

# Bulletin

of the Rutherford Appleton Laboratory

3 May 1983 No.7

## European Collaboration for the Modelling of Semiconductors

On the 18th April the European Commission signed a contract to provide half of the costs of a £2 million programme to develop better methods for modelling the behaviour of semiconductors. The 3 year programme brings together industrial and academic expertise from the UK, the Netherlands and the Republic of Ireland. This is a further example of the trend towards large collaborative projects in Information Technology, in which the Laboratory is performing a key coordination role (see also the Project UNIVERSE, *Bulletin* 4, 1983).

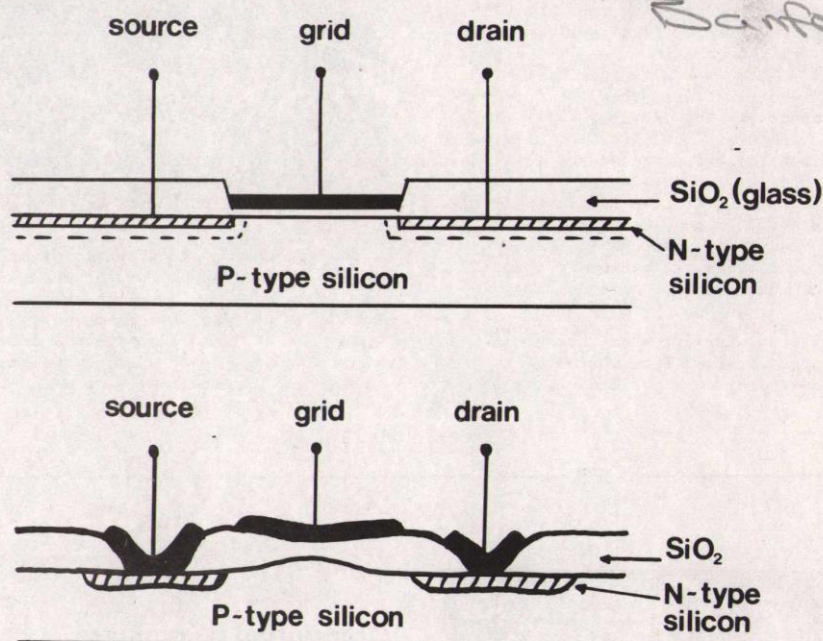
The Prime Contractor for the programme is the Science and Engineering Research Council, working through the Rutherford Appleton Laboratory to provide the Project Management. The other partners are the General Electric Company at its Hirst Research Centre in Wembley, Nederlandse Philips Bedrijven BV in Eindhoven, University College Swansea and Trinity College Dublin.

### Numerical Models

The aim of the programme is to develop robust and efficient numerical models to simulate the detailed physical behaviour of semiconductor devices. These models should be valid for a wide range of problems including metal oxide semiconductor (MOS) and bipolar transistors, and be capable of producing results on a powerful computer in a reasonable time.

A sketch of an idealised device is shown in the figure, together with the cross-section through a typical device. The project aims to apply numerical techniques in 3-dimensions to predict the behaviour of realistic devices. Numerical simulation is the only practical way to improve the performance of existing devices or to design new schemes.

The project presents some formidable numerical problems at the forefront of research. Each partner has an established reputation in the field and will bring a wealth of complementary expertise to bear upon the problems. For example, Philips are specialists



*Sketch of a section through a MOS field-effect transistor. The upper diagram represents an idealised case, whereas a more realistic device is shown below. The simulation of an actual device is rather complex, especially in 3-dimensions.*

in the development of numerical methods in linear algebra, GEC in the application of these methods to real MOS and bipolar devices, Swansea in the development and application of finite element methods, Dublin in the analytical approximation of device behaviour and RAL in the application of 3-dimensional techniques to the development of design software for high technology apparatus.

### Economic Importance

Since the discovery of the transistor in 1948, its application to modern electronics has had a dramatic effect upon industry, commerce and indeed our everyday life. Electronics technology has improved in leaps and bounds.

Today, one can purchase a 6 mm square microchip containing over 100,000 transistors! This rapid evolution has made the electronics industry a major factor in world trade. By the year 1990, the electronics market is expected to grow to £150 billion. Governments in the USA, Japan and Europe have recognised the importance of this industry and are seeking to effect major initiatives in this area.

### A Better Understanding

The development of semiconductor technology has been so rapid that it has not allowed the full exploitation of each technique before it is overtaken by the next. This has led to a

(over)



## Semiconductor Modelling

(continued from p1)

rather incomplete understanding of present-day devices. Optimisation of a device is only possible if the physical effects are fully understood. This is recognised in the Alvey Report which outlines a strategy for a UK programme in Advanced Information Technology. The Report highlights the need for a better understanding of the physical processes involved and numerical models for the performance of sub-micron devices.

The present 3 year programme aims to pool the expertise and resources of industry and the academic sector to increase the understanding and predictive power of the design of semiconductor devices. The numerical models will be based upon Poisson's equation, the two current continuity equations and the temperature equation, incorporating the physical effects relevant at small device dimensions.

The numerical models, together with the results from test problems, will be fully documented. A final report will be forwarded to the Commission for distribution within the European Community. The partners will also provide test facilities for a 12 month period following the end of the contract for the use of interested parties within the EEC. The results will give industrial companies within the EEC an essential advantage in the competitive world market in the design and manufacture of semiconductor devices.

Further information on this programme can be obtained from the Project Manager, Bill Trowbridge.

## This Blessed Plot



Professor John Jeffries, Director of the Institute of Astronomy, Honolulu, addressing the congregation at a ceremony of 'Blessing' held on the site on Mauna Kea, Hawaii where work on the foundations for the RAL designed Millimetre Wave Telescope has now commenced. On his left is Dr Terry Lee, Astronomer in charge of UKIRT who also spoke of his high hopes for the enterprise, and to the right, The Rev. Leon Stirling who conducted the service, asking for a blessing on the facility and those who will build it.

(83RB2243)

## RAL TECHNOLOGY LECTURES

The next lecture in this series will be held on Thursday 5 May at 3.00pm in the Lecture Theatre

TECHNICAL INNOVATION AND THE  
BRITISH ECONOMY  
by  
Professor C Freeman  
University of Sussex

This lecture considers the relationship between a range of scientific and technical activities and competitive international trade performance.

It discusses the reasons for German and Japanese success in world markets over the past 30 years and some of the implications for British policies in relation to technical innovation and design.

FOR YOUR DIARY: The next lecture entitled 'Computer Vision Systems' will be given by Dr J V Kittler, RAL on Thursday 2 June.

## Computing Seminars

This seminar will be held in the Atlas Centre Colloquium on Monday 9 May at 10.15am.

'The SHARE Program  
Library Agency (SPLA)'  
by  
Melinda J Hickman  
Manager, SPLA

The SHARE Program Library is a collection of user-contributed programs. It was created and is administered to promote the exchange of technical information, to lower software development costs, and to help avoid redundant effort. Programs and their documentation are made available at distribution costs. SPLA is operated on a non-profit basis and the Library contains almost 200 different program packages including scientific and mathematical.

In her talk, the manager of the Library will discuss what the Library contains, how to order programs from it, and how to contribute material to it.

## RAL Lectures

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

THE USE OF HUMAN CLONED GENES  
TO STUDY INHERITED DISEASE  
by

Professor R Williamson  
St Mary's Hospital Medical School  
University of London

'Genetic engineering permits the isolation of human genes, and the function of each gene can be identified and studied in a family. Through this approach, it has been possible to clone genes that are responsible for several inherited diseases, and to use these for diagnosis. Recent developments even indicate a possibility of treatment at the gene level. When a total human gene map is available, it may be possible to extend this research to the study of common polygenetic conditions such as coronary heart disease, as well as the large number of single gene defects.'



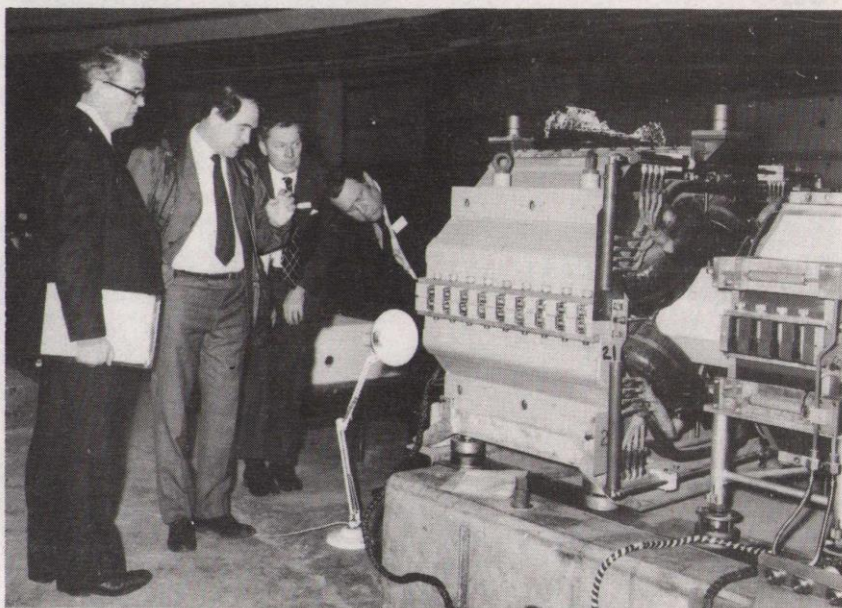
## Parliamentary and Scientific Committee Visit

On Wednesday 18 April, the Laboratory was host to the Parliamentary and Scientific Committee, a body set up, forty years ago, to provide a forum for the exchange of views between the scientific community and Parliamentary members. Visits of this kind are part of the programme of this all-party committee.

The guests, who included Members of Parliament, Peers, industrialists and representatives of professional societies, were welcomed by Dr Geoff Manning and then guided on an extensive (and exhausting) tour of the wide range of research activities in which the Laboratory is involved.

The visitors were shown the Laser facility, the Electron Beam Lithography facility, the IRAS control centre, work in Remote Sensing, the Bubble Chamber scanning facilities, the Megatek facility for analysing events from the proton-antiproton colliding experiment, and the latest developments in computing, including Starlink and the UNIVERSE project.

Speaking at the end of a very full day Dr Manning said that he hoped the visit had provided the Committee with an insight into the work of RAL. The Laboratory has, he explained, two particular attributes; skill and experience in producing successful collaborations with and between universities, and, a dedicated, skilled and enthusiastic staff.



Mr Tam Dalyell, MP (far left), Mr Alan Carne, Dr Trevor Hyman and Mr A B Davey (Rubber and Plastics Research Association) inspecting the RF shield and ceramic vessel in the SNS doublet quadrupole assembly. (83 RB 2375)

Mr Tom Dalyell MP thanked the staff of RAL, on behalf of the Committee, for an interesting and enlightening visit.

A remark made by one of the guests, that though not a physicist, he had

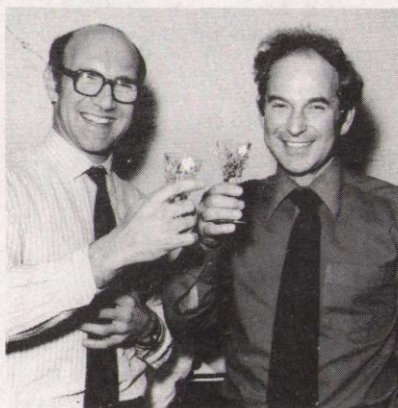
been absolutely fascinated, especially as he had thought that he would be out of his depth, seems to indicate that the demonstrators' aim of making their projects understandable had been achieved.

## Widening His Net

Dr Roland Rosner, Head of the Joint Network Team for the past four years became Head of the Networking and Communication Department of University of London Computer Centre on 11 April. To wish him well in his new job and to thank him for his work (18 years man and boy) at the Laboratory a farewell ceremony was arranged for Friday 8 April, at which Dr Geoff Manning presented him with a set of glasses, a memento from all his friends and colleagues at RAL.

Roland graduated in Mathematics at UCL in 1965 and obtained his PhD in 1970. He formally joined the Lab in 1970, but had spent much of his time previous to that date ostensibly as an experimental physicist working on elastic scattering, but, according to Geoff Manning's humorous over-view of Roland's career, playing with his PDP8.

In 1971 he joined the newly formed data handling group, working on a computer based general graphics facility for studying data from spark chamber experiments and programming computers, large and small, providing a system still widely used in HEP. He was seconded to the Network Unit in 1976, which transformed itself into the Joint Network Team of which he became Head in 1979.



"You have been a good colleague and a good friend and we are sorry to see you go", said Geoff as he presented the farewell gift. "We all wish you the best of luck."

Roland thanked everyone for the gift and for their presence at his send-off. "These have been eventful years", he said, "and it hasn't yet dawned on me that I'm leaving, but the realisation will come over the weekend. Nevertheless, I shall still be part of this community and hope from my new position to build towards a larger academic computing community. See you all when I come back!"

## Library Notice

The Library would like to thank everyone for their donations at the 'Book Disposal'. We raised £47 for charity and cleared space on the Library shelves. Thanks. EM

## Sales to Employees

The sale of scrap metal and plastics will take place (subject to the usual conditions) on 6 and 20 May at the R40 scrap compound from 1200-1230 hrs.

## Crib

A Crib evening is being held on 20 May in R22. There will be both singles and pairs competitions and the entry fee is £1 per head.

Will entrants please send their names and fees to T Morgan, R18 or T Lubbock R2 NOT LATER THAN 13 May.

## '100' Club

The February draw took place in R58 on 6 April, the winning tickets being drawn by Mr P Kent, Atlas Centre. The first prize of £125 (ticket No 19) was won by Mrs Myra Gilbert, R1 and the second prize of £25 by Mr Tudor Morgan, R18 (ticket No 49).



# Indoor Sports Day 1983

About 90 players, officials and spectators from RAL made the trek to the splendid sports centre at Aston Villa, Birmingham on Friday 15 April, to pit their skills against the best from the other SERC establishments. This was the second year that the Rutherford Appleton RecSoc had organised the event and the day ran very smoothly.

## Badminton

Once again the doubles were dominated by the Rutherford pair of Roger Wolfenden and Dave Wooton. After winning all their matches to the final, they were given a very hard match by Richard Lawrence and Alan Stevens; Roger and Dave just getting home in a thrilling finish. (Perhaps the legs are slowing up).

In the mixed doubles, the events was, as always, dominated by Kay Knight who partnered for the third time by Tony Short made it a hat-trick! They beat Jimmy Chauhan and Helen Dorsett in another good final.

## Bridge

A game played in another world; the players moving from table to table with very serious looks on their faces (I'm sure its not that serious). With calls like 'No Bid' and 'Two Spades' ringing around the room, the matches progressed throughout the afternoon. Barry Martin and Gordon Rowe from Central Office emerged the winners, with Hari Shah and Jim Hall (Appleton) joint runners-up.

## Crib

Another card game with its own language "fifteen for two", "thirty one for two" etc, but played in a different atmosphere from Bridge. It seemed much more relaxed and players actually smiled and talked to one another. After all the dust had settled Steve Hancock and Steve Stoneham finally won the event, losing only one match all day.

## Darts

This, another event that Rutherford seem to think their own - so far winning every year. This year was no different, the team of Ian Forster, Duncan Robertson, Del Forsyth, Ricky



Kay Knight and Tony Short collect the Badminton Cup for the third time in a row, from Mr Brian Oakley.

Mills and Steve Wooldridge, winning in great style.

## Squash

A very energetic sport. All the players had four games of five sets each during the afternoon, at the end of which, we had some very tired contestants.

With the Rutherford 'A' and Daresbury 'A' teams expected to meet in the final, the Rutherford 'B' team of Bob McClure, John Mogford and Ruth Jeans sprang a surprise, by beating 'Daresbury A', setting themselves up with a match in the final against the 'A' team. The 'A' team proved to be the stronger and Jenny Coates, Will Johnson and Malc Edwards ran out easy winners.

## Table Tennis

This was another very close competition, spoilt for us by the fact that the very strong Atlas team had to play one short all day - due to illness in the family, the other member could not play.

Peter Kent and Tim Pett found the handicap too much for them, but even so reached the semi-final before being defeated. In a very close final RGO just edged out Daresbury to win.

## Volley Ball

Somehow, this one always eludes us, and this year's game proved another tale of woe. Again some of our team members didn't arrive and two of our spectators agreed to play. Our thanks to Francesca Chinzvende and Jahangir Iqbal for playing and putting up such a good show. The event was won by Daresbury.

Special thanks are due to the organisers of the day, for the hard work they put in to enable the proceeding to run smoothly, and to Mr Brian Oakley, Secretary SERC, for kindly agreeing to present the trophies to the winning competitors.

## Cricket Club AGM

The AGM will be held on 5 May in R20 Conference Room at 12.30 pm. Anyone interested in playing this year is invited to come along.

Net practice on DRY Tuesday evenings from 5.30 pm has now commenced.

Further details available from R G Jones, R3.

# Bulletin

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Deadline for insertions:



# INTERNAL Events

## HEP SEMINARS

R61 CONF RM - 1100 hrs

- 11 May Dr J G McEwen/Southampton  
'Experimental Estimation of the Gluon Structure Function on the Pion from  $J/\psi$  Production'
- 18 May Prof T Kibble/Imperial  
'Monopoles and Strings in the Early Universe'
- 25 May Dr Chan Hong-Mo/RAL  
'Loop Space Formulation of Gauge Theories'

## CONDENSED MATTER SEMINARS

R3 CONF RM - 1330 hrs

- 3 May R J Elliott/Oxford  
'Diffusion in Partly-Blocked Lattices'
- 10 May W B Yelon/Missouri  
'Improved Treatment of Extinction in Polarised Neutron Scattering: Silk Purses from Sows' Ears'
- 17 May R C Ward/RAL  
'Phase Transition in Molecular Crystals'
- 24 May H Fuess/Frankfurt  
'Neutron Scattering from Minerals'

## NIMROD LECTURES

R61 CONF RM - 1400 hrs

- 9 May Dr J-M Richard/P&M Curie, Paris  
'N-N Oscillation in Nuclei'
- 16 May Prof H Steiner/Berkeley & CERN  
'A Precision Measurement of the  $\xi$  Parameter in the  $\mu^+$  decay: a Search for the Effects of Right-handed Current in the WI'
- 23 May Prof J K Walker/Fermilab  
'New Results on Neutrino Reactions at Fermilab.'

# EXTERNAL Events

## PHYSICS COLLOQUIA

CLARENDON LAB - OXFORD - 1615 hrs

- 13 May Prof J T Devreese/Antwerp  
'Recent Developments in the Physics of Polarons'
- 20 May Prof J D Dowell/Birmingham  
'The Search for the Weak Intermediate Boson'
- 27 May 'Cherwell-Simon Lecture' in the Zoology Building at 4.30pm by  
Steven Weinberg, Nobel Laureate  
'New Directions in Elementary Particle Theory'

## SHEP SEMINARS

SOUTHAMPTON - 1400 hrs

- 11 May J Fröhlich/Zurich  
(Title to be announced)
- 20 May R Cashmore/Oxford  
'Experiments in  $e^+e^-$  Physics'

## SERC/NERC - TALKS & FILMS

POLARIS HOUSE, SWINDON

- 3 May Sir Hermann Bondi  
1200hrs "Special Relativities"

## TPD SEMINARS

LECTURE RM, BLDG 424.2 - HARWELL - 1400 hrs

- 10 May Dr C T J Dodson/Lancaster  
'Space-time Edge Geometry'
- 17 May Prof G H C New/Imperial  
'Problems in the Theory of Ultrashort Pulse Generation'
- 24 May Dr J D F Ramsay/Harwell  
'Formation and Properties of Oxide Colloids'

## A Funny Thing ---

We have had an inquiry for "anecdotes and bits of humour which give insight into research and changing views of science", to be published in an anthology of "science with a smile".

Would any of our readers care to supply subtle scientific snippets- which are printable?

If so, please send your manuscript to, the Editor RAL "Bulletin".

## Thanks

Special thanks to everyone who contributed towards our lovely wedding presents. For those of you who missed the presentation, there was a super set of saucepans, an elegant carriage clock, a smart wall clock, a nice food mincer, some sharp shears specially for the garden, a wine rack and, last but not least, a bottle of wine to start off the collection. The huge card with many, many signatures was a lovely surprise. We're both thrilled to bits with everything. Thanks again to one and all."

Sue Palmer (née Howard)

## Christian Fellowship

Meetings take place on Thursdays in R2 Conference Room (4th Floor) at 12.30pm. All are very welcome.

### MAY PROGRAMME

- 5 May Prayer Meeting  
Jimmy Darius
- 12 May 'Strike a Light'  
A Christian Aid film to be held in the Lecture Theatre
- 19 May Bible Study  
Chris Biddlecombe
- 26 May Visiting Speaker - Colin Bowker  
from Mozambique  
Adrian Cole