



Rutherford
Laboratory

COMMON/CSCAL/IBM, NERR, NCH, NGAP, ISCAN, NBR, NGR, NSCAN, NRO
1 TYSEL, TYSEU, TYMAX, NTRACK, NSCAN, NES, NFAL, MAXTR, MAXN
2 NBEGIN, NTK, NTRY, NMIS, NSSR, NFIC, MAXMIM, NFIRST, NEND
COMMON/CFID/MFX(20,3), MFY(20,3), NFDX(10,3), NFX(3), NF
QTAB(2,20,3), NX(100,4), NY(100,4), XN(2), YN(8), TB(100,10)
R IDY(100,2), JDX(4), JDY(4), IHS(4), IGV(2), bulletin 3
S NCF(16), IFS, NFS, FX, FY, JK, PIC, KPIC, NCUANT, NBIN, MAXOV, MAX
T MAXN, CTA, CTB, MX, 9 - 23 February 1976
DIMENSION NCTR(144), NGTR(207), CTR(1127), GTR(12), MODE(217)

COMPUTER GRAPHICS & CRYSTALLOGRAPHY

Mike Elder, a member of the
Applications Software Group of
the Atlas Computing Division

reports on the very successful two-day meeting entitled
"Applications of Computer Graphics Techniques to
Crystallography Problems", organised by the Division
and held at The Coseners House on 29 & 30 January.

Crystallography is, of course, only one of the large number of the large number of scientific disciplines making large and increasing use of computer graphics for display purposes and for interactive use. It has some well defined problems, however, and the elucidation of protein crystal structures in particular has been a field in which a lot of pioneering work with display tubes and interactive mini-computer systems has been performed. The meeting was an opportunity to bring together representatives from many of the crystallography groups now actively using interactive graphics, for the purposes of discussing common problems and predicting future advances.

The importance of graphical methods as an interface between computer and chemist is obvious. Extensive tables of three-dimensional coordinates may be acceptable to crystallographers as a necessary means of communication with the computers essential to their work, but chemists and biochemists are accustomed to a three-dimensional ball-and-stick type representation of molecules. The stability and reactivity of molecules, the mechanisms of their interaction and the difference between them, depend to a great extent upon the details of their three-dimensional structure. Computer graphics provides this link between crystallographer and chemist. Modern systems with features allowing the manipulation of displays, and with computer links for interactive access to large data banks of structural information,

will become increasingly important laboratory tools.

An even more important application of interactive graphics techniques to crystallography lies in the work of the protein crystallographer. It was this field that concerned a lot of the participants at the meeting. The solution of the crystal structure of a protein requires the construction of a molecular model representing in three-dimensions the positions of some thousands of atoms. This model must be derived from and fitted to a map of the density of electrons in the crystal which is in turn derived from experimental observations. How does one represent electron density, calculated at a few million positions, in order to fit a large model to it experimentally? One solution involves contouring the density on to transparent sheets representing successive slices through the density and then making ingenious use of a half-silvered mirror in order to "project" the model into the density. But computer graphics techniques provide a tidy answer to the problem. Electron density may be displayed as a three-dimensional contour envelope on a screen and a line model of the protein molecule superimposed upon it, region by region. Control knobs allow interactive adjustment of the model position and automatic rotation features give the crystallographer a full three-dimensional view of what he is doing.

The meeting was broadened by the participation of representatives of other groups actively involved in interactive computer graphics, including a civil engineer, computer scientists from regional computing centres and members of the Rutherford Laboratory with experience in this field. Its success as a discussion meeting could be judged by the quality and quantity of the exchange of ideas and opinions amongst the participants generated by the invited speakers.

REQUIEM FOR THE 14 GeV/c K⁰_p EXPERIMENT

If all the initial design and
development work and final analysis
is taken into account, a typical
high-energy physics experiment

(if there is such a thing) has an overall lifetime of several years and sees the comings and goings of many different people. As the 14 GeV/c K⁰_p experiment draws to a conclusion, Ken Paler takes a last look back before the physicists get carried away by the momentum of a new experiment.

The need for this experiment was recognised in 1967 but its realisation had to wait until radio frequency particle separators were ready so that such a high energy beam of negative kaons could be produced. When energetic negative kaons collide with protons an enormous range of different particles emerge. This is mainly because the kaon possesses a peculiar property called strangeness which unlocks a Pandora's box of different particles when the kaon collides. Strangeness is not understood, it has no classical analogue and seems to be only a property of subnuclear particles, its relevance to the mechanisms of nature is yet to be found. It is this richness of particle production which attracts study but to do it efficiently a detector which - reveals all - is needed. The bubble chamber is such a device, which when filled with hydrogen also provides a simple target particle, the proton.

Thus the stage was set at CERN in early 1969 with the 14 GeV/c negative kaon beam and the 2m hydrogen filled bubble chamber ready to go. In an initial run about

400,000 pictures were taken. Two more runs were to follow, the last was in Summer 1972.

The experiment was a collaboration between R.L., Centre d'Etudes Nucléaire - Saclay, and Ecole Polytechnique - Paris. It has been a good example of international cooperation with a free flow of ideas and a lot of combined effort. The R.L. personnel involved with the experiment which has spanned three generations of R.A.'s were, in order of appearance, John Smith, Jim Phelan, Bob Miller (these latter two are now at Argonne Nat Lab. - Chicago), Tara Shah, Ken Paler, Stuart Tovey (now at Melbourne University), and Clive Comber.

The total amount of film taken was 1,200,000 - 50 mm pictures each with three views - 400 miles of film. The approx. total computing time used by the collaboration is equivalent to 15,000 hours of 360,195 operations. The final data tapes contain 500,000 events and so far 28 papers have been published.

It is difficult to summarise the results, which have spanned such a wide range of topics. Briefly the most important have been in two-body dynamics - particularly K*(890) production and the energy dependence of its cross-section, meson spectroscopy where a new axial vector strange meson was found as a result of a three-body partial wave analysis and finally in A-production in which tests of the current theoretical models were made. This created a lively dialogue between the experimentalists and theoreticians at R.L., to their mutual enlightenment. All in all the experiment has been a great success.

INTERNAL EVENTS

NIMROD LECTURE SERIES
Monday 9 February
11.30
Lecture Theatre

Status of Ξ^* Search and Other Aspects of Hadron Spectroscopy in K^+p Reactions at 4.2 GeV/c.

Dr R Hemingway/CERN

HEP SEMINAR
Wednesday 11 February
11.00
R61 Conference Room

Derivative Analyticity Relations for Amplitude Analysis.

U Sukhatme/DAMTP

HEP DATA HANDLING SECTION SEMINAR
Wednesday 11th February
13.30
R61 Conference Room

Use of Formal Languages in Compiler Writing

P P Haskell/RL

SAFETY FILM SHOW
Wednesday 11 February @ 12.40 & 13.15
Thursday 12 February @ 13.15
Lecture Theatre

One Million Hours - a 22 minute colour film.

A documentary based on real life incidents which caused injury & death. Following an accident in an engineering works a committee of enquiry is set up. In collecting and considering evidence on the accident many unrelated bad practices are brought to light. The film, designed for both management and workforce, shows how both can work together in accident investigation to prevent the same incident recurring and many others from happening. An excellent and thought provoking film.

NIMROD LECTURE SERIES
Thursday 12 February @ 09.30
Thursday 12 February @ 14.00
Friday 13 February @ 11.30
Lecture Theatre

A series of three lectures on -

Some Techniques in the Theory of Extended Particles.

Dr R W Tucker/Lancaster University

NIMROD LECTURE SERIES
Monday 16 February
11.30
Lecture Theatre

A review of Large p_T Processes.

Professor J C Polkinghorne/DAMPT - Cambridge

TRADE DEMONSTRATION
Wednesday 18 February
13.30 - 17.00
R12 Conference Room

Belling & Lee Ltd who are visiting the Lab for the afternoon only will display their product range of connectors, circuit protection & indication devices, flexible printed wiring, inconnector systems, RFI/EMC suppression and filtering equipment and, fibre-optic components & systems. Designers considering using fibre-optics have been restricted before because of the cost of 'trying out' opto-electronic connection systems as connectors are prohibitively expensive in small quantities. Belling-Lee have solved the problem by producing the "Belling-Lee Fibretran" development kit, which comprises a variety of senders and receivers incorporated in miniature connection which can be coupled using standard lengths of light guides supplied in the kit. Provision is also made for users to install their own emitters/receivers into the connectors. In addition, signal modulator and demodulator units are available which cover a wide frequency band.

"NEW PHYSICS" MEETING
LECTURE THEATRE
Wednesday 18 February
10.30 - 18.00

Preliminary List of Speakers with Provisional Titles

ψ Resonances at SPEAR
 ψ Decays at DORIS
 e^+e^- Interactions
The State of ψ Phenomenology

G Feldman/SLAC
S Orito/DESY and Tokyo
C C Morehouse/SLAC
T Walsh/DESY

Thursday 19 February
09.30 - 18.00

$e\mu$ Events at SPEAR
 ψ Photoproduction at SLAC
Charm Schemes and Weak Decays
"Old" Neutrino Anomalies & $e\mu$ Events at Gargamelle
Anomalous Neutrino Induced Events in the Fermilab 15' Bubble Chamber
Theories of Neutrino Induced Phenomena and the New Physics

M Perl/SLAC
C C Morehouse/SLAC
G Altarelli/Rome
G Myatt/Oxford

H Wachsmuth/CERN

A Pais/Rockefeller

Friday 20 February
09.30 - 17.00

Direct Lepton Production in Hadron Beams
 ψ Production and Charm Searches in Hadron Beams
Charm Search at ISR
Charm Searches in Emulsion
Theories of Charm Production

L Lederman/Columbia
J Peoples/Fermilab
M Albrow/RL
D Davis/UCL
D Sivers/RL

ATTENDANCE AT THIS MEETING IS BY INVITATION ONLY

SEMINAR IN COMPUTING

Friday 20 February
11.00
R61 Conference Room

Hardware for Computer Graphics

M J Holmes, D Dent/RL

Computer graphics hardware is as diverse as the applications of graphics itself, but some patterns are emerging. As graphics moves from the laboratory and is used by time and cost conscious processes we find the growing need for a real-time response. The implications of this for the graphics hardware and for the system that supports it will be discussed. Then the hardware of the Aspect Display System (ADS) which has been developed at the Rutherford Laboratory will be briefly described. Finally the software necessary to support ADS will be discussed together with an outline of the interfacing package available on the GEC 4080.

NIMROD LECTURE SERIES

Monday 23 February
11.30
Lecture Theatre

Internal Density Waves in the Ocean

Dr S M Flatté/CERN

Date for your diary: -

Next Rutherford Laboratory Lecture on Thursday 26 February, 15.15, Lecture Theatre.

EXTERNAL EVENTS

SEMINAR IN THEORETICAL HEP/NP DEPT.OX - 1430 hrs.

13 Feb: Prof J C Polkinghorne/DAMPT-Processes at Large p_T

COLLOQUIA/CLARENDON LAB, OX - 1615 hrs.

13 Feb: Dr A C Wiin - Nielsen/Bracknell - Medium - range Weather Forecasts.

20 Feb: Dr J D Silver/N P Dept - Beam Foli Spectroscopy.

THEOR. PHYS. SEMINARS/MANCHESTER U. - 1430 hrs.

11 Feb: Dr B Sinha/King's - Nuclear Structure Calculations with Density & Momentum Dependent Delta Interactions.

18 Feb: Prof R Elliott/Oxf - Phase Transitions in Spin-Phonon Coupled Systems.

HEP SEMINARS/4TH SEMINAR RM,MANCHESTER U. - 1600 hrs.

12 Feb: A Irving/Liverpool - Axial Vector Mesons.

19 Feb: A Wolfendale/Durham - γ Rays from the Cosmos.

HIGH ENERGY SEMINAR/CAVENDISH LAB CAMB - 1500 hrs.

11 Feb: Dr R G Roberts/RL - Calculation of Zweig Rule Violating Amplitudes.

HEP SEMINARS/SILVER ST,CAMBRIDGE U. - 1500 hrs.

12 Feb: Dr R Zia/Soton - Symmetries as a Result of Renormalisation Constraints.

19 Feb: Dr D K Sinclair/Oxf - The Harmonic Oscillator: an Introduction to Lattice Gauge Theories of Quark Confinement.

PHYSICS DEPT COLLOQUIA/READING U. - 1700 hrs.

16 Feb: Dr G E Attenburrow - Plastic Deformation in Chain-Extended Polyethylene.

23 Feb: Mr D Butts - Ion Cyclotron Resonance Spectroscopy.

NUCLEAR PHYSICS SEMINAR/KING'S COLLEGE - 1515 hrs.

11 Feb: Mr D Asbury/Surrey - The Truth About the n-p Total Cross-Section.

LECTURE SERIES/DARESBURY LABORATORY - 1400 hrs.

10 Feb: A Irving/Liverpool - Virtual Meson Spectroscopy.

17 Feb: W Demtröder/Trier-Kaiserslautern-Application of Laser Spectroscopy to Atomic & Molecular Collision Processes.

THEORY SEMINARS/DARESBURY LABORATORY - 1400 hrs.

16 Feb: A M Lane/Harwell - Giant Multipole Resonances; $L = 0, 2$.

23 Feb: D J Thouless/Birm. - Minimum Metallic Conductivity in Two Dimensional Systems.

THEOR.PHYS.DIV.SEMINARS/CONF.RM.BLD.8.9,AERE - 1415 hrs.

13 Feb: Mr C M M Nex/Camb. - Some Computations Involving the Density-of-States Function.

20 Feb: Dr P W Taskor - Potential Surfaces & Common Reactions.

NP DIV. COLLOQUIUM/CONF.RM HANGAR 8, AERE - 1530 hrs.

19 Feb: Dr R J Clark/Glynwed Group Services Ltd - Commercialism - R & D's Vital Link with Reality.

OBITUARY NOTICE

We deeply regret to announce the death of Mr C Hodgson on Tuesday 3 February. He was aged 56. Charles joined the Laboratory in January 1961 having previously worked at AERE since 1955. He sustained severe injuries in a motor cycle accident many years ago which left him disabled. Despite this he has provided a cheerful and efficient service to staff in R18 workshop. His sense of humour and cryptic comments will be missed.

We extend our deepest sympathy to his wife and daughters.

NIMROD SCHEDULE

At 0830 on Sunday 22 February, HEP will stop. Nimrod will then be shut down for about six weeks for installation work in Hall 3.

MAIL

A letter addressed to Mercedes Garcia Rebolloso, Madrid, Spain and signed Toni has been found. Will the sender please collect it from Mr J Marshall, Bldg. R1.

RUTHERFORD LABORATORY BULLETIN

Published by the Scientific Administration Group

Editor: H F NORRIS

Deadline
for
Insertions

1000 hours Wednesday 18 February

Room 42 Building R20
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Chilton Didcot Oxon
Abingdon 21900 Ext 484

COMMONS COMMITTEE REPORTS ON SCIENTIFIC RESEARCH

Scientific research in British universities, including the activities of the Science Research Council, is the subject of a new report from the Science Sub-Committee of the House of Commons Select Committee on Science and Technology which was widely reported in the national press.

While noting the 'high regard' in which many British scientific institutions are held by their counterparts overseas, the Sub-Committee does not think that all is well with the British system of research funding, saying "we are deeply disturbed about the effectiveness of the universities' present contribution to the national scientific effort, and believe that considerable changes in attitudes and practice may be required. This question will be the subject of further study, but the principle of enabling the universities to provide their staff with independent facilities for research is one we support".

An analysis of the distribution of SRC research grants taken together with separate evidence presented to the Sub-Committee leads the report to conclude that "there is room for further study of the extent to which the existence of a handful of highly-favoured university scientists may influence the formulation of SRC policy."

Although the Sub-Committee acknowledged that there were difficulties in dealing with large numbers of grant applications and that dissatisfaction amongst disappointed applicants is inevitable, it nevertheless recommended that "the element of uncertainty, particularly when applications are made for the renewal of grants" could be reduced to a minimum, citing the example of an overseas research council which provides additional grants to cover the period after the termination of

research grants to help staff readjust to a new situation.

The Sub-Committee agrees with the SRC's view that improved methods of support for 'engineering research' are needed and that the requirements in this direction of the natural sciences and the engineering sciences are different, but rejects the idea of the creation of a separate 'Engineering Research and Development Council', saying that this would represent unnecessary bureaucracy.

Instead, the Sub-Committee says that there would be 'merit' in renaming the Council as the 'Science and Engineering Research Council', as this would emphasise the SRC's national role for funding research in both science and engineering.

The Sub-Committee also endorses the SRC's own recommendations that "a substantial improvement is needed in the training of future research workers and particularly for those many scientists and technologists whose careers should be outside the confines of research." It agrees with the views for the SRC's own specially-appointed working party which recommends that broader, less-specialised postgraduate education is called for, and that a number of research studentships should be awarded competitively to students who would then be free to choose the subject of research at any university with any supervisor. Some students could be selected by the SRC to work on particular topics of national importance.

First Report from the Select Committee on Science and Technology - Second Report on Scientific Research in British Universities, HMSO 75p. Some copies are available in the Library.

MISSING EQUIPMENT

The following items of equipment have been reported

missing from the R25 optics lab:-
35mm Nikon camera body. Ser. No. 7024027 - fitted with 50mm Nikkor lens. Ser. No. 767169 - RL No. 05177.
Micro-Nikkor lens. Ser. No. 271180 - RL No. 5179
Adaptor for Nikon camera - Ser. No. 380250
Noroflex Extension Bellows - RL No. 5254.
Anyone with information on the present whereabouts of these items is asked to contact Inventory Section, R20, Ext. 570.

The following item of equipment has been reported missing from Lab 5, R1, suspected casualty of vacation of Lab 5 for EPIC last year:-
Pulse Generator, Type 132L, Ser. No. 1467.
Anyone with information on the present whereabouts of this item is asked to contact R T Elliott, R2, Ext. 6651.

OVERSEAS VISITS

Mr B J Day, to CERN, 8-11 February, to work on & discuss computing

matters.

Dr G E Kalmus, to Saclay, 9-10 February, to give seminar and discuss BEBC proposals.
Dr W A D Venus, to the USA, 9 February - 7 May, to work at Fermilab on the analysis of neutrino pictures from 15' BC
Dr R G Roberts, to Orsay, 9-10 February, to give seminar.
Dr D Madon, to CERN, 10 February - 3 March, for development of test software for Proposal 151.
Mr D C Salter & Mrs L J Bird, to ILL, Grenoble, 10-14 February for processing of UK experimental proposals for next ILL selection round.
Dr G A Ringland & Dr F E Close, to Geneva, 21 February - 4 March & 22 February - 2 March respectively, to attend International Conference on Storage Ring Physics at Flaine, France & to hold discussions at CERN.

SALES TO EMPLOYEES

Sales of scrap metal/plastics as set out in RLN 12/73 will be made on 13 and 20 February.

FILM BADGE NOTICE

It is Period 2. Colour strip - BROWN for $\beta\gamma$ films and neutron packs. Please check that you are wearing the current films and that all old ones are returned.

Next film issue - Monday 23 February.

LOCAL SUGGESTIONS AWARDS

At the 16th meeting of the Local Suggestions Awards Committee held on 25 November,

the following awards were approved:-

Mr D Harriott	Admin	R59	£10
Mr W E Jackson	Admin	R56 Stores	£120
Mr B Bruckshaw	Engineering	R18	£10
Mr T Morgan	Engineering	R18	£20
Mr N Martindale			
Mr B G Prior	Engineering	R18	£10
Mr K Waller	Nimrod	R2	£10
Mr J E Watson	Nimrod	R55	£70

LIBRARY NOTICE

The Library have been circulating new journal lists for a choice of

contents pages.

Will eligible staff who have not received the list and would like to receive photocopies of contents pages, please contact the Library, Ext. 384.

RECORD CONCERTS

To avoid confusion the word 'Society' has been dropped. Why not drop in for a few minutes on Tuesday and relax. Anyone with good records willing to loan for a concert can be assured that no harm will come to them - not at a playing weight of 1.25 grams!

For the next two weeks we offer the following:-
Tuesday, 10 February at 12.40 - The Syd Lawrence Orchestra.

Syd has always had an affection for the music of the big band era of the 1930's and 40's. When he found that other musicians felt the same way he decided to form a band that would play that kind of music. This record contains reminders of Glenn Miller, Tommy Dorsey, Bob Crosby and others.
Tuesday, 17 February at 12.40 - Verdi - Rigoletto (highlights). Cornell MacNeil, Joan Sutherland, Renato Cioni with Chorus and Orchestra of the Accademia de Santa Cecilia, Rome.

About those records - why not ring the Editor?

CHRISTIAN FELLOWSHIP

All are welcome to join in a time of Bible Study and

at present we are looking at Paul's letter to the Church at Colosse. The meetings, on Friday 13 and 20 February, commence at 12.30 in the R12 Conference Room.