energy saving.

In spite of the problems, by May the overall performance of the whole PS complex was pushing beyond the best levels achieved in 1988. After adjustments in the PS BOOSTER more than 1.4 10^{13} protons per pulse reached the $\bar{p}$ production target, and when the 20 mm Lithium lens was installed the $\bar{p}$ production rate reached 5.17 10^{10} $\bar{p}$/hour. The maximum $\bar{p}$ stack also overtook the 1988 record at 8.7 10^{11} particles circulating in the AA. During the Whitsun weekend a record initial luminosity in the SPS of 3 10^{30} $cm^{-2}.sec^{-1}$ was obtained, and over 120 $nbarn^{-1}$ integrated luminosity was accumulated in one day.

It is to be hoped that the Division can maintain and even improve upon such performances. However, in view of the present dire shortage of resources, this may not be possible.

SUPER PROTON SYNCHROTRON DIVISION

The most significant installation works carried out in the winter shutdown during the first two months of the year were the following:

i) Installation and commissioning of the last 8 single cell 200 MHz cavities for lepton acceleration. The entire system of 32 cavities is now operational for the functioning of SPS as injector for LEP.

ii) Completion of the upstream end of the 20 GeV e^- transfer line TI12 to LEP.

iii) Installation and commissioning of the 6 injection kickers in the LEP main ring to complete the 20 GeV beam transfer systems for e^+ and e^-. (This work extended until the beginning of June).

iv) Various improvements and completion of the commissioning of the 100 MHz accelerating system for collider operation.

v) Replacement of all control cables in the downstream part of long straight section 1. This region houses the beam dumps of the SPS and the insulation of these cables had been destroyed by radiation.

From March until end June, the SPS is operating in the collider mode. At the beginning of the run, machine development sessions took place to establish the proper operation conditions for the 100 MHz

system which is now routinely used to capture the antiprotons and the protons at injection in the SPS. As a result, the capture losses at injection have decreased from about 15% last year to a few % in the present run. The main 200 MHz accelerating system of the SPS is also in operation at injection with only 200 kV per turn since the large bandwidth of its travelling wave cavities is needed to damp longitudinal instabilities of the individual bunches. The bunches accelerated by the 100 MHz system are twice as long as before, with a corresponding reduction of their space-charge induced Q-spread, which can now be fitted better in between the higher order resonance lines in the Q-diagram. As a result the beam transmission from injection to coast is presently better than 90%. Finally, by adding the 1.5 MV of the 100 MHz system to the 3.6 MV of the 200 MHz system during the coast, the luminosity lifetime which is limited by intrabeam scattering, has been increased from 12h to 16 h.

As a result of these improvements, the initial luminosity of a coast in the SPS is practically proportional to the intensity of the stack in the AA at the time of antiproton transfer. The best initial luminosity of 3×10^{30} cm^{-2} has been reached with a stack of 8×10^{11} antiprotons in the AA. The 3 pb^{-1} mark was passed on 26th May, with 30 days of the run still to go. For comparison, the integrated luminosity of the 1988 run was 3.3 pb^{-1}.

TECHNICAL SUPPORT DIVISION

During the first 6 months of 1989, the workload of all Groups in the Division has been shaped by two factors:

- the final all out effort to complete the construction of the LEP accelerator and the associated four experiments;

- the operational and maintenance duties which suffer from more and more stringent constraints on staff and financial resources. The age structure of ST staff has lead to particularly heavy losses of staff in 1988 and the process continues in 1989 at a comparable rate.

The financial impact of the sudden and unexpected weakness of the Swiss currency against most European currencies has put a considerable additional burden on the already meagre resources of the division, since many of its industrial support contracts are handled on the basis of French francs.

The Mechanics Support Group has been involved in the installation programme of the LEP accelerator components and the LEP experiments. A firm with up to 190 workers has been in charge of transport and handling in addition to CERN's own resources. The fact that the total number of Industrial Support staff has shrunk to about 80 by the end of May indicates the proximity of the end of the installation programme.

The Central Workshop facility has helped to manufacture and/or repair the last missing components for the accelerator and experiments.

The spectrum of state-of-the-art machining facilities at CERN was highlighted by the commissioning of a spark-erosion machine which is expected to perform particular shapes for metallic components.

The Electricity Group has become heavily involved in the installation and commissioning of various gas and fire alarm systems covering the LEP surface buildings, the accelerator and the experiments. The numerous radio, television and telephone links have increasingly needed help from this Group and it is foreseen to combine similar activities CERN-wide in a new group before the end of the year. The Group has also resumed its responsibility to provide precise forecasts for future electricity consumption via detailed analyses of the accelerator programmes and associated experimental areas.

Cooling, Ventilation and Air-Conditioning Group has a complex task to operate practically all of the large cooling and ventilation systems at CERN. In addition, the park of LEP surface buildings is being commissioned and special attention and help is given to LEP experiments for the construction of rather individual cooling systems within the LEP experiments. A special task was the design, construction and

commissioning of a pumping system which has to evacuate seepage water collected in a stock pit at the LEP tunnel floor at PA3. This system has to cope with considerable changes in the rate of water flow and has to exhibit a quasi total reliability so as to avoid flooding of the tunnel floor.

The Logistics Group has efficiently run the complex operations of the Stores. In times of financial hardship the conflicting requirements of the users for a wide variety of components, particularly well justified during a long construction period, have to be weighed against the financial means which the Organization can afford to invest. The persons in charge of running the Stores have to show great skill to forecast needs properly and to make best use of the available financial resources.

After lengthy discussions between CERN and the competent French Authorities, an improved customs regime was brought into operation at the beginning of May, and the many users who have to transport goods and instruments between the Swiss and French sites of CERN have begun to appreciate the new, simplified procedures. The Organization has expressed its appreciation to the French Authorities.

The Site Management Group has seen a substantial increase in its cleaning tasks due to the commissioning of many LEP surface buildings and a heavy demand for cleaning in the LEP tunnel and experimental areas. Even though the underground activities are likely to decrease, the surface buildings will remain a task to be integrated into new, result-based contracts which will have to be tendered for in the near future.

Emergency Repairs of buildings become more and more frequent and it is strongly hoped that quite soon a clearly defined budget item will help to set the frame for a well defined maintenance and repair programme.

The Group has provided the CERN Management with a computerized inventory of all CERN buildings and their estimated value of today. It has been a particularly fastidious task to collect and standardize the necessary data.

To our pleasant surprise a number of outside institutions have shown great interest in profiting from the computer programme developed for the buildings inventory.

The Technology Group has acquired a new electron-beam welding apparatus. This instrument represents the front line of this type of instrument and its welding capabilities will be very much in demand for work on metal joints where extremely high precision and cleanliness are required. The apparatus is about to be commissioned and great hopes are placed in its capacity to introduce new and better solutions to technical problems arising from the prototype and development work in the future. The Group has also helped a number of Member State Research Laboratories to carry out annealing and bakeout processes under unique conditions in the big bakeout furnace which combines very elevated temperatures, excellent vacuum and large geometrical dimensions.

TECHNICAL SUPPORT DIVISION - TIS COMMISSION

The TIS Commission continues to rationalise its various services in order to deal with the increasing activities occasioned by LEP operations, while the total manpower decreases. Efforts in accident prevention have been rewarded with a somewhat lower CERN accident rate for the first few months of 1989 and a very significantly lower number of lost working days.

The specialised Groups of the Commission have all been heavily involved in the reception tests and procedures for the LEP machine and experiments, notably for lifting equipment, inflammable gas systems, fire detectors and alarms of all sorts. The most important alarms now reach the Alarm Centre but with only a minimum level of supporting information. As a result, the Fire and Rescue Service are obliged to respond to a record number of calls.

The radiation monitoring system for LEP is fully operational and ready for first beam. A radiation data-base is installed on ORACLE and the necessary programs for access and display available. The pre-LEP environmental measuring programme of the last four years has been completed and documented, and is now being reorganised to take account of LEP in operation.

While all Groups prepare for LEP operation, the routine tasks such as safety inspections, dangerous waste and environmental controls, and even radiation protection for new beam lines of the fixed target programme continue.

A considerable effort is still provided for safety training courses, which will in the future be extended to all CERN users. A three-week intensive training course in first-aid and fire-fighting was given to the new team of LEP site supervisors, bringing the total number of auxiliary firemen regularly training with the Fire and Rescue Service to twenty.

CERN safety documentation is regularly updated and a new Fire Code was recently presented to the Safety Policy Committee.

III ADMINISTRATION

- **General Administration**
  - *Office of the Head of Administration*
  - *Services of the General Direction*
  - *Central Services*

- **CERN Pension Fund**

- **Finance Division**

- **Personnel Division**

ADMINISTRATION GENERALE

BUREAU DU CHEF DE L'ADMINISTRATION

Au titre des relations aves les Etats-hôtes, l'Administration a poursuivi sa mission de représentation de l'Organisation auprès des services publics français et suisses. Elle s'est occupée des questions suivantes : séjour et emploi des familles des membres du personnel et anciens membres du personnel, passage par le tunnel reliant les différentes parties du domaine et la frontière, procédures douanières (négociation avec les douanes françaises du nouveau régime fiscal et douanier), transports (circulation, cartes et carburant détaxés, facilités administratives), entreprises contractantes (accès et activités sur le domaine, passage de la frontière), gestion de la partie française du domaine laissée à l'agriculture (réunions avec les Administrations, les élus et les organisations professionnelles) ainsi que de procédures administravives diverses.

Le Bureau, par ailleurs chargé de missions factuelles pour le Chef de l'Administration, a également pris une part active aux travaux de divers comités. Il a aussi été engagé dans les activités liées à la préparation du futur système budgétaire et comptable de l'Organisation développé par la Division des finances.

Le Bureau a assuré la gestion financière des différentes unités composant l'Administration centrale du Laboratoire et géré de grands contrats à caractère administratif.

SERVICES DE LA DIRECTION GENERALE

Comme chaque année, le Service d'Audit interne a concentré ses activités au cours du premier semestre principalement sur la vérification des Comptes 1988 de l'Organisation et de la Caisse de Pensions.

Ces travaux se sont déroulés selon un programme établi à la suite de la demande des Commissaires aux Comptes d'examiner plus en détail certains postes. D'autre part, divers contrôles de suivi ont été effectués, ainsi que quelques études à la demande du Chef de l'Administration.

Le Secrétariat du Conseil a continué d'assurer ses tâches habituelles (préparation des réunions et des documents du Conseil, de ses Comités et de ses groupes de travail, ainsi que de l'ECFA, avec en particulier la préparation de la conférence "ECFA Study Week on Instrumentation Technology for Future High Luminosity Hadron Colliders" à Barcelona en septembre 1989; liaison avec les Présidents des différents Comités).

With the imminent completion of LEP the efforts of the Media Service have been directed towards dealing with the increased interest from both Journalists and Television companies in CERN in general and LEP in particular.

Not only is it necessary to keep pace with the incoming requests for information, interviews and filming facilities, but also to prepare and implement a complete Press Campaign to exploit to the maximum the first collisions in LEP and the Inauguration Ceremony. To this end use is made of a Public Relations consultant to work in close collaboration with the Media Service and the "LEP Inauguration Coordination Group". The first event in this Press Campaign is to be a major Press Conference at CERN on 15 June 1989.

Neil Calder succeeds Dr Harald Bungarten as Head of the Media Service.

Le Service juridique a assuré sa fonction de conseil de l'Organisation. Il a assuré le secrétariat du groupe de travail ad hoc relatif à la participation d'Etats non Membres au programme du CERN et pris part aux travaux de la "Task Force" sur cette même question.

Il a participé à l'étude des problèmes de transferts de technologies dans le cadre des relations de l'Organisation avec les industries, aux travaux concernant la prise de brevets et contribué à l'élaboration d'accords de coopération avec d'autres laboratoires.

Il a pris part aux travaux concernant la Caisse de Pensions de l'Organisation, notamment en ce qui concerne la garantie des pensions en cas de dissolution et la révision de son statut.

Il a participé à divers Comités (notamment le Comité pour la Politique de Sécurité, le Groupe des Pensions) et groupes de travail.

Sur le plan du contentieux, il a défendu les intérêts de l'Organisation et a poursuivi sa tâche dans le domaine des assurances. Il a conduit le dossier de l'affaire EUROLEP/CERN.

The Publications Section continued its regular production of the CERN COURIER, Weekly Bulletin, Images, Annual Report and worked on the up-dating of documentation for visitors to CERN in preparation for the advent of LEP. The Exhibitions Section was involved in exhibitions in Italy at the Milan Fair and in L'Aquila in collaboration with INFN and the nearby Gran Sasso Laboratory. Many other exhibitions are in preparation for the second half of the year, several with particular emphasis on technology and collaboration with industry.

In 1989 the amount of work handled by the Translation and Minutes Service increased by 8% overall relative to the previous year. Though the increase was distributed across all sectors, the biggest growth (+ 74%) came in miscellaneous tasks such as editing and linguistic revision. As usual, major clients included the Finance and Personnel Divisions, the Pension Fund and the Services of the General Direction such as Publications, the Legal Service and the Council Secretariat, though Scientific and Technical Divisions were also well represented. Texts were translated into English, French or German out of the same languages plus Dutch, Italian, Russian and Spanish. The Service also continued its new task of providing simultaneous interpretation into English and French at numerous meetings.

CENTRAL SERVICES

Composition and Printing Group

The volume in the print-shop is somewhat up on last year, particularly for colour work. Breakdowns in the ageing equipment are on the increase.

In preparation for using workstations, Cheapernet has been installed in the offices used by the group. Security against theft has been strengthened.

General Services Group

The constant review of site guarding practices has resulted in the provision, in a staggered fashion, of an extra guard during peak hours, greatly increasing the number of checks.

Plans are near to finalization for the installation at the main entrance of upgraded facilities, with audio-visual links to the Reception building, remote control from this building, and operation outside working hours by

access card. Simplifications are under discussion for use of the inter-site tunnel, notably the addition of a second, access-card operated lane, and a reduction in the number of documents to be presented to the guard.

The Housing Service accommodation facilities (hostel, dormitories, flats) continue to operate at very high occupancy rates in an attempt to satisfy ever-increasing numbers of users. Offers from private owners of studios and flats, a very precious source of accommodation at prices the typical CERN user can afford, have increased thanks to adverts placed by the Housing Fund, but remain insufficient to satisfy demand for low-cost accommodation. Meanwhile, prices generally on the local market continue their substantial upward movement, and we are currently augmenting the private supply side in preparation for the onset of the operational phase of LEP.

Studies have been concluded on the computerized reservations and billing system for the Hostel. By the use of several terminals in conjunction with a well tested software package, it will be possible to alleviate the intractable operational problem whereby the staff endeavour to deal with a veritable torrent of requests from customers using telephone, telex, mail, electronic mail and calling personally at the reception desk. Increased presence at the front desk in the Reception Building will also improve our User relations.

CERN PENSION FUND

The Annual Report of the CERN Pension Fund is submitted separately to the Council (CERN/1744-CERN/FC/3230).

FINANCE DIVISION

1. FINANCIAL SITUATION

1.1 The upward trend of interest rates on the Swiss franc and other currencies at the beginning of 1989 has increased substantially and could continue during the year.

1.2 An overall amount of 106 MCHF was obtained from banks in the form of short-term loans in November and December 1988 to cover additional LEP project costs. These credit facilities were repaid to the banks concerned at the end of March 1989 on receipt of contributions from Member States. Despite cashflow difficulties during the first few months of the year and owing to the efforts of several Member States to pay their contributions earlier, it is hoped to achieve the level of income forecast in this year's Budget.

1.3 Over the last twelve months, the Swiss franc has depreciated against most currencies. This will result in losses in the Organization's Budget on several contracts and payments in currencies other than the Swiss franc. The depreciation of the Swiss franc has continued during the period under review with respect to European currencies and especially to the US dollar.

1.4 After a very thorough review of the various sectors of the Organization, severe restrictions on spending were imposed and the Director-General has re-allocated Budget provisions to take account, wherever possible, of the needs of research, LEP operation and commissioning, support for LEP experiments in the research sector and additional expenditure on energy, etc.

2. BUDGET AND ACCOUNTING REFORM

2.1 In Chapter VII of its Final Report of December 1987, "The Finances of CERN", the CERN Review Committee made a number of comments on budget and accounting matters.

2.2 In addition, Annex VII.1 of the above-mentioned report contains recommendations for a new system of financial and accounting management.

2.3 The White Paper of the President's Group of January 1988 was discussed by the Finance Committee at its meeting of 3 and 4 February 1988.

2.4 In February 1989, the Finance Committee was informed of a possible time-scale for implementation of the Reform.

2.5 A document on this matter will be submitted to the Finance Committee in June 1989.

2.6 Preparation of the proposed changes and their presentation to Member-State Delegates have substantially increased the work-load and will continue to do so in 1989 and 1990.

3. FINANCIAL AND ACCOUNTING SERVICES

3.1 Over this period, a substantial amount of the work of the Financial and Accounting Services has been concerned with operations relating to the closing of the Accounts, the drawing-up of the 1988 Annual Accounts and 1989 budget follow-up. The Accounts have been audited by new Swedish Auditors who were assisted in their work by the provision of detailed explanations on all the Organization's complex finances.

3.2 The loan of 50 MCHF granted to the EUROLEP consortium, which was covered by a bank loan, was repaid on 11 April 1989.

3.3 There were 550 visiting teams' accounts in May 1989.

4. PROCUREMENT SERVICE

4.1 The Purchasing and Contract Sections were merged on 1 January 1989 in the interests of greater efficiency.

4.2 Although LEP construction is almost completed, 42 new contracts had to be placed during the first five months of 1989 to meet the evolving needs of the Organization. These contracts do not affect the unavoidable changes, additions, adjustments and amendments to existing contracts to take account of the many difficulties entailed in their execution. There are 177 such amendments. There were 14 calls for tenders, which represents a sharp drop. Over the same period, 12 911 orders were placed.

4.3 A new distribution of human and material resources is being examined, with efficiency as the main criterion, to take account of the current evolution in the Organization's activities.

4.4 Thirteen firms took part in the "Spain at CERN" exhibition (31 January to 3 February 1989) and 29 in the "Germany at CERN" exhibition (23 to 25 May 1989). There have also been 18 one-day technical presentations since the beginning of the year.

5. PLANNING AND BUDGET OFFICE

The main job of the Planning and Budget Office is to prepare and edit the Organization's Budget documents (annual and medium-term Budgets) and those relating to the calculation of cost-variation indices and to scales of contributions of the Member States.

6. ADMINISTRATIVE AND TECHNICAL ASSISTANCE

6.1 The Invoice Office dealt with some 29 000 documents, which is comparable with the figure at this time last year. However, the average amount per invoice has tended to decrease in a number of fields.

6.2 A prototype on-screen automatic checking program was introduced in April 1989 for a specific type of invoice. Following promising trial runs, a new module was produced in May.

PERSONNEL DIVISION

Personnel policy issues

Considerable effort was devoted to the preparation of proposals concerning CERN's personnel policy which were presented to Finance Committee and the Committee of Council in April. Work began on the planning and/or implementation of several features of the scheme, including performance appraisal, skills inventory, succession plans, individual career plans, manpower planning, career paths and Fellowship stipends.

Tripartite Advisory Committee on Employment Conditions (TRACE)

Preparations were made for the first meeting on 20 June 1989 of this new body, created by Council to succeed CCEC. The first topic to be examined on the basis of a mandate decided by Council is the Five-yearly review of CERN salaries. Staff of the Personnel Division re-examined the grade equivalences with the reference organizations and prepared salary comparisons to be submitted to Council, via TRACE, later in 1989.

Training

A start was made to restructuring Education Services to face the challenge of the role of training in a changing CERN. Actions taken include redeployment of staff and increased attention to the relation between courses provided and the personnel policy of the Organization.

Skills inventory

An Oracle-based skills inventory was created, comprising up-to-date information on staff members' professional qualifications and experience. Data collection and input will stretch over the next few months.

Performance Appraisal

As envisaged, the annual periodic review discussions between supervisors and subordinates were extended to include formal performance appraisals.

Relations with the Host States

Detailed information was prepared for discussions with the Host State authorities on various aspects of the residence conditions of expatriate families.

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