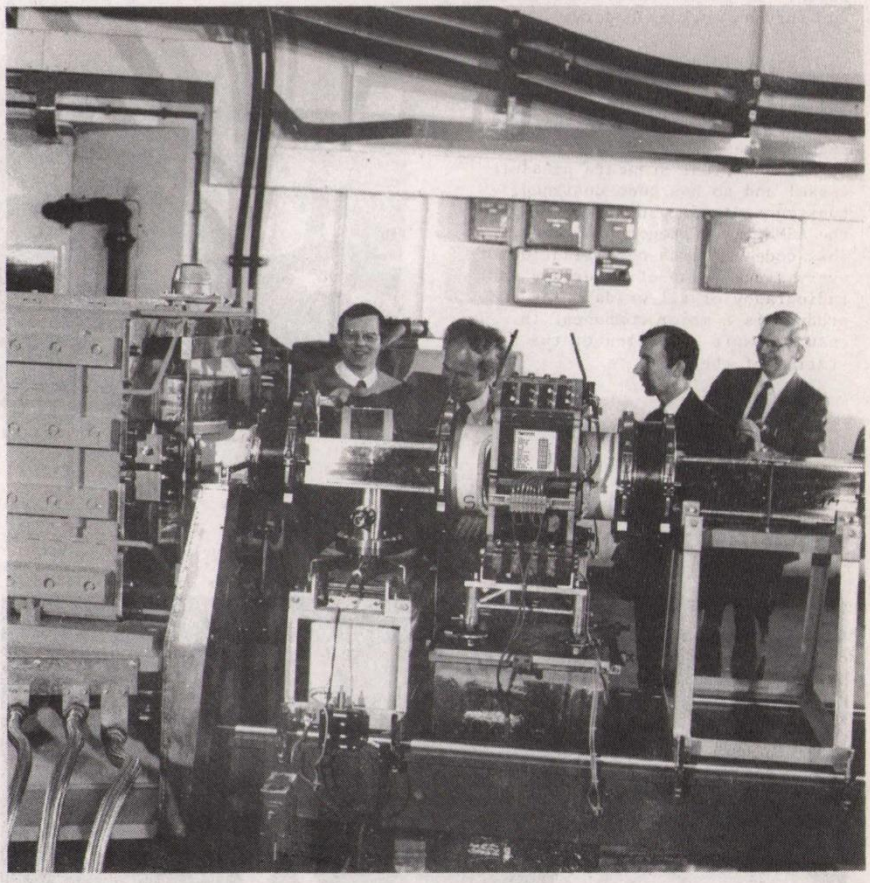
Bulletin
of the Rutherford Appleton Laboratory
10 Jan 1984 No.1

SNS Magnet Ring Completed

The last of the 10 dipole magnets for the SNS was delivered on Monday, 5 December. This was the final component required to enable a complete vacuum ring to be made for the next stage of commissioning on the SNS - injection studies. The whole order of dipoles was very late and this led to a squeezing up of the programme of work to be done after delivery. Even the last dipole was later than the expected delivery date of 1 December which had been used to determine the date of 15 December for the making of the final vacuum joint. However, a major effort by all concerned enabled the 15 December date to be kept and the Director, Geoff Manning, was able to tighten up the last joint on the day.



Geoff Manning tightens up the last vacuum joint watched by Bob Hall, Peter Parry and David Gray. 83RC5953

The Build Up

In fact, two dipoles had to be processed between the 5th and the 15th because the first dipole delivered had been retained as a standard against which the others were compared magnetically. In Hall 1, each magnet was tested to full voltage at 50 Hz using part of the capacitor bank for the main magnet power supply. A measurement of the effective magnetic length was made to an accuracy of 1 part in 10^4 at field levels corresponding to injection and extraction from the SNS. The dipoles were then transported to the Synchrotron Room on the air-pad supporter 'Hissing Sid'. Hissing Sid broke most of its air-pads during transport of the last magnet. The much less convenient back-up trailor was finally used with a great deal of skill - but with some trepidation from onlookers - during the final stages of handling the 35 ton load. In the Synchrotron Room, with the dipoles sitting on 3 pre-aligned feet in the centre of the room, the 5m long curved ceramic chambers were installed, fitted with supports, aligned and vacuum tested. A special curved measuring bar was then used to measure the inside of the vessel. This enabled accurate machining of ceramic spacers which support the radiofrequency shield in the correct position inside the chamber. This rf shield is necessary to provide the SNS proton beam with the good rf environment necessary if the design current of the SNS, the highest ever attempted in a synchrotron, is to be attained. The shields, an array of wires and plates supported on ceramic frames, were successfully fitted. Copper pipes for the cooling water for the dipoles were fitted, and the magnets then placed on their 3 pre-aligned supports in the synchrotron ring. The final vacuum components joining the dipoles to the rest of the ring were carefully aligned and the joints finally made on 15 December.

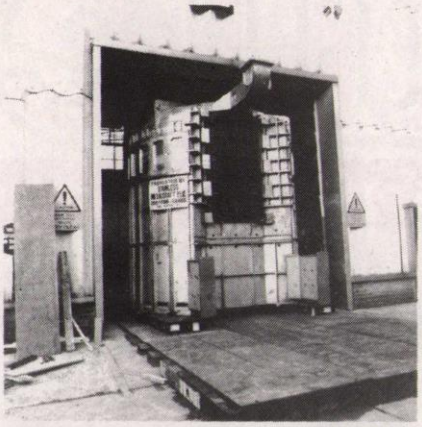
The whole magnet system has now been connected up electrically and with water cooling and power supply tests have started. Vacuum tests started immediately and good progress is being made in getting the vacuum down to the levels (5×10^{-7} torr) required for operation.

The next few months will be most challenging and exciting, with injection and beam trapping studies being performed which will need many of the major systems of the SNS to work successfully.

D A Gray

SNS Target Void Vessel Arrives

After a delay of some months the SNS Target Void Vessel was delivered to the RAL on 28 November 1983. The main part of the vessel is 3.2m diameter and 4 m high and was transported by road from Chatteris, Cambs., starting out at the crack of dawn. It arrived at Building R55 at 1.0 pm where an anxious throng watched it being unloaded and fed through the door on skids (as the photo shows it was a very close fit!). The vessel was placed on blocks and was successfully vacuum tested that evening. The next day the vessel was installed in its proper resting place deep within the Target Station bulk shield (the second photo shows it being craned into position) and the alignment process begun. It is now fully surveyed-in and further work is underway.



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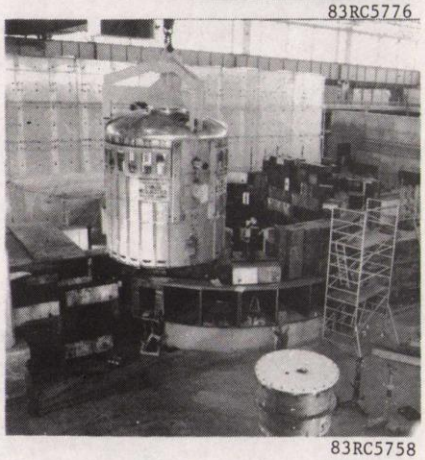

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The Target Void Vessel is a complex vessel with a number of functions, the main one to contain the target assembly in a helium atmosphere at reduced pressure. The vessel is in effect a nuclear standard pressure vessel and so has been designed, constructed and tested according to the ASME III, Category 'A' code. This code requires certification of every stage, also of materials and radiography of all welds. The end product is a major component in ensuring safe operation of the target station of the SNS.

A Carne

A Measure of Success

Del Forsyth of the SNS mechanical workshop receiving a cheque for £250 from his Division Head David Gray. The award was made under the Suggestions Award scheme, for devising a method of accurate optical alignment required to measure and set up nine of the correction magnets used to build some of the modules forming part of the SNS ring magnet system.

ALEPH f8

Now that the construction of LEP has started we must wait patiently until 1989 for this enormously important new electron - positron collider to come into action.

The equally daunting task of making the new generation of detectors needed to exploit LEP is now well under way. The UK (with RAL) is heavily involved in 3 of the 4 approved experiments: ALEPH, DELPHI and OPAL. All are large international collaborations with several hundred participants, not just from Europe but also from Japan, China, Canada, USSR and USA.

The ALEPH detector aims at sophisticated simplicity:sophisticated in that each component of the detector is optimised to extract the maximum possible information, simple in that the number of different components is at an irreducible minimum. The drawing shows that ALEPH consists of only 4 major items: the Inner Tracking Chamber, the Time Projection Chamber (TPC), the Electromagnetic Calorimeter, and the Hadron Calorimeter, all built inside or around the superconducting solenoid magnet (1.5T field).

The structure is therefore rather homogenous: all particles coming from the interaction region go through the same combination of detector elements, with very few 'holes' or dead regions. The TPC measures the momentum and position of tracks, and by energy loss measurements distinguishes the type of particle. The Electromagnetic Calorimeter measures the energy of electrons and photons, and pin-points their position. The Hadron calorimeter measures the energy of pions, protons etc., but because it is made out of laminated iron it also serves double duty as the magnet return yoke.

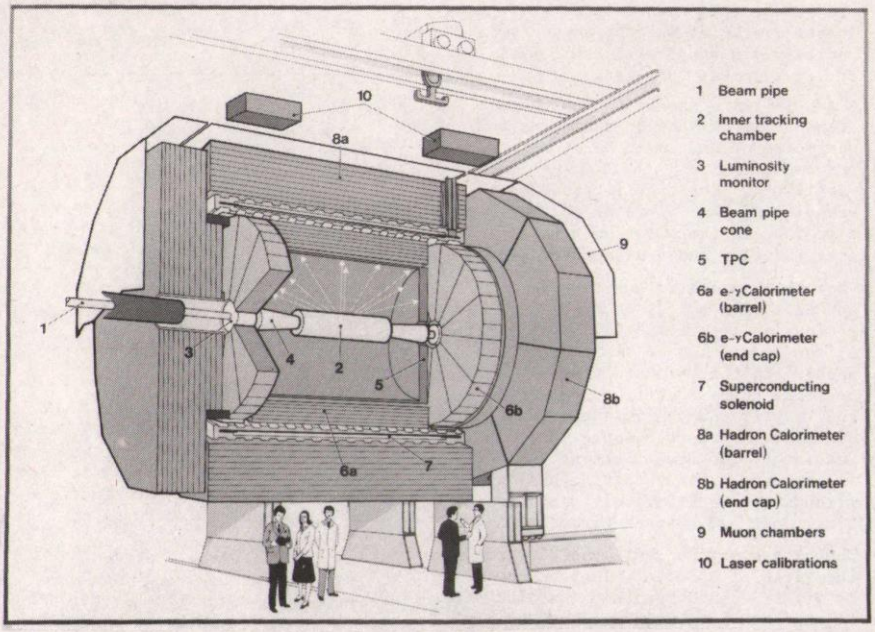
UK Effort

UK contributions are very important to ALEPH. Glasgow, Lancaster, Sheffield, Westfield and RAL are collaborating in building the Electromagnetic Calorimeter elements for the end-caps, Imperial College is building the Inner Tracking Chamber and its associated electronics for the trigger, Glasgow is working with Dortmund to provide the Laser calibration system needed for the TPC and RAL is responsible for some of the trigger electronics and a substantial part of the on-line data acquisition system.

As could be expected, almost every part of ALEPH pushes the current 'state of the art' a bit further in the effort to get more physics per pound sterling (the latter commodity being in notably short supply!).

The electromagnetic calorimeter is a case in point. Here, the aim is to detect electrons and photons by their characteristic interaction

r LEP



83FB5053

("showering") in dense material. Since the typical lateral size of a shower is of the order of a few centimeters only, the calorimeter has been designed so that it looks like a matrix of independent 3cm x 3cm shower detectors, each one subdivided longitudinally into 3 layers. This results in a detector with some 220,000 individual analogue channels to be read out. Even a few years ago such a number would have been unthinkable. Today, by making special integrated circuits (designed entirely by R36 Electronics Group), and hybridising as much as possible of the rest of the electronics, the problem becomes manageable.

The mechanical problems are just as immense. The shower energy is sampled by a set of fine (25 micron diameter) wires in 3.5mm square aluminium channels. Each end-cap has 12 modules, each module has 43 planes of wires, and each plane has more than 240 wires: a grand total in the end-caps alone of more than a quarter of a million wires to be strung! Each wire has to be positioned to an accuracy of better that 50 microns, maintained over the whole of its length; no mean problem for PAG to solve.

In Full Swing

Although the LEP time-scales may seem leisurely to some, those involved know that this is an illusion, and work is necessarily already in full swing to meet the 1987/88 installation dates. The end-cap calorimeter prototype, made jointly by RAL and Glasgow, will soon be shipped to CERN for testing. Next year the design parameters will be fixed, incorporating all that has been learned from prototype and development work here and in France. If all goes well, the first of the 24 modules will be completed by mid-85, and the last will appear early in 1988, just ready for installation in the ALEPH experimental hall. Then, all the components of the whole detector will be coming together in 18 months of feverish activity, and we will find out if the years of careful preparation result in the smooth assembly of one of the biggest pieces of physics apparatus ever built.

Ian Corbett.

Film Badge Notice

It is period 1. Colour strip PINK. Please check that you are wearing the correct dosimeter and that all old ones are returned.

Internal Events

ASTROPHYSICS SEMINARS
R61 CONF. RM - 14.00 hrs.

11 Jan Dr Geoffrey Brown/UC Wales
"Some Solar Activities: Predicting Cycles and Finding Tropospheric Signals"

25 Jan Dr Derek McNally/UCL
"Diffuse Interstellar Absorption Lines"

8 Feb Dr William Sealey/ROE
"Sea, Sun and Stars: A Personal View of UKIRT"

RAL Lectures

The next lecture in this series will be held on 19 January at 3.15 pm in the R22 Lecture Theatre.

NUTRITIONAL SCIENCE:
THE NEW PARADIGM
by
Dr Magnus Pike

Lavoisier's fundamental discovery that life is a chemical process has been the foundation upon which the science of biology in general and nutrition in particular has been developed ever since. For much of the present century, nutritionists have been preoccupied to insure that each of the increasing number of chemical eompounds and mineral elements needed for nutritional well-being should be available in adequate amount to avoid deficiency disease. Today, however, their concern is shifting towards the avoidance of excess, particularly of fat and sugar. The relevance of current preoccupation with superfluity, as of previous fear of deficiency, will be considered as will the adequacy of the philosophy of a chemical life process.

The next lecture will be on 16 February 1984 given by Professor R Penrose, The Mathematical Institute, Oxford.

RAL TECHNOLOGY LECTURES

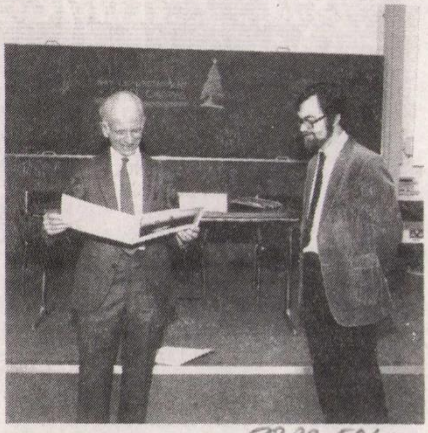
The next lecture in this series will be held on Thursday 2 February at 3.00 pm in the R22 Lecture Theatre.

TECHNOLOGICAL DEVELOPMENTS REQUIRED
FOR THE BUILDING OF THE
SPALLATION NEUTRON SOURCE
by
David A Gray

To reach the required performance of the SNS, the highest current synchrotron to be built, a wide range of technological developments have been required. These will be described. A film of the making of the ceramic vacuum vessel will be shown during the talk.

FOR YOUR DIARY: The next lecture will be on Thursday 1 March 1984 by Dr W Sibbett, Imperial College of Science & Technology, and will be entitled "Pico- and Femto- Second Techniques"

The End of a Mighty Career



83RB 5960

Forty two years an 'Appleton' man was the achievement by Richard Smith, celebrated by his many friends and colleagues on Monday 19 December. Ostensively the occassion was to mark Richards retirement, but in reality it was a tribute to a man whose outstanding,dedicated and selfless service to Ionospheric science is unlikely ever to be matched.

Richard, we were told by John Harries who was making the presentation, "Is one of the few true 'Appleton men' in the proper sense, that his early work can be justifiably linked with Sir Edward Appleton. In fact it was on Sir Edwards recommendation that Richard was deferred from call-up in 1944, because "the technical complexity of the problems involved in the service he provides makes him virtually irreplacable".

Richards early career in Ionospheric science brought him into contact with all the eminent men of the pioneering day of the Radio Research Station at Ditton Park, and they still esteem his work. Professor Roy Piggot attended the celebration and spoke warmly of their association. "He produced years of first class data, and I owe him a tremendous debt of gratitude", he said. Sir Granville Beynon in a message of regret for his absense stated, "In the best tradition of Radio Scientists, Richard has been an excellent and faithfull servant to the Ionospheric and Geophysics community in this country and abroad and all are greatly in his debt."

From this it can be seen that not all Richard's life has been bound up with the Ionosphere. After a spell in Singapore as officer in charge of the Radio Research Sub-Station he was involved in design and development of the transistorised equipment for the first Radio Research Station rocket experiment; the operation and maintenance of satellite tracking and telemetry receiving at Winkfield; in the Ariel 3 and ESRO1 projects; became computer operations manager at Ditton Park, analysed data from Ariel 3, trained British Antarctic Survey staff in the design of absorption equipment and provided support at South Uist during a rocket campaign.

About 10 years ago Richard became responsible for the organisation and operation of the World Data Centres for the Ionosphere and Rockets and Satellites. The high international standing of the Centre at the present time results largely from his conscientious and dedicated efforts.

"Before I am criticised for concentrating solely on his professional career," said John Harries at the conclusion of his address, "I should add that Richard's warm personality has contributed much to the very friendly atmosphere that prevailed at the old Appleton Laboratory and now exists at RAL. It is abundantly clear that he has many friends at the Laboratory who all wish him a long and happy retirement".

Thanking everyone most sincerely for the gifts of a radio, plane and book on birds Richard remarked that much of what had been said was news to him! From the anecdotes with which he regaled us, it was evident that he had found his forty two years in radio and space research an abiding pleasure. He had had a wonderful career with no regrets.

"I wish you all a very Happy Christmas and continuing success to RAL in the New Year, when I shall see you all in my new role as consultant" he concluded.

Vacuum '84

The Vacuum Group of the Institute of Physics is holding its biennial conference on TECHNOLOGICAL ASPECTS OF SURFACE TREATMENT AND ANALYSIS. The meeting is being organised jointly with the Atomic Collisions in Solids Group and will take place at the University of York from 1-4 April 1984.

Registration Forms and details are available from G S Grossart, R2, Ext: 5583 at RAL.

Lifeboat Fund

The 1983 collection for this fund at RAL was £104.25 and the Honorary Treasurer conveys his gratitude to all who helped raise this sum.

Football

RUTHERFORD LUNCHTIME FOOTBALL

		P	W	D	L	For	Agst	PTS
	R25	4	3	0	1	20	5	6
*	R2	3	2	1	0	16	3	5
	ATLAS	4	2	0	2	9	2	4
	STUDENTS	3	2	0	1	8	6	4
	HEP	3	1	1	1	3	9	3
	STORES	4	1	0	3	5	27	2
	R18	3	0	0	3	4	13	0

* HOLDERS

As we came to our Xmas Break the lunch time 7-a-side league results were as shown in the table. With the top 4 teams to play each other the league is still open; but with R2 convincingly beating R25 in the last game after a shakey start to the season, other would-be pretenders to their title had better watch out.

The games are normally played on Tuesdays, Wednesdays and Thursdays, so please come and watch - as it is quite entertaining - especially when the STORES are playing. The first games of 1984 will be played on 10, 11, and 12 January.

RVN

Thanks

Mrs Avril Moat matron of the Sue Ryder Home, Nettlebed wishes to thank all at RAL who helped to raise £55 for the Home at the Art and Craft Exhibition. "We greatly appreciate all the help and support that we receive which enables us to continue to provide care and comfort to the patients here," she writes.

Sales to Employees

The sale of scrap metal and plastics will take place, subject to the usual conditions, on 20 January at the R40 scrap compound from 12-1230 hrs.

Bulletin

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