# SUMMER VACATION STUDENTSHIPS

*United Kingdom Atomic Energy Authority*

## HARWELL AND CULHAM

1965

# Summer Vacation Studentships

The Research Group of the U.K.A.E.A. is offering Vacation Studentships, tenable in the summer of 1965, to students who would like to supplement their studies with first-hand experience of the objectives and methods of scientific research or engineering work in a large research organization.

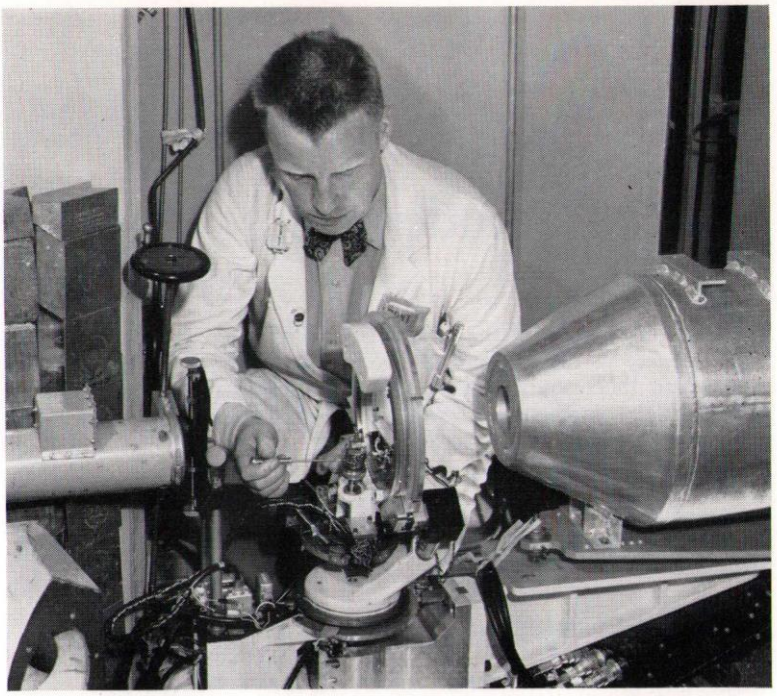
Studentships will be available at the Group's establishments at Harwell, Culham and Wantage, all of which are in Berkshire, and the fields of work in which experience can be obtained are:—

CHEMICAL ENGINEERING
CHEMISTRY
ELECTRICAL ENGINEERING
ELECTRONICS
HEALTH PHYSICS
ISOTOPE RESEARCH (WANTAGE)
MATHEMATICS
MECHANICAL ENGINEERING
METALLURGY
NUCLEAR PHYSICS
PLASMA PHYSICS AND FUSION RESEARCH (CULHAM)
SOLID STATE PHYSICS
THEORETICAL PHYSICS

(Isotope research includes some work in biology and zoology, and there will be a small number of places available in these fields.)

Studentships are open to undergraduates who, in the autumn of 1965, will be entering the final year of their university course. The Studentships will last for eight weeks, and as far as possible students will be allowed to decide their own starting dates. Week-ends and August Bank Holiday will be free for leisure activities.

Most of a student's time will be spent assisting in a particular research programme or engineering project under the guidance of a tutor who will be an experienced research scientist or engineer. In most weeks, one full day will be spent attending lectures or being shown different aspects of the work of the Group. Students will be encouraged to make use of the extensive facilities of the Harwell and Culham libraries; in the Harwell main library, which is one of the major scientific libraries in the United Kingdom, there are now some 30,000 volumes including sets of most scientific and technical periodicals.



*An automatic neutron diffractometer for neutron scattering experiments designed to study the positions of atoms in compounds of heavy elements.*

*A view showing movable "glove boxes" in the plutonium handling laboratory of the main radiochemistry building at A.E.R.E., Harwell.*

# Organisation of the U.K.A.E.A. and the Research Group

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

*Chairman:* Sir William Penney, K.B.E., F.R.S.

*Deputy Chairman:* Sir Alan Hitchman, K.C.B.

ENGINEERING GROUP | PRODUCTION GROUP | REACTOR GROUP | RESEARCH GROUP | WEAPONS GROUP | HEALTH AND SAFETY BRANCH | LONDON OFFICE

## A.E.R.E. HARWELL AND OUTSTATIONS

*Director:* Dr. R. Spence, C.B., F.R.S.
*Assistant Directors:* Mr. R. F. Jackson
Dr. P. Murray

—ANALYTICAL CHEMISTRY BRANCH:
*Head,* Mr. A. A. Smales, O.B.E.

—APPLIED PHYSICS GROUP:
Mr. P. D. Dunn

—CHEMICAL ENGINEERING DIVISION:
Mr. A. S. White

—CHEMISTRY DIVISION:
Dr. W. Wild

—ELECTRONICS DIVISION:
Mr. E. H. Cooke-Yarborough

—ENGINEERING DIVISION:
Mr. R. F. Jackson

—GENERAL SECRETARIAT:
Mr. T. B. Le Cren

—HEALTH PHYSICS AND MEDICAL DIVISION:
Mr. N. G. Stewart

—ISOTOPE RESEARCH DIVISION (Wantage Research Laboratory):
Mr. B. S. Smith

—METALLURGY DIVISION:
Dr. P. Murray

—NUCLEAR PHYSICS DIVISION:
Dr. E. Bretscher

—RESEARCH REACTORS DIVISION:
Mr. W. F. Wood

—SOLID STATE PHYSICS DIVISION:
Dr. W. M. Lomer

—THEORETICAL PHYSICS DIVISION:
Dr. W. C. Marshall

## CULHAM LABORATORY

*Director:* Dr. J. B. Adams, C.M.G., F.R.S.

—ELECTRONICS DIVISION:
*Head,* Mr. A. B. Gillespie

—ENGINEERING DESIGN DIVISION:
Mr. D. L. Smart

—EXPERIMENTAL DIVISION A:
Dr. R. S. Pease

—EXPERIMENTAL DIVISION B:
Dr. P. C. Thonemann

—SECRETARIAT:
Mr. D. R. Willson, M.B.E.

—SITE SERVICES DIVISION:
Mr. J. T. D. Mitchell

—SPECTROSCOPY DIVISION:
Dr. R. Wilson

—TECHNOLOGY DIVISION:
Mr. R. Carruthers

—THEORY DIVISION:
Dr. J. B. Taylor

# The Research Group and its relationship to the U.K.A.E.A.

The United Kingdom Atomic Energy Authority was formed by Act of Parliament in 1954 and is responsible for establishing practical methods of using the energy which is released in either the fission of heavy atomic nuclei or the fusion of light nuclei and of using the radioactive materials made available by such processes. To carry out this task it has developed an organisation employing some 36,000 people, in which most of the work is divided among five Groups as shown in the table on page 3.

One of these is the Research Group, which employs almost 7,000 people and has two main establishments. The larger of these is the Atomic Energy Research Establishment, with headquarters at Harwell, which carries out a wide range of research, associated mainly with the quest for the most advantageous and economic methods of harnessing nuclear energy to the generation of electrical power. Some of this is directly linked with the development of particular reactor systems and associated plant, but a good deal of it is long-term, basic research in the many branches of science involved in the study of nuclear energy. Closely linked with Harwell is the Wantage Research Laboratory, which is responsible for developing research, analytical and production techniques using radiation or radioisotopes.

The Group's other main establishment is the Culham Laboratory, at which the Authority is concentrating its plasma physics and fusion research with the ultimate objective of controlling and using the power released in thermonuclear reactions.

The work of the Group is divided, largely according to discipline, between several Divisions as shown in the table on page 3; the Divisions are in many respects similar to university departments and come under the academic and administrative leadership of a Division Head, whose status is comparable to that of a professor.

# Outline of the main fields of research within the Research Group

**Applied Physics**

Research into problems connected with the direct conversion of heat in nuclear reactors to electricity by such methods as thermionic emission.

**Chemical Engineering**

Research into chemical engineering operations including gas-solid fluidisation, heat transfer in a reactor by helium and the effect of impurities, graphite manufacture and heat transfer processes in steam-water mixtures. Research into such processes as the conversion of acid solutions of radioactive materials into glass for waste disposal.

**Chemistry**

Research in reactor chemistry (e.g. corrosion studies), radiochemistry (e.g. fission product diffusion), solid state chemistry (e.g. X-ray crystallography), spectroscopy (e.g. atomic spectra of actinide elements), analytical chemistry, and physical chemical fields connected with ceramic and cermet materials. Radiation studies of reactor materials (e.g. $CO_2$—graphite reaction).

**Electronics**

Research into the application of new electronic techniques or processes to nuclear energy research (e.g. the uses of semi-conductors and of ferrites in storage circuits). Basic design and development of specialised equipment (e.g. for high speed counting) and of improved particle detectors.

**Health Physics**

Research which is necessary for the assessment of health hazards arising from the use of radioactive materials.

**Isotope Research**

Research into the problems involved in the various industrial, medical and agricultural applications of radiation and radioisotopes, which may range from small tracer experiments to large scale sterilisation plants.

**Metallurgy**

Basic and applied research into the structure and properties of materials used in reactors for structural purposes or as fuels, moderators or canning materials, considering especially the effects on them of irradiation: particular attention is given to ceramic and cermet fuels as well as metal fuels.

**Nuclear Physics**

Basic research into nuclear structure and processes. Measurement, using time of flight methods, of nuclear cross-sections and other data needed for reactor calculations. (Experimental equipment includes a 170 MeV synchrocyclotron, a 12 MV tandem electrostatic accelerator, a 3 MV pulsed Van de Graaff generator, a high intensity pulsed neutron source driven by an electron linear accelerator, and fast neutron choppers used with reactors.)

**Physics of Research Reactors**

Determination and assessment of data needed in the operation and use of research reactors and in the design of new types of research reactor.

**Plasma Physics and Fusion Research**

Experimental and theoretical studies of the nature and behaviour of plasma and of methods of containing it by magnetic fields for long enough and at high enough temperatures and particle densities for thermonuclear fusion to produce a net gain in energy.

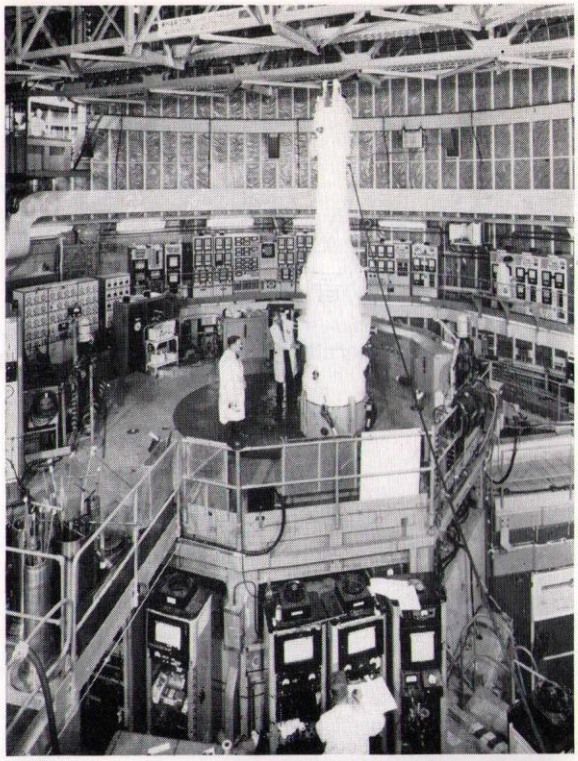
Apart from the major containment experiments, the programme includes substantial basic research into the plasma state (including studies on natural plasmas) and research into the associated technological problems.

**Solid State Physics**

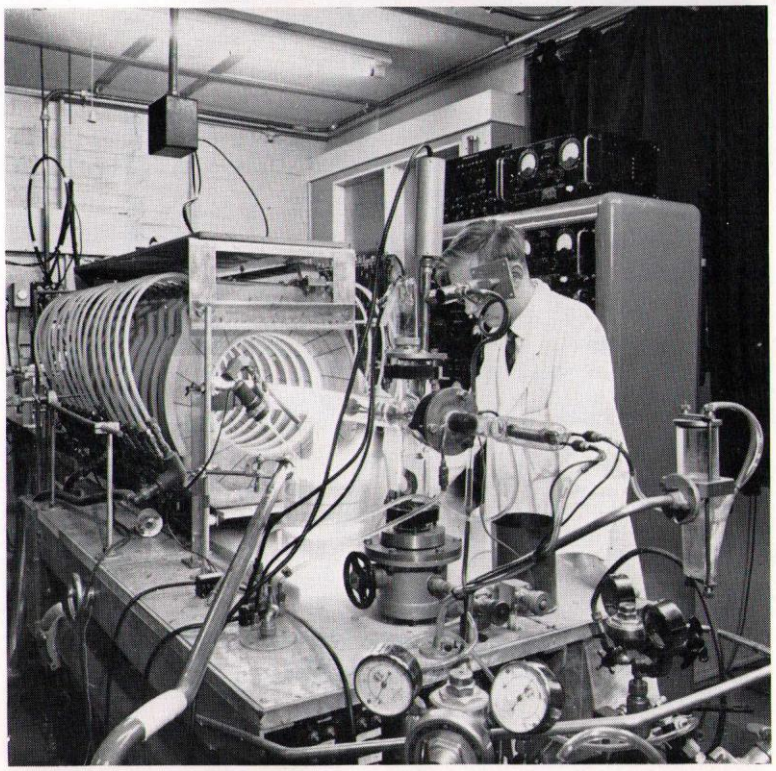
Basic research, making particular use of reactors, into the structure of solids and their behaviour under all kinds of physical conditions, including irradiation by energetic particles.

**Theoretical Physics**

Research, which is closely related to the experimental work of the Group, into the theoretical aspects of nuclear, solid state and radiation damage problems.



*An interior view of the Dido reactor at A.E.R.E., Harwell, showing experimental equipment and, in place on top of the reactor, the lead flask used for removing irradiated materials.*



*The Culham Laboratory—wave motion studies in a plasma column.*

## Accommodation, Allowances and Transport

Students will normally be placed in approved undergraduate lodgings in Oxford and will receive the cost of bed and breakfast plus a weekly allowance of £4 15s. 0d. They will also be paid the cost of the second class rail fare to and from their Establishment at the beginning and end of the course, and they will be allowed to travel, without charge, on the daily transport services run by the Authority.

## Applications

Those wishing to be considered for studentships should obtain application forms from their University Appointments Offices or write to:—

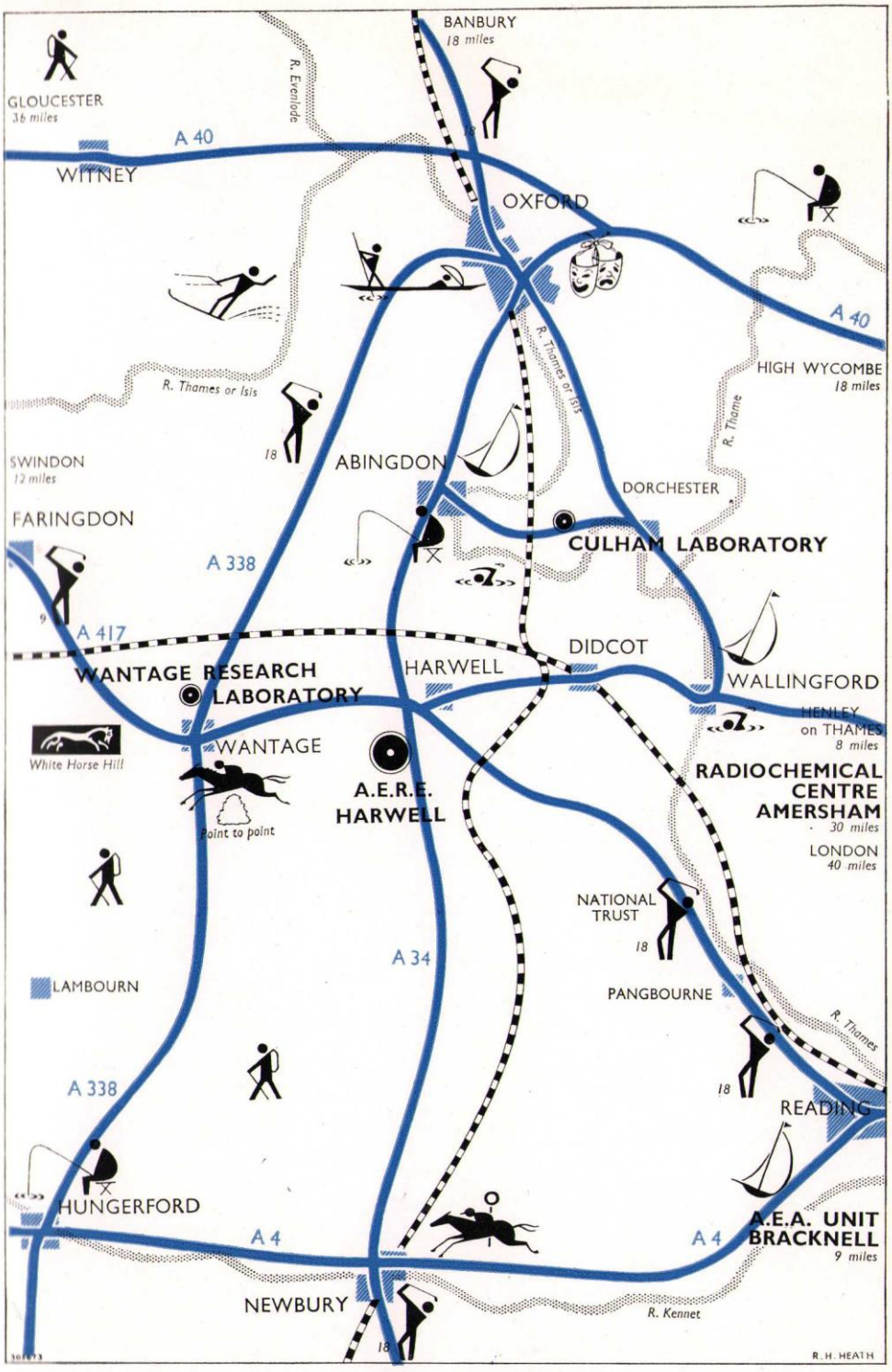
Appointments Section 'A',
A.E.R.E. Harwell,
Didcot,
Berks.

or

Personnel Branch,
Culham Laboratory,
Culham,
Abingdon,
Berks.

So that students can be told the results of their applications as soon as possible, all applications must be received by DECEMBER 31st.

*Printed in Great Britain by The Berkshire Printing Co. Ltd., Reading*


BANBURY
18 miles
GLOUCESTER
36 miles
R. Evenlode
A 40
WITNEY
OXFORD
A 40
HIGH WYCOMBE
18 miles
R. Thames or Isis
R. Thame
SWINDON
12 miles
ABINGDON
DORCHESTER
FARINGDON
CULHAM LABORATORY
A 338
A 417
DIDCOT
WANTAGE RESEARCH
LABORATORY
HARWELL
WALLINGFORD
HENLEY
on THAMES
8 miles
White Horse Hill
WANTAGE
Point to point
A.E.R.E.
HARWELL
RADIOCHEMICAL
CENTRE
AMERSHAM
30 miles
LONDON
40 miles
NATIONAL
TRUST
A 34
LAMBOURN
PANGBOURNE
R. Thames
A 338
READING
HUNGERFORD
A 4
A 4
A.E.A. UNIT
BRACKNELL
9 miles
NEWBURY
R. Kennet
R. H. HEATH