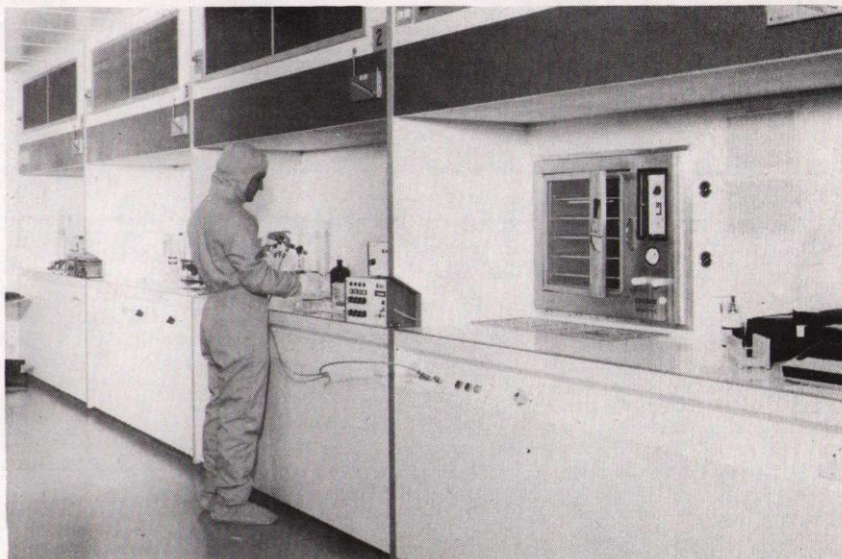


## EBLF News

Some technical details of the Electron Beam Lithography Facility (EBLF) were given in Bulletin No 6 3-17 April 1978. We thank Ron Lawes for the latest news of progress in setting up the EBLF over the past year.

The overall design of the EBLF was completed late in 1977, essential equipment was ordered and attention devoted to the conversion of part of the former central computer wing of building R1 into a suitable clean area. A joint team from the EBL Group and the Mechanical and Electrical Services Group, under Roy Tolcher, worked during the early part of 1978 to bring an area of over 300 square metres up to Class 100 conditions of cleanliness (about 200 times as clean as the average computer room!) The building work was completed by June 1978 and an immediate start made to installing the equipment. With relatively few set backs the equipment was ready for experimental use by the end of the summer and in November 1978 a significant point was reached when access to the Facility was limited to key personnel in full protective clothing.



Jeff Bizzell of the EBLF Group preparing a mask plate for spin coating with electron resist. Note the necessity for personnel protective clothing to prevent contamination of the workpiece. Clean filtered air flows down from the roof of the cabinets and across the worktops giving extremely clean conditions.

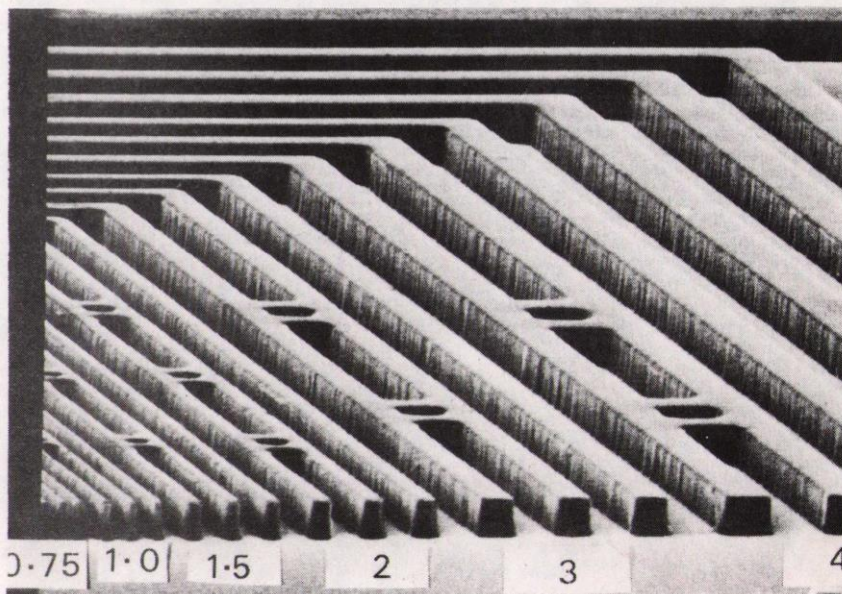
### Mask making experience

Unfortunately it became clear during the later part of the year that the electron beam pattern generator itself was going to be delivered many months later than promised, due to production difficulties. In order to gain experience with the various technologies involved in mask making, a programme of work was started to reproduce mask patterns generated at another research organisation. By using deep ultra-violet illumination ( $\lambda = 200\text{nm}$ ) in a special contact printer, it was possible to demonstrate the complete mask making process and to reproduce patterns with linewidths down to 1 micron. Thus familiarisation was gained with electron beam resist preparation, exposed pattern development and ion beam etching of chrome patterns.

### Software designed

While the construction and commissioning work was in hand, progress was made in providing the essential computer-aided design software. Members of Computing Applications Group under Bill Trowbridge insured that versions of the commercial integrated design

(continued on Page 3)



A scanning electron microscope photograph of a test pattern contact printed using deep ultra violet light and electron beam resist. The pattern is shown after exposure and development, but before etching. Dimensions shown are in microns. The photograph was taken with the S-150 in routine use at the EBLF.



# INTERNAL Events

## RUTHERFORD LABORATORY LECTURES LECTURE THEATRE - 1515 hrs.

17 April: Dr B J Mason/Director-General of the Meteorological Office.  
"The Atmospheres of the Planets".

## COMPUTING SEMINARS

COLLOQUIUM R27 - 1400 hrs.

24 April: Prof B Randell/Newcastle  
"The History of Computing"

## EASTER SERVICE

LECTURE THEATRE - 1240 hrs.

10 April: Rev Brian John

## HEP SEMINARS

CONF.RM. R61 - 1100 hrs

11 April: G T Jones/Birmingham  
"Partial Wave Analysis of the Diffractively Produced  $K\pi\pi$  system".

25 April: R G Roberts/RL  
"QCD Analysis of Moments of Structure Functions in Electron and Muon Experiments".

## NIMROD LECTURE SERIES

LECTURE THEATRE - 1130 hrs.

9 April: Dr Bob Jaffe/Oxford & MIT  
"Confined Quarks"

18 April: Prof G F Chew/CERN & Berkeley  
"Boot Strap Theory of Colour and Flavour"

NOTE: THIS LECTURE IS ON WEDNESDAY AT 1100 hrs.

23 April: Dr B Duff/U.C.L.  
"Constituent Models and New Results in Large Angle Elastic Scattering"

## OVERSEAS Visits

P M Sharp to CERN from 9-12 April and 16-19 April to work on NA11.  
J R Maidment to CERN 9-11 April for discussions on LEP study collaboration.

W Cameron to the USA from 17 April - 20 May to attend Washington APS meeting and to give seminars at Brookhaven, Argonne and SLAC.

C M Fisher to CERN from 18 April - 1 May to attend users meeting and set up NA13.

J Hutton to CERN from 22-28 April to attend e-Y group meeting.

D Clarke to DESY 26 April-4 May to work on JADE experiment.

J A Blissett and B T Payne to DESY from 29 April - 4 May for installation of TASSO experiment.

From 1 April 1979 the forms for "Overseas Visits" have a new format. The system is being computerised! The new application forms should be available from Secretaries and DAO's. Travel Section would be truly grateful if all Divisions would use them.

## Film Badge Notice

It is Period 4. Colour strip PURPLE. Please check that you are wearing the correct film and all old ones are returned.

Next Film Change - Monday, 23 April.

## EXTERNAL Events

### THEORY GROUP SEMINARS

CONF RM3 DARESBURY - 1400 hrs

9 April: Dr M K Pal/Oxford  
"Some Aspects of Time - Dependent Hartree-Fock Theory"

12 April: Dr P J Kunz/HMI Berlin  
"Classical Trajectories and Ion-molecule Reactions"

### ELEM PART PHYS SEMINARS

WESTFIELD COLL LONDON - 1400 hrs

19 April: Prof G F Chew/CERN & Berkeley  
"Boot Strap Theory of Colour and Flavour"

# Digital design

The recent article on the use of microprocessors in the Laboratory (see Bulletin no. 5 12 March 1979) typifies the way in which this device and similar integrated digital systems are being taken up by a variety of users to solve problems in data capture, control, special purpose arithmetic and so on. The explosive growth in this technology is fuelled by continuing research and development into new devices and techniques.

## Major facility

Active research and development continues in British university and polytechnic departments, much of it funded by SRC. A major facility for this work, the Electron Beam Lithography Facility has been set up at the Rutherford Laboratory to produce the tiny "masks" which are central to "chip" fabrication. These chips are produced by an intricate combination of diffusion, etching metallisation and, sometimes, ion implantation. Most of these processes

use photographic techniques often beyond the resolution of visible light, the "masks" being the master patterns.

## Computer-aided

Current integrated circuits can contain as much circuitry as occupied a couple of racks the size of a 4-drawer filing cabinet only five years ago. Consequently the amount of design 'effort' necessary to produce a new integrated circuit can be comparable to that required to produce a small minicomputer. To complete such a design within today's timescales requires considerable help from the computer and computer-aided design techniques are essential to providing a realistic Digital Systems Design facility.

The Applications Group of SRC's Interactive Computing Facility (ICF) has recently begun to assemble and develop the computer programs needed to provide SRC grant-holders and

others with up-to-date computer-aided design (CAD) tools for effective digital design. This will involve high level specification languages, libraries of devices and materials, simulators and testing algorithms, as well as programmes for printed circuit board conductor routing and wire wrapping. Extensive easy-to-use software "packages" will cushion the users from the peculiarities of the many machines on the Interactive Computing Facility and from the IBM 360/195s which are an important background resource.

## Ambitious project

This large, ambitious project is in keeping with the decision to put the UK amongst the runners in large scale integration (LSI) and very large scale integration (VLSI) technology in the 1980s.

(We thank Peter Dewar for the information contained in this article.)



## EBLF (continued from Page 1)

package GAELIC were available at both the Edinburgh DEC10 and Rutherford PRIME 400 of the Interactive Computing Facility (ICF) and wrote the necessary interface software to convert the data to a form suitable for the pattern generator. At present the EBLF Group is finishing the necessary computer linking software so that integrated circuit design files generated by users of the ICF throughout the UK can be transmitted directly to an EBLF computer.

### Pattern generator arrives

Construction and commissioning of the Electron Beam Lithography Facility, excluding the electron beam pattern generator was completed on schedule in January 1979. The pattern generator itself was delivered to the Rutherford Laboratory on 27 March 1979. Assembly and acceptance testing will take some time, but it is hoped to start production work for university research workers in the summer.



Parts of the electron beam pattern generator being transported into the EBLF clean room.

## Mirror Mirror-----

Friday 6 April saw the final shipment of spherical mirrors to CERN for a large Cerenkov counter array. A total of eighteen counters covering an area of 5m x 10m will be installed in the Intersecting Storage Rings in April and May as part of the Rutherford Laboratory's contribution to experiment R807. This experiment is designed to study jets of very large transverse momentum particles coming from proton-proton collisions at the highest energy currently available, hence its local nickname "ISR-JET". These Cerenkov counters will be used in conjunction with other devices to identify pions, kaons and protons over a large solid angle (1 steradian). The Rutherford Laboratory is also constructing six large proportional chambers for the experiment.



The photograph shows - Phil Griffiths of Physics Apparatus Group, Norman McCubbin RL (who really does have two heads!) a couple of technicians from the ISR division experimental support team, and Dave Fleet, RL; all engaged in the assembly, at CERN, of one of the Cerenkov modules. (Photo: CERN)

## Rutherford Laboratory Lecture

This month's distinguished speaker will be Dr B J Mason, Director-General of the Meteorological Office, whose subject will be 'The Atmospheres of the Planets'. He will describe recent advances in our knowledge of the atmospheres of Venus, Mars and Jupiter based on information from orbiting and landing space vehicles.

This is a return visit of Dr Mason. Many readers will remember his outstanding lecture on "Weather Forecasting in the Satellite and Computer Age" just over ten years ago. This lecture promises to be another such spell-binder.

## Introducing IRAS

The infra-red-astronomy satellite is an international project involving the Netherlands, USA and the UK, the UK part being the responsibility of the Science Research Council.

Work was already in progress at the Appleton Laboratory when the decision was taken to locate the Satellite Ground Control Station at the Rutherford Laboratory. Plans were then made to install the main control room with its computers in RL and a twelve metre diameter antenna in the

south-east corner of the site with a small local control room in R58. An ICL 2960 computer is now on site and being installed and work has also started on the preparation of an access to the site from the feeder road to the Blue Car Park and on the excavation of trenches for the cable ducts between the antenna site and Building RL.

A more detailed account of the Satellite and the Ground Station will appear in a later issue.



## Rec Soc News

The ANNUAL GENERAL MEETING of the Recreational Society will take place in the LECTURE THEATRE on WEDNESDAY 25 APRIL at 1240 hrs. All members are asked to make every effort to attend.

## Chess

In the Chess Tournament the latest position after 7 rounds is that Peter Hemmings is now the clear leader with 7 points. Roy Culliford has dropped into second place with 6 points and Peter Craske third with 5 points. With two rounds to go it is still a battle between Peter Hemmings and Roy Culliford for the Title.

## Netball

The turn-out for the netball team has been very successful, so much so that we are now able to enter two teams in the SRC Sports day Tournament. We are still hoping for many more ladies who are interested in joining us. If you are interested please contact Sue Gill, Ext 495, or Sue Underdown, Ext 443.

The training sessions take place at Tuesday lunchtimes from 1200-1300 hrs outside R20.

## Christian Fellowship

The next meetings will take place at 12.30 pm in the R2 Conference Room.

11 April: What is the evidence for the death and resurrection of Jesus Christ? Do Christians believe in something which is absolute truth, or are these events only legend and fable? As a follow-up to the Easter Service the Rev Brian John will speak of his experiences and faith in these matters which no-one can really ignore. All are welcome to come along.

19 April: Psychiatrists tell us that one of the problems many people face is 'loneliness' even though they may be surrounded by friends and family. What is 'loneliness' and how can we cope with it? Chris Biddlecombe will lead a study and discussion on this subject.

## Easter Outing

With the weather at last beginning to brighten it maybe that you are casting around for a family outing of interest to everyone.

Manor Farm Museum, Cogges near Witney, is a place that could easily fit the bill.

### Cogges Manor Farm Museum

In the traditional farm buildings of mellow Cotswold stone, with roofs of slate and thatch are displays following the farming season. Waggon, other horse-drawn implements, and a selection of tools show how the farmer worked and raised livestock a century ago.

### Its History

A settlement was recorded here in the Domesday Book, and a village grew up farming the fields around the moated manor of Wadard, one of William the Conqueror's Knights. Later there was a priory, with fishponds and a mill, and a medieval manor house. Visitors can follow an historical trail which marks the moated manor, field systems, fishponds and deserted village earthworks. Remains of the priory and its tithe barn can be seen in the nearby school and vicarage, with the parish church next to the medieval manor house.

The farmhouse kitchen and back kitchen, open for the first time in 1979, were the medieval hall and service wing of the 13th Century Manor House. The dairy is 16th Century. The Manor House was altered and extended in the next 4 centuries and is now restored as it was in Edwardian times. There will be live demonstrations showing some domestic activities of 75 years ago, such as bread making using a bread oven, boiling laundry in a copper, and cooking on an open range, and butter-making in the nearby dairy.

### Visitors Centre

A snack bar serving lunches and teas, gift shop and bookstall are near the entrance to the Farm Museum. Picnics are welcome in the orchard.

### Riverside Walks

The meadows and commons alongside the River Windrush provide pleasant walks and several wildlife habitats for nature study.

The Museum is just off the B4022, and parking is available on site, or in Witney Market Place, which is within easy walking distance.

Open from 14 April 11.00 - 6.00 daily at 40p for adults and 20p children it's good value for money.

## Rutherford Wives

The April Coffee Morning at the Cosener's House will be on Tuesday 10 April between 10.30 a.m. and 12 noon. This is during the school holidays and, as usual, young children are welcome.

The dates for future coffee mornings are:

Thursday 10 May  
Tuesday 12 June  
Wednesday 11 July

For further information please contact Gillian Litt (Abingdon 26009) or Dorothy Gibson (Abingdon 25250)

## Lunchtime Music

Wed. 11 April at 12.30  
Lecture Theatre.

TANGERINE DREAM - 'STRATOSFEAR'

This week we have a progressive instrumental group. We've not been able to find out much about Tangerine Dream (they seem to want to keep their identity secret) except that they have made five or six albums - all with equally mysterious titles. In fact we should welcome a bit of background information if anyone knows them.

We were trying out a few albums of various groups and 'STRATOSFEAR' was just one of them, but it stood out so much from the rest, we just had to choose it in spite of knowing nothing about the group. It is difficult to categorise them, they simply make very interesting sounds. Anyway come and hear for yourselves.

## Lunchtime Films

The showings take place in the Lecture Theatre, starting at 12.35 hrs and all are welcome - it's free too!

18 April: 'IMAGES'

An imaginative and creative impression of the many uses of photography.

'LASER FUSION'

A film made by the Los Alamos Scientific Laboratory.



RUTHERFORD LABORATORY

# BULLETIN

Deadline for Insertions

1000 hrs - Tuesday 17 April

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