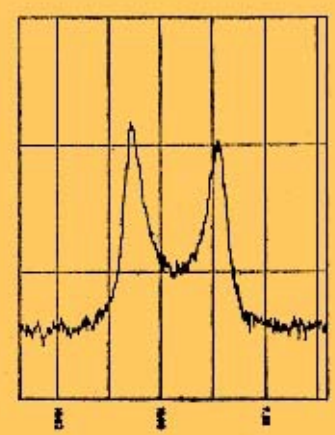
PHYSICS



QUEEN MARY COLLEGE

University of London

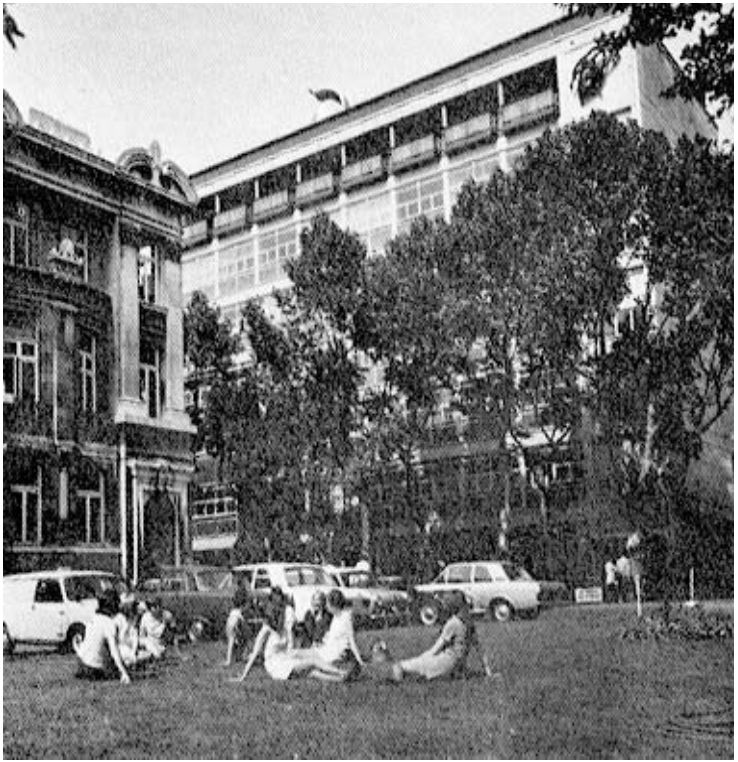
September 1969

this booklet describes

undergraduate teaching—the new degree structure.

research.

activities of interest to schools.



A view of part of the new
Physics Department

The New Degree Scheme

Three years ago students coming to this department started working to a new degree structure. Recently these students have graduated from the College and are generally enthusiastic about the scheme. They liked the versatility of the degree: they liked being able to decide which courses to take, and above all they liked a system which examines each course separately for in this way they were able to assess their progress throughout their three years work.

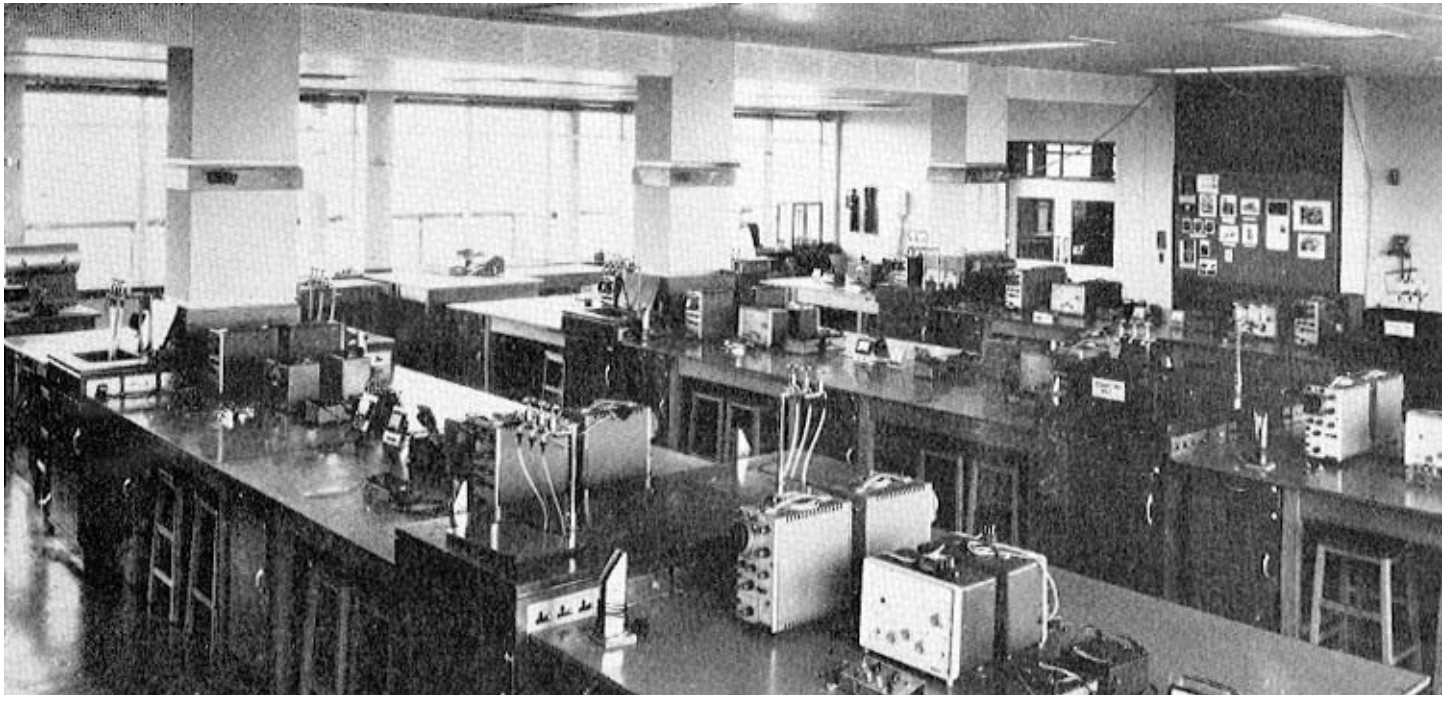
In awarding honours individual records of all course gradings are used. Four course units per year are normally taken but a degree can be obtained with passes in eight units. With advice from the staff the student decides which courses to take bearing in mind the need for a coherent pattern of study. Most courses are half course units so that eight are normally taken each year: the table shows courses given by the Physics Department.

First Year Courses
Mechanics:
Optics & Wave Motion:
Electrical Circuits & Electronics:
Spirit of Physics.

Second Year Courses
Atomic and Molecular Spectra:
Electromagnetism: Electromagnetic Theory:
Thermodynamics & Statistical Physics:
Physics of Matter: Atomic Physics:
Computer Applications in Science:
Nuclear & Elementary Particle Physics:
Quantum Mechanics.

Third Year Courses
Methods of Theoretical Physics:
Quantum Mechanics: Statistical Physics:
Group theory in Spectroscopy:
Nuclear Structure: Elementary Particles:
Astrophysics: Crystal Physics:
Structure of Crystalline Solids:
Magnetism in Solids: Metal and Polymer
Physics: Experimental Practice:
Design, Essay, and Experimental projects:
Data Analysis:
History and Philosophy of Science.

Broadly speaking it is the intention of the first and second year courses to provide a stimulating introduction to modern physics whilst at the same time giving a thorough understanding of the basis of



Sixth floor laboratory ready for the ‘Electrical Circuits and Electronics’ course

the subject. Third year work concentrates more on detailed and advanced techniques in theoretical, instrumental and experimental physics: but it also includes a chance for students to show personal initiative and to engage in original research as is seen in the following list of topics (chosen mainly by students) in some of their third year courses.

Essay Projects

Lasers: solar flares: Cybernetics: The structure and evolution of white dwarf stars: The contribution of Francis Bacon to the development of scientific method: High energy cosmic radiation: Physics and the violin: Mass measurement of elementary particles: Ergodic theory: Elementary operotions in digital systems: Magnetic monopoles.

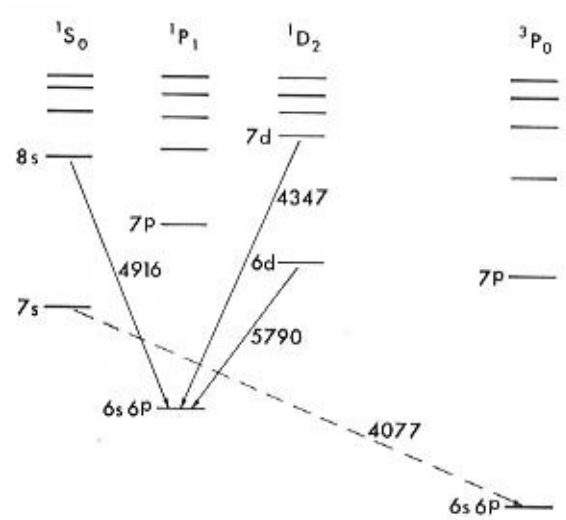
Experimental Projects

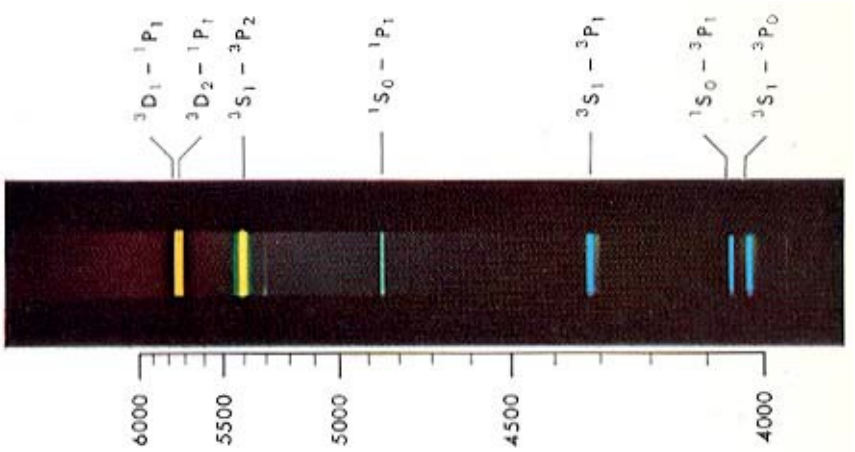
Flux quantisation in superconducting meshes: A far-infrared laser: Dielectric constant during polymerisation: Crystal growth: X-ray spectrometer: Fast-gated photomultiplier: Solar storms at 1mm. wavelength: Electron spin resonance with Gunn diode: X-ray cryostat: 3°K cosmic background: Metallic skin depth.

Design Projects (group projects)

Telescope automation: An optical computer.

An important feature of the new degree scheme is that it enables physics students to take a high proportion of courses in the other departments. The decision to branch out into these other subjects is not made at the beginning of the undergraduates work but at yearly intervals so that the scheme has a flexibility which allows for the students work to evolve as his understanding and interests grow. Apart from Mathematics which is an integral part of their studies students registered in this Department are taking courses in Chemistry, Botany, Zoology, Computer Science, Engineering, Theoretical Astrophysics, History of Science and Economics.





The Mercury spectrum—colour positive ot plate taken as part of the practical work for the second year undergraduate course 'Atomic and Molecular Spectra'.

Students in the Departmental Museum wait to be called for oral examinations of their essay projects. The museum contains a permanent collection of apparatus of historic interest, It also houses Gallery 273—an art gallery having regular exhibitions of painting and sculpture.

For their 3rd year experimental project two undergraduates prepare to make measurements of unexplained active regions of the sun recently discovered here at 1mm. wavelength. A scan using this telescope during the 1966 eclipse is shown on the front cover.

Theoretical physics

Elementary particles —
Cross section sum rules, Scattering amplitudes;
Many body problem — superfluids:
Crystal field theory — Spin polarisation,
paramagnetic ions: atomic surface scattering:
Non-linear equations of quantum field theory:
Statistical mechanics of infinite systems.

Solid state physics

Submillimetre, X-ray and neutron spectroscopy:
Magnetic, dielectric and polymer crystals:
Polymerisation by U.V. and 4 Mev electrons:
Crystal structure and phase transitions in halides:
Ferro- and pyro-electrics: thin films:
Optical properties of metals:
Flux trapping in superconductors:
New methods for crystal growth:
Far infrared properties of lunar rock.

Elementary particle physics

Particle scattering and annihilation
using 7GeV Synchroton at Rutherford Laboratory,
150 MeV synchrocyclotron at A.E.R.E. Harwell,
25 GeV C.E.R.N. synchrotron at Geneva.
Induced thermoluminesence in lunar samples.

Astrophysics

Millimetre and submillimetre astronomy
from Q.M.C., Royal Greenwich Observatory,
European high altitude sites and balloons.
Lunar samples

Research

theoretical physics: solid state physics: elementary particle physics: astrophysics:

Research is an integral part of the activities of the Department not only contributing original work but allowing undergraduate courses to be kept properly up-to-date. Within this setting undergraduates with good first degrees are encouraged to do research leading to the London University Ph.D.

Details of the four main areas of reseach are listed on the opposite page. Recent developments include the study of polymerisation by electron bombardment, proton-proton scattering at energies around 3 GeV, and a lunar samples laboratory currently used to analyse some of the first pieces of lunar rock returned to earth.

The photograph shows a Cerenkov radiation collector designed built and operated within the Department. Cerenkov radiation is emitted when a charged particle travels in a transparent medium at a velocity faster than light in that medium, and is analagous to the supersonic bang. The reflectors shown here are used to increase the collection efficiency for this very weak light. An efficient shape is obtained by rotating a parabola about a line inclined to the parabola axis.

Activities of Interest to Schools

An evening consisting of a lecture about some aspect of current interest in physics together with demonstrations is held in the Department on the first four Fridays in May. The evenings are intended mainly for 5th and 6th forms.

A conducted tour of the Department is held during term time on the afternoon of the second Friday of each month (Jan., Feb., Mar., May, June, July, Oct., Nov., Dec.) Visits can be arranged al other times.

Booking for the lectures is recommended.

If there is sufficient demand vacation courses for school teachers will be arranged.

The Department has a pool of apparatus which is available for loan to schools.

For any further information about the Department please contact Head of Physics Department:—
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