FOURTH INTERNATIONAL YOUTH SCIENCE FORTNIGHT

London International Youth Science Fortnight, July 1962.
Sponsored by Worldfriends in conjunction with the
British Association for the Advancement of Science.

Patron: His Royal Highness The Duke of Edinburgh, K.G.

President: The Rt. Hon. Lord Nathan, P.C., T.D., F.B.A.

Vice-Presidents:
The Rt. Hon. Lord Luke of Pavenham, T.D., D.L., J.P.
Sir John Cockcroft, O.M.
Dame Kathleen Lonsdale, D.B.E., F.R.S.
Dame Irene Ward, D.B.E., J.P., M.P.

Administration Headquarters:
Worldfriends,
308, Earl's Court Road,
S.W.5.
(FRE: 7071)

The Science Fortnight

During the autumn of 1958 Worldfriends approached the British Association for the Advancement of Science with the suggestion that they should co-operate in creating an international meeting ground for young scientists. A Science Fortnight based on exchanges between sixth form boys and girls in Western Europe was the immediate proposal, it being felt that exchanges among young people having the common interest of science were likely to be particularly fruitful. The British Association welcomed the proposal and work was started immediately on the first Fortnight which took place in July 1959. The British Association undertook the scientific programme and Worldfriends was responsible for selecting the participants and for the general administration.

The first Fortnight attracted some two hundred and fifty young scientists from Western European countries; they spent the Fortnight as guests in the homes of London sixth formers and later invited the Londoners to their homes. In the following year the Gulbenkian Foundation offered to sponsor a group of University students from Portugal and so started two new trends—the inclusion of older students and residence in hotels or hostels where exchange was not possible. These two trends developed in 1961 and a third was added, that of participation by selected sixth formers in Scotland, Wales and the provinces of England. The present year carries these three trends to the point where they are likely to become established practice. Four hundred and seventy are expected to take part in the 1962 Fortnight of whom two hundred will be on exchange and two hundred and seventy in Residential Halls. Participants from the nearer European countries will exchange with those from London, while the sixth formers sponsored by Education Authorities and Schools outside London will share residential accommodation with the visitors from the more distant European countries and from further afield.

The ultimate purpose of the Science Fortnight is to cultivate among young scientists the habit of co-operation in the service of mankind. Among those taking part in the Fortnight may well be some of the future leaders in the world of science. If through the Science Fortnight they have made friends from widely different cultures from the four corners of the world they will have taken the first step towards the goal of peaceful co-existence and tolerance without which there may well be no survival. *Philip S. Green, Director.*

MR. PHILIP S. GREEN, M.B.E., WHO ORIGINATED THE SCIENCE FORTNIGHT AND NOW DIRECTS IT, WITH THE LEADER OF THE FRENCH PARTY IN 1959.

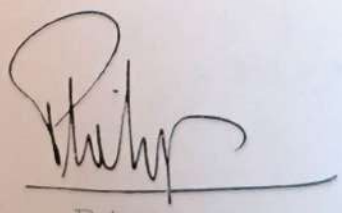
H.R.H. THE DUKE OF EDINBURGH, K.G. AT THE OPENING OF THE INTERNATIONAL YOUTH SCIENCE FORTNIGHT 1960

BUCKINGHAM PALACE

The London International Youth Science Fortnight has two principal intentions. First, it is hoped that all those attending will gain an insight into science which will be helpful to them in the course of their studies. Secondly, it is hoped that the meeting will produce a sense of common purpose and friendly understanding between individuals of different nationalities. People are naturally inclined to judge a nation by the individuals of that nation known to them personally. Sharing an interest in a common subject and meeting in the usually friendly and interesting atmosphere of an international congress, the chances are that the members will go home with a reasonable view of their international colleagues which they will almost certainly pass on to their friends and relations.

I want you to realise, as you start your fortnight's scientific tours and studies here, that you are joining a great international fraternity which is trying to serve mankind. As Cervantes put it, "Learning without virtue is like a pearl on a dung heap". We all know that science is not always directed to the material improvement of the world but it is equally certain that every true scientist, whatever his work, has the best interests of mankind at heart.

It is in that spirit that I welcome you to this country and to the Science Fortnight. I have no doubt that you will find much that will interest and instruct you in the scientific field but I hope you will also find out many things about each other and about this country which will give you a better and a wider understanding in the years ahead.



Patron.

5th July, 1961.

Message from Lord Hailsham

THE RT. HON. THE VISCOUNT HAILSHAM, Q.C., LORD PRESIDENT OF THE COUNCIL, MINISTER FOR SCIENCE.

I am very glad to offer a welcome to all our visitors from abroad who come here in connection with the London International Youth Science Fortnight. At the same time I extend my thanks to their British hosts upon whom will fall the task of speaking for Britain in the interesting and valuable exchange of views that we hope the Fortnight will afford.

If my Parliamentary duties permit I hope to be with you at the closing ceremony. In any case, I offer my best wishes to one and all who take part.

Hailsham.

Message from Sir Norman Kipping, K.B.E.

SIR NORMAN KIPPING, K.B.E., DIRECTOR GENERAL OF THE FEDERATION OF BRITISH INDUSTRIES.

I am delighted to send this message of welcome, on behalf of British industry, to all those visiting Britain for the Fourth International Youth Science Fortnight.

Because we possess so few natural resources, we British have increasingly had to depend for our living on scientific and technological leadership in many fields, and we have much to show you. I am glad that the programme of your visits will permit you to see at least something of the many recent developments in British industry.

The research laboratory is the birthplace of change, and almost all change spells challenge and opportunity. Such work is essentially an activity for young and vigorous minds, and it is good that you should be devoting this Fortnight to the development of international co-operation in scientific matters.

I hope you will enjoy your visit to us, and I wish you every success in your chosen careers.

International Praesidium of Honour

The Rt. Hon. The Viscount Hailsham, Q.C.,
Lord President of the Council, Minister for Science

His Excellency the Swedish Ambassador

His Excellency the Austrian Ambassador

His Excellency the Luxembourg Ambassador

His Excellency the Swiss Ambassador

His Excellency the Spanish Ambassador

His Excellency the Ambassador for the Netherlands

His Excellency the Israeli Ambassador

His Excellency the Polish Ambassador

His Excellency the Ambassador for the Republic of South Africa

His Excellency the American Ambassador

His Excellency the Belgian Ambassador

His Excellency the United Arab Republic Ambassador

His Excellency the Italian Ambassador

His Excellency the Danish Ambassador

His Excellency the Portuguese Ambassador

His Excellency the German Ambassador

His Excellency the Norwegian Ambassador

His Excellency the French Ambassador

His Excellency the High Commissioner for the Commonwealth of Australia

His Excellency the High Commissioner for Canada

His Excellency the High Commissioner for the Federation of Malaya

His Excellency the High Commissioner for Pakistan

His Excellency the High Commissioner for the Federation of Nigeria

His Excellency the High Commissioner for Tanganyika

The Rt. Hon. The Earl of Home, Secretary of State for Foreign Affairs

The Rt. Hon. Sir David Eccles, K.C.V.O., M.P., Minister of Education

The Irish Chargé d'Affaires

Mr. K. Helveg Petersen, Secretary General, World Friendship Federation

Joint Organising Council

Chairman:

The Rt. Hon. Lord Nathan, P.C., T.D., F.B.A.

Members:

†Mr. Martin Stevens
THE RANK ORGANISATION: WORLDFRIENDS

*Mr. E. N. Matthews
HEADMASTER, DE BEAUVOIR SCHOOL: WORLDFRIENDS

Mr. A. McTaggart-Short
FOUNDER OF WORLDFRIENDS

*Mr. P. S. Green, M.B.E.
GENERAL SECRETARY, WORLDFRIENDS

*Mrs. M. A. Lambert Lamond
WORLDFRIENDS ORGANISER FOR SCIENCE FORTNIGHT

Advisers:

*Mr. W. J. Langford, C.B.E., J.P., M.Sc.
HEADMASTER, BATTERSEA GRAMMAR SCHOOL: CHAIRMAN OF ADMINISTRATIVE COMMITTEE

Mr. R. C. S. Whitehead
SHELL INTERNATIONAL PETROLEUM CO. LTD.

*Miss C. J. Arlidge
EDUCATION DEPARTMENT, FEDERATION OF BRITISH INDUSTRIES

*Miss F. M. Eastwood, B.A., B.Sc.
ASSOCIATION OF WOMEN SCIENCE TEACHERS

*Mr. D. M. Hall, M.A.
MILL HILL SCHOOL

*Mr. H. W. Lascelles, M.A.
IMPERIAL CHEMICAL INDUSTRIES LTD.

*Miss M. P. C. Mackenzie, B.Sc.
PUTNEY HIGH SCHOOL FOR GIRLS

*Mr. F. R. Reavell
UNILEVER LTD.

*Mr. W. F. Spinks, M.A.
ST. MARYLEBONE GRAMMAR SCHOOL

*Mr. R. A. Stevens
ASST. SECRETARY, BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

*Mr. L. R. Temple
CENTRAL BUREAU FOR EDUCATIONAL VISITS AND EXCHANGES

*Mr. A. E. J. Trinder
SCIENCE MASTERS' ASSOCIATION

Observers:

Mr. B. Bevan
FOREIGN OFFICE

*Dr. C. E. Clarkson, M.Sc.
NATIONAL UNION OF TEACHERS

*Mr. R. M. Gordon, M.A.
EDUCATION COMMITTEE, LONDON COUNTY COUNCIL

*Mr. T. M. Pyke, O.B.E., T.D., H.M.I.
MINISTRY OF EDUCATION

THE RT. HON. LORD NATHAN, P.C., T.D., F.B.A., PRESIDENT AND CHAIRMAN OF THE COUNCIL.

MRS. M. A. LAMBERT LAMOND, WORLDFRIENDS ORGANISER OF SCIENCE FORTNIGHT

MR. W. J. LANGFORD, C.B.E., J.P., M.Sc., CHAIRMAN OF THE ADMINISTRATIVE COMMITTEE.

*Members of Administrative Committee.

†Adviser on Publicity to the Council.

The British Association for the Advancement of Science

Founded in 1831, the British Association remains unique as an independent institution of national reputation, which brings almost the whole range of sciences within its scope, and opens its membership, without qualification or nomination, to all who are interested in the progress of science.

It was the example of a German Society—the Deutsche Naturforcher Versammlung—which inspired the foundation of the British Association. In 1831 the Yorkshire Philosophical Society organised the first meeting at York, and Sir David Brewster defined the objects of the Association thus: "The principal object would be to make the cultivators of science acquainted with each other; to stimulate one another to new exertions; to bring the objects of science more before the public eye and to take measures for advancing its interest and for accelerating its progress."

At that time in Britain the public was indifferent to science, and government and press were hostile. The tremendous progress which science has made is a measure of the success of the Association in persuading public, government and press that science is important and worth backing.

To-day science is of paramount importance not only to Britain, but to the whole world. Only science can provide the answers to some of the problems which face the world. On the other hand, misuse of science can mean the end of life on the planet.

For this reason, the Association regards it as one of its main tasks to promote a better understanding of the significance of scientific research and its impact, through its applications, on society as a whole.

The principal activity of the Association is still the Annual Meeting, held every year since 1831 except for the period of the two world wars. It is a movable Festival of Science, held in a different city each year, and is the greatest scientific meeting in Britain each year. This year the meeting is at Manchester.

In addition to the Annual Meeting, the British Association has now established a central lecture service and nineteen area committees whose function it is to present science to many sections of the community throughout the year and all over the country. During the past year these lecture services have provided scientists from many fields of science and technology to speak to audiences totalling some 170,000.

His Royal Highness the Duke of Edinburgh, Patron of the International Youth Science Fortnight and a past President of the British Association, said at the annual meeting of the Indian Science Congress (at which he represented the British Association) in New Delhi on 22nd January, 1959: "In my opinion, this last objective is more important than ever. Every human invention or discovery can be used for good or evil and in the end it is the people as a whole who decide which it is to be.

It is therefore essential that the possible consequences of scientific research should be put before the forum of ordinary people. Only in this way can a combined opinion of reasonable, upright and humane men and women throughout the world exert the necessary pressure to ensure that science is used to set free and not to enslave mankind".

The British Association is happy to co-operate with Worldfriends in arranging the scientific programme for the International Youth Science Fortnight.

Worldfriends

Worldfriends was founded in 1948. Its formation helped to bring about the creation of the World Friendship Federation. As a member of this Federation, Worldfriends is able to benefit from full consultative status with UNESCO and UNICEF. The Minister of Education for Denmark acts as General Secretary of the Federation at its Copenhagen headquarters.

The principal aim of Worldfriends is to promote understanding and friendship by means of home-to-home exchange visits for groups of young people. Its other activities include conferences, language schools, youth festivals and international fortnights. These are organised through local branches of Worldfriends in co-operation with schools, youth organisations, community and kindred associations. Through contacts of this nature young visitors from abroad each year are entertained in homes throughout the British Isles, whilst parties of young people from Britain travel all over Western Europe on exchange. Apart from these visits, local branches are encouraged to carry out a programme of international education throughout the year. Worldfriends youth sections are springing up on the initiative of young people who have themselves travelled under the exchange visit scheme. Over the years many thousands of young people have learned something of the way of life of other countries and have made firm friendships with their counterparts on the Continent.

Worldfriends receives no support from public funds but nevertheless it plans to develop its activities even further in the future. The aim is to expand the field of activity far beyond Europe.

The day when young people will travel from Britain to the Americas and to Australasia for their holiday is not a mere pipe-dream. Today they travel to the furthest corners of Europe as a matter of course. Worldfriends eagerly plans for the time when they will travel to the furthest corners of the earth, if not beyond.

A. McTAGGART-SHORT
FOUNDER, WORLDFRIENDS

W. C. MARSH, J.P.
CHAIRMAN, WORLDFRIENDS

Opening Ceremony

The Opening Ceremony will be held at the Institution of Electrical Engineers in Savoy Place at 11.0 a.m. on Monday, 23rd July. The Rt. Hon. Lord Nathan, P.C., T.D., F.B.A., the President of the Science Fortnight, will take the Chair. The Address of Welcome will be given on behalf of Her Majesty's Government by Mr. Peter Thomas, M.P., Parliamentary Under-Secretary of State for Foreign Affairs.

The Scientific Address will be delivered by Sir Charles Goodeve, O.B.E., D.Sc., F.R.S., who will speak on the theme "Catching up with Progress". Sir Charles Goodeve was born in Canada and attended the University of Manitoba. He came to England in 1927 as Lister Lecturer and Reader in Chemistry at University College, London. After distinguished war-time service in the Navy, Sir Charles Goodeve became Director of the British Iron and Steel Research Association. From 1959 to 1961 Sir Charles was Secretary of the International Federation of Operational Research Societies, his special interest being the application of scientific technique to the study of social organisation and to the solution of its problems. It is on this fascinating subject that Sir Charles Goodeve will speak.

Lectures

Dr. Kenneth Mellanby, C.B.E., Sc.D., on "International Co-operation in Biological Research on Conservation of Natural Resources."

Director of Monkswood Experimental Station at the Nature Conservancy. Between 1947 and 1953 Dr. Mellanby was First Professor at University College in Ibadan, Nigeria; he is also President of the Entomological Society of London and President of the Association for the Study of Animal Behaviour.

Dr. A. M. Uttley, Ph.D., on "Automation".

Dr. A. M. Uttley, recently appointed Superintendent of Control Mechanisms and Electronics Division of the National Physical Laboratory, is a graduate of King's College, London. In 1926 he graduated with first class honours in mathematics. After gaining teaching experience, Dr. Uttley returned to college and took the B.Sc. degree in psychology. During the war he worked in the telecommunications research establishment of the Ministry of Supply. He has since worked on the automatic guiding of astronomic telescopes. Within the last few years Dr. Uttley's interest has been mainly focused on the problems of control involving a human operator and on visual pattern recognition.

Closing Ceremony

Provided parliamentary duties in the House of Lords do not prevent him being present, the Rt. Hon. Viscount Hailsham, Q.C., Lord President of the Council and Minister for Science, will deliver the Farewell Address. The Chair will be taken by The Rt. Hon. Lord Nathan, P.C., T.D., F.B.A., President of the Science Fortnight.

SIR JOHN COCKCROFT, WHO GAVE THE SCIENTIFIC ADDRESS IN 1961, SEEN HERE WITH A MODEL OF CALDER HALL NUCLEAR POWER STATION *(SEE ARTICLE ON PAGE 16)*

Officials representing the organisers during the event:

Couriers

Head Courier: Mr. Michael Dodds, LATE CAIUS COLLEGE, CAMBRIDGE

Mr. Lancelot Andrews, WOOLWICH POLYTECHNIC

Miss Carol Ashton, LATE SOMERVILLE COLLEGE, OXFORD

Mr. Gerald Ashton, BRISTOL UNIVERSITY

Mr. David Baldwin, BIRMINGHAM UNIVERSITY

Mr. Jonathan Betts, SELWYN COLLEGE, CAMBRIDGE

Miss Valerie Braybrooke, CHELSEA COLLEGE OF SCIENCE AND TECHNOLOGY

Miss Anna Furth, QUEEN ELIZABETH COLLEGE, LONDON UNIVERSITY

Miss Isobel Gillham, BIRMINGHAM UNIVERSITY

Mr. Andrew Hayes, BELFAST UNIVERSITY

Miss Sarah Hughes-Lewis, UNIVERSITY COLLEGE, LONDON

Miss Jeannette Price, WOMEN'S LEAGUE OF HEALTH AND BEAUTY

Mr. Peter Robjant, ST. CATHARINE'S COLLEGE, CAMBRIDGE

Miss Mary Spence, HOCKERILL TRAINING COLLEGE

Miss Theresa Stokes, QUEEN ELIZABETH COLLEGE, LONDON UNIVERSITY

Miss Mary-Ann Unwin, WESTFIELD COLLEGE, HAMPSTEAD

Mr. John Webb, IMPERIAL COLLEGE, LONDON

Hosts and Hostesses for participants in residential halls

Passfield Hall: Mr. and Mrs. J. G. Gaddes

Mr. Gaddes is an Assistant Lecturer at Peterborough Technical College teaching geography, economics and economic history. Mrs. Gaddes is also a trained teacher.

Bentham Hall: Mr. and Mrs. J. A. Glossop

Mr. Glossop is a Research Scholar in Education at the University of Manchester. Mrs. Glossop is a Domestic Science Teacher.

International Hall: Mr. and Mrs. Derek Williams

Both Mr. and Mrs. Williams are Honours Graduates of the University of Wales, and both teach in Grammar Schools. Mr. Williams was formerly a lecturer to extra-mural classes of the University College of Ibadan.

Richmond Hotel: Mr. Denis B. Jagoe.

Mr. Jagoe is an Honours Graduate of Queen's University, Belfast, and teaches in the Coleraine Academical Institution, Belfast.

We express our thanks to these officials for their kind co-operation.

Discussion Group Leaders

Physics: Dr. H. R. Allan, M.A., Ph.D.
After war-time work on radar, Dr. Allan returned to the Cavendish Laboratory in Cambridge to undertake research in nuclear physics. At present he is studying cosmic rays as senior lecturer in physics at the Imperial College of Science and Technology in London. Dr. Allan was for some years honorary General Secretary of the Atomic Scientists' Association.

Chemistry: Dr. Peter Sykes, M.Sc., Ph.D.

Fellow of Christ's College, Cambridge, and University Lecturer in Organic Chemistry in the University of Cambridge. Visited the U.S.A. in 1959 and 1961 on lecture tours. Broadcaster. The general field in which Dr. Sykes works is the chemistry of thiazolium compounds and the chemical mode of the action of thiamine.

Biology: Dr. J. D. Carthy.

Lecturer on Zoology at Queen Mary's College, University of London; Fellow of the Royal Entomological Society and of the Zoological Society. Author and broadcaster.

General Science: Mr. L. J. Brimble.

Editor of "Nature".

Mathematics: Professor Bryan Thwaites.

Professor of Mathematics at Southampton University.

Countries Represented

Australia
Austria
Belgium
Canada
Ceylon
France
Germany
Great Britain
Holland
India
Irish Republic
Israel
Japan
Luxembourg
Federation of Malaya
Federation of Nigeria
Norway
Pakistan
Poland
Portugal
Republic of South Africa
Spain
Sweden
Switzerland
Tanganyika
United Arab Republic
United States of America
Yugoslavia

Programme

Fri.	20th July	
Sat.	21st July	7.30 p.m.
Sun.	22nd July	
Mon.	23rd July	11.00 a.m.
		2.00 p.m.
		3.00 p.m.
Tues.	24th July	
Wed.	25th July	
Thur.	26th July	10.30 a.m.
		7.30 p.m.
Fri.	27th July	
Sat.	28th July	
Sun.	29th July	a.m.
		p.m.
Mon.	30th July	10.00 a.m.
		2.00 p.m.
		3.45 p.m.
Tues.	31st July	
		7.30 p.m.
Wed.	1st. Aug.	
Thur.	2nd Aug.	10.30 — 12.00 noon
		2.00 p.m.
		3.30 p.m.
		4.15 p.m.
		7.30 p.m.
Fri.	3rd Aug.	

e of Events

Arrivals

Welcome Dance at Baronial Hall, Mincing Lane, E.C.3.

Free

Opening Ceremony at Institution of Electrical Engineers. Sir Charles Goodeve: 'Catching up with Progress'.

Business Meeting of Participants.

British, American and Russian Scientific Films.

Scientific visits all day.

Scientific visits all day.

Lecture at the Institution of Electrical Engineers. Dr. Kenneth Mellanby: 'International Co-operation in Biological Research on Conservation of Natural Resources'.

Afternoon free.

Film Show at London Transport Executive.

Scientific visits all day.

Family day for overseas participants.

Free.

Optional excursions for hostel students to Luton Hoo, Woburn Abbey, Windsor, etc.

Discussion Groups at Institution of Electrical Engineers.

Shell Film Show at National Film Theatre.

1. Story in the Rocks.
2. Search for Oil in Nigeria.
3. A Question of Springing.
4. The Golden Lands.

Tea arranged by Shell at Shell Centre.

Scientific visits all day.

Film Show at London Transport Executive.

Scientific visits all day.

Lecture at Institution of Electrical Engineers. Dr. A. M. Uttley: 'Automation'.

Representative discussion on Fortnight at the Institution of Electrical Engineers.

Closing Ceremony.

Tea for Guests of Honour and Members of Committee.

Farewell Dance in the Empire Rooms, Tottenham Court Road, W.1.

Departures.

Sponsoring Bodies

American Science Teachers' Association

Bayerischer Jugendring

Belgian Ministry of Education

Canadian Science Fair Council

Calouste Gulbenkian Foundation, Lisbon

Israeli Ministry of Education

Luxembourg Ministry of National Education

Mouvement Jeunes Sciences

Nederlandse Stichting Voor Schoolreizen

Norwegian Committee for International Information and Youth Work

Office of the High Commissioner for India

Office of the High Commissioner for the Federation of Malaya

Office of the High Commissioner for the Federation of Nigeria

Schola Europaea, Luxembourg

South African Association for the Advancement of Knowledge and Culture

Spanish Embassy

Swedish Central Committee for International Exchange between Schools

Tanganyika Ministry of Education and Information Services

United Arab Republic Embassy

Worldfriends Austria

World Friendship Association of Japan

Worldfriends U.K.

Notes of places to be visited during the Science Fortnight

W. H. Allen Sons & Co. Ltd., Bedford.
MECHANICAL, ELECTRICAL AND HYDRAULIC ENGINEERS.

The Atomic Energy Research Establishment, Harwell.
INITIATES NEW IDEAS AND EARLY DEVELOPMENT WORK ON ALL CIVIL ASPECTS OF ATOMIC ENERGY.

Beecham Research Laboratories Ltd., Betchworth.
RESEARCH IN PHARMACEUTICALS—PARTICULARLY PENICILLIN AND FERMENTATION CHEMISTRY. ALLERGY RESEARCH AND RESEARCH IN NEW DRUGS OF A PURELY CHEMICAL NATURE.

The British Coal Utilisation Research Association.
ONE OF THE LARGEST RESEARCH ASSOCIATIONS WITH A STAFF OF 300.

British Insulated Callenders Cables, Shepherd's Bush.
RESEARCH ESTABLISHMENT FOR THE GROUP OF COMPANIES MANUFACTURING ALL KINDS OF ELECTRIC CABLES.

British Iron and Steel Research Association, Battersea.
RESEARCH ORGANISATION FOR IRON AND STEEL INDUSTRY SPONSORED JOINTLY BY GOVERNMENT AND INDUSTRY.

British Oxygen Co., S.W.19.
RESEARCH INTO INDUSTRIAL APPLICATIONS OF OXYGEN.

The Central Electricity Generating Board.
OWNS AND OPERATES THE POWER STATIONS AND MAIN TRANSMISSION LINES IN ENGLAND AND WALES. VISITORS WILL SEE THE BOARD'S PERMANENT EXHIBITION AND A POWER STATION.

The Chester Beatty Research Institute.
TOGETHER WITH THE ROYAL CANCER HOSPITAL'S PHYSICS AND RADIO-THERAPY DEPARTMENTS, FORMS PART OF THE INSTITUTE OF CANCER RESEARCH.

The C.I.B.A. Laboratories, Horsham.
VISITORS WILL SEE THE PRODUCTION AND DISTRIBUTION OF PHARMACEUTICALS.

East Malling Research Station.
DEALS WITH PROBLEMS ARISING FROM THE GROWTH AND CULTURE OF FRUIT PLANTS.

The Electrical Research Association.
CO-ORDINATES A WIDE FIELD OF INDUSTRIAL RESEARCH IN THE ELECTRICAL INDUSTRY. THE LABORATORIES AT LEATHERHEAD WILL BE VISITED.

E.M.I. Electronics, Hayes.
MANUFACTURES ALL TYPES OF ELECTRONIC EQUIPMENT, INCLUDING RADIO AND TELEVISION. TRANSMITTING AND STUDIO EQUIPMENT AND COMPUTERS.

The Esso Research Centre, Abingdon.
RESEARCH AND ADVISORY CENTRE FOR ALL ESSO COMPANIES IN EUROPE AND NORTHERN AFRICA.

Imperial Chemical Industries—Paints Division
VISIT TO THE FACTORY AND RESEARCH UNIT AT SLOUGH.

Ilford Ltd.
BRENTWOOD LABORATORIES ARE THE RESEARCH UNIT OF THE ILFORD PHOTOGRAPHIC COMPANY.

Kodak Ltd.
THE MUSEUM OF PHOTOGRAPHY AT HARROW CONTAINS A NUMBER OF UNIQUE EXHIBITS.

James Latham & Co., Clapton.
TIMBER IMPORTERS AND SAWMILLERS.

London Airport.
TELECOMMUNICATIONS AND AIR-TRAFFIC CONTROL.

Maritime Museum, Greenwich.
MARITIME HISTORY, ARCHAEOLOGY AND ART OF GREAT BRITAIN, HOUSED IN A ROYAL PALACE BUILT BY INIGO JONES (1635).

The National Coal Board Mining Research Establishment, Isleworth.

The National Institute for Medical Research, Mill Hill.
THE PRINCIPAL ESTABLISHMENT OF THE MEDICAL RESEARCH COUNCIL.

The National Institute For Research in Dairying.
AT SHINFIELD, MILK PRODUCTION, SCIENTIFIC FARM PRODUCTION AND DAIRYING AS AN INDUSTRY CAN BE STUDIED.

The National Physical Laboratory, Teddington.
IMPORTANT NATIONAL CENTRE FOR RESEARCH IN NON-NUCLEAR PHYSICS.

Natural History Museum.
CHIEF INSTITUTION IN THE BRITISH COMMONWEALTH FOR SCIENTIFIC RESEARCH IN NATURAL HISTORY.

London Planetarium.

Albert Reed & Co., Ltd. Aylesford.
MANUFACTURE OF PAPER, PACKAGING MATERIALS, AND PACKAGES.

Rothamsted Experimental Station.
OLDEST AGRICULTURAL RESEARCH STATION IN THE WORLD.

The Royal Aircraft Establishment, Farnborough.
CARRIES OUT RESEARCH AND DEVELOPMENT WORK FOR THE BRITISH AERONAUTICAL INDUSTRY.

The Royal Botanical Gardens, Kew.
300 ACRES OF GARDEN, HERBARIUM AND RESEARCH.

The Royal College of Aeronautics, Cranfield.
NATIONAL COLLEGE OF AERONAUTICS WITH ITS OWN AIRFIELD SPECIALISING IN AERODYNAMICS, AIRCRAFT DESIGN, ECONOMIC PROPULSION, FLIGHT, AIRCRAFT ENGINEERING.

The Science Museum.
RICH IN MATERIAL OF HISTORICAL SIGNIFICANCE.

Shell Research Ltd., Woodstock Agricultural Research Centre.
HEADQUARTERS OF ALL AGRICULTURAL RESEARCH CARRIED OUT IN EUROPE BY THE ROYAL DUTCH SHELL GROUP.

Shell Laboratories, Egham.
THE STRIKING ADVANCE IN THE DEVELOPMENT OF CHEMICALS FROM PETROLEUM CAN BE STUDIED.

Shell Haven.
SHELL'S LARGEST AND MOST MODERN REFINERY IN THE U.K. IT COVERS 500 ACRES AND HAS AN OUTPUT OF 8 MILLION TONS OF CRUDE OIL A YEAR.

United Power Company.
THE ATOMIC ENERGY DIVISION AT ERITH WILL BE VISITED.

Unilever Research Laboratories, Colworth House, Bedford.
RESEARCH INTO FOOD PRESERVATION WITH PARTICULAR REFERENCE TO FROZEN AND CANNED FOODS.

Vickers-Armstrongs (Aircraft) Ltd., Weybridge.
A COMPANY OF THE BRITISH AIRCRAFT CORPORATION. MANUFACTURERS OF CIVIL AIRLINERS INCLUDING THE VISCOUNT, THE VANGUARD, AND THE V.C. 10.

Vickers Research Ltd., Ascot.
RESEARCH ORGANISATION COVERING THE ENTIRE VICKERS GROUP. SPECIALISES IN CIVIL DEVELOPMENT PROBLEMS INCLUDING MEDICAL ENGINEERING.

The Wellcome Chemical Works, Dartford.
PRINCIPAL CHEMICAL AND PHARMACEUTICAL MANUFACTURING UNIT OF THE WELLCOME FOUNDATION LTD. EXTENSIVE LABORATORIES FOR CHEMICAL AND BIOLOGICAL TESTING.

The Wellcome Museum of Medical Science.
A TEACHING MUSEUM OF TROPICAL DISEASES. USED EXTENSIVELY BY MEDICAL STUDENTS.

Westland Aircraft Ltd., Saunders-Roe Division, East Cowes.
PIONEERS IN HOVERCRAFT DEVELOPMENT.

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A programme of visits is prepared for each participant according to scientific interests.

Atom Power should be cheaper than coal within eight years

By Sir John Cockcroft,
O.M., K.C.B., C.B.E., F.R.S.

Master of Churchill College, Cambridge, President of the British Association for the Advancement of Science and Vice-President of the Science Fortnight.

Britain to-day has a larger programme of nuclear power installation than any other country.

The reason for this is the rapidly increasing demand for electricity which will require fuel equivalent to 100 million tons of coal by 1970 and 130 million tons by 1975. This compares with 58 million tons a year to-day. The National Coal Board's target output for economical production of coal is 200 million tons a year and taking account of other important consumers in industry and the domestic demand, Sir Christopher Hinton, Chairman of the Central Electricity Generating Board, considers that it would be unsafe to rely on more than 100 million tons of coal a year from home production. It would, of course, be possible to import more oil but at a heavy additional drain on Britain's balance of payments.

There are good reasons for believing that electricity will be generated more cheaply from nuclear power than from oil or coal before 1970.

We have now been operating the Calder Hall nuclear power station for over five years and its twin at Chapelcross for three years. Between them they are now steadily generating over 2 billion units of electricity a year. We have had very little difficulty with these power stations, the initial teething troubles being minor faults in conventional components.

The output of the reactors which supply the heat has been steadily increased and is now 30 per cent above the design figure. One of the reactors operated for a period of 12 months at 95 per cent of the maximum output and all the eight reactors have been operating at full load over a year for more than 88 per cent of their possible time. This promises that the future magnox nuclear power stations, which are designed to be able to change fuel under load, should be able to operate with load factors of 85 per cent or more, instead of the load factors of 75 per cent which had been assumed.

The fuel costs of nuclear power stations depend on the amount of heat which can be extracted from the uranium fuel elements before they have to be changed. We had assumed in our forecast that we would be able to extract from each ton of uranium the heat equivalent of 10,000 tons of coal. Fuel elements in Calder Hall have already surpassed this target and we have also inserted in Calder Hall fuel elements of the next generation of nuclear power stations to test their behaviour. So far we have seen no sign of deterioration at life times which have reached two-thirds of the target.

Fuel costs may, therefore, be lower than predicted before we had this experience.

Our experience also suggests that the reactors of Calder Hall and Chapelcross will have a long life.

We had assumed, in our economic forecast, that capital cost should be written off in 20 years, a shorter time than used for conventional power stations. Since the reactors have few running parts and since there is no reason to expect any deterioration it seems probable that nuclear power stations will have as long lives as conventional power stations.

This experience has a considerable bearing on the future of nuclear power. We are now building seven nuclear power stations of much larger output and will by 1968 have a total installed capacity of about 5000 MW, the latest station in the series having an output of 560 MW fed by two reactors.

The capital cost per KW of these power stations has been falling steadily with successive stations, falling from over £165 per KW for the stations coming into operation this year to below about £100 per KW for the Sizewell station which will come into operation in 1966. These figures include the cost of certain site charges but exclude interest on capital during construction. So the overall capital cost figures remain high even in 1966. After that they are expected to fall further as ratings and temperature increase further as a result of developments now proceeding. These high capital costs are offset by fuel costs which should be about half conventional fuel costs in coal or oil-fired power stations.

The overall costs of power from nuclear power is usually compared with the cost of power from the most modern coal-fired station likely to be operated on the coalfields in future.

It is now estimated that a 2000 MW coal-fired power station built near the cheap East Midland coalfields and using the most advanced steam technology now envisaged, but not proved, will generate electricity at about 0. 5d. per unit. A similar station built in Southern England a hundred miles or more from the coalfields would have appreciably higher generating costs owing to cost of coal transport.

Forecasts of the cost of nuclear power depend on the basic assumptions that are made. It is currently estimated that Sizewell will generate at about 0.65d/kWh at 75 per cent load factor and using an amortisation life of 20 years. If the amortisation life were extended to 25-30 years the generating cost would fall by 0.04-0.07d per unit. If, in addition, it were appropriate to use an average load factor of 85 per cent rather than 75 per cent over the whole of this period, the generating cost would fall by a further 0.04d. Greater heat extraction from fuel elements could save up to 0.03d. per unit. There are, therefore, prospects of costs being lower than 0.55d per unit. All of this has still to be proved but the prospects are favourable.

We are not content with this, however, and are just bringing into commission at Windscale a 30 MW nuclear power station of advanced design which operates at temperatures 150°C higher than Sizewell. This should allow efficiencies of conversion of heat to electricity to be increased from about 32 per cent to about 40 per cent in large stations. The rate of heat extraction per ton of fuel would be two-and-a-half times higher than that of Sizewell and the volume of the reactor per unit output would be correspondingly reduced. The fuel in this reactor will be sintered UO_2 canned in thin stainless steel.

We expect that the heat extracted per ton of uranium will be equivalent to about 40,000 tons of coal—about 4 times that assumed for the earlier stations. We believe that the improved type of nuclear power stations will, in large units, enable generating costs to fall to 0.5d per unit sent out and below.

Proof will come when the large scale generating stations of this type are constructed by the Electricity Generating Boards.

The long term future of nuclear power depends on being able to extract a much larger proportion of the potential fissile energy of uranium than we are achieving in these early power stations. These will at best extract a little over 1 per cent of the available fissile energy. It is possible, however, to extract a very much higher proportion using the principle of breeding.

A breeder reactor is fuelled with plutonium fuel which is produced as a by-product by the first generation of nuclear power stations. As plutonium is fissioned to produce heat, surplus neutrons from the fission process are captured in the abundant U238 and turned into more plutonium than is being destroyed. So a power breeder reactor may produce 1.5 new plutonium nuclei for each nucleus destroyed, the exact figure depending upon design.

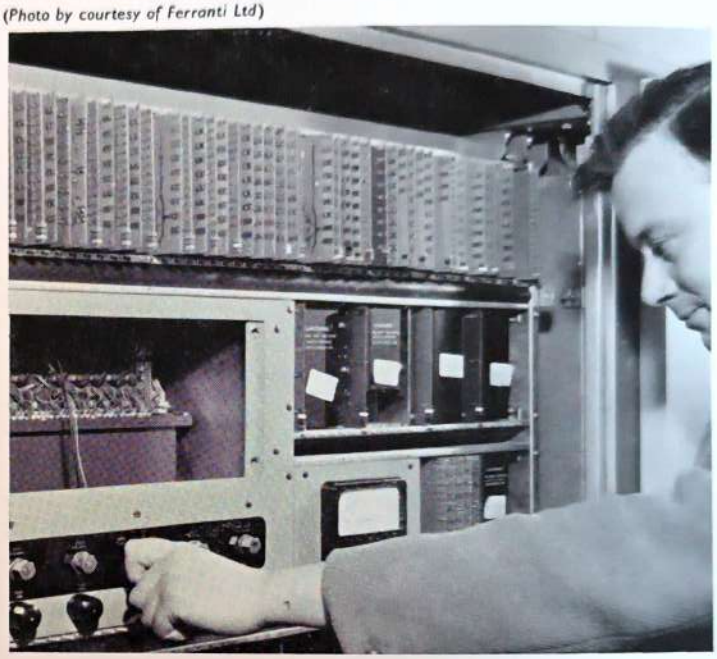
We now have at Dounreay in the North of Scotland an experimental fast breeder reactor designed to produce 60 MW of heat. After two years of commissioning troubles it has been operated at 10 MW and the core elements are now being replaced with a new type which will allow operation at appreciably higher powers. We are now working on the design of a breeder power station of large output and hope that this might be constructed during the next few years in time to provide experience for bringing breeder power stations into commercial operation in the 1970's.

Already Britain has acquired a large fund of practical experience in the application of atomic energy for peaceful purposes and her development of nuclear power is proceeding from well laid foundations. We have made a beginning in exporting nuclear power stations by the construction of a 200 MW power station at Latina, south of Rome, and of a 160 MW power station in Japan and our manufacturers will doubtless extend this effort.

Article reproduced by courtesy of Achievement magazine.

Some outstanding examples of recent

(Photo by courtesy of Ferranti Ltd)



The Ferranti "Atlas"

The photo on the right shows the central computer unit of the prototype model of "Atlas", the world's most powerful computer, being installed at Manchester University. "Atlas" is the result of co-operative development between the University and Ferranti Ltd. A hundred times faster than any computer so far built in Europe, its speed was mainly achieved by new techniques in circuitry developed at Manchester University. It can do about a million additions or 300,000 multiplications in a second. Perhaps its most revolutionary feature is the 'supervisor', which automatically makes its own decisions in regulating the flow of work through the computer. It ascertains that all the computer's resources are operating at maximum efficiency. This system enables "Atlas" to carry out as many as 250 different programmes simultaneously.

(Photo by courtesy of H.M. Postmaster General)

The Goonhilly Satellite Communication Station

The U.K. Satellite Communication Ground Station at Goonhilly Downs, Cornwall, was built and tested in less than a year, in order to take part in an Anglo-American series of experiments to assess the technical feasibility of long distance communication by artificial earth satellites. It is designed to handle television, telephone, telegraph and other signals transmitted between ground stations in the U.S.A. and that at Goonhilly, via satellites to be launched this year. It is equipped with a large steerable dish aerial. It has to be large because the signals received from the satellite are very weak and a large collecting area is therefore required. The same aerial is used for transmitting to the satellite, and because of its large size the transmitted signal power is concentrated into a narrow beam only one-fifth of a degree in width. Because of the very narrow beam, the aerial has to be pointed with very great precision at the satellite, and in order to maintain this in high wind, the aerial is very massive and of sturdy construction.

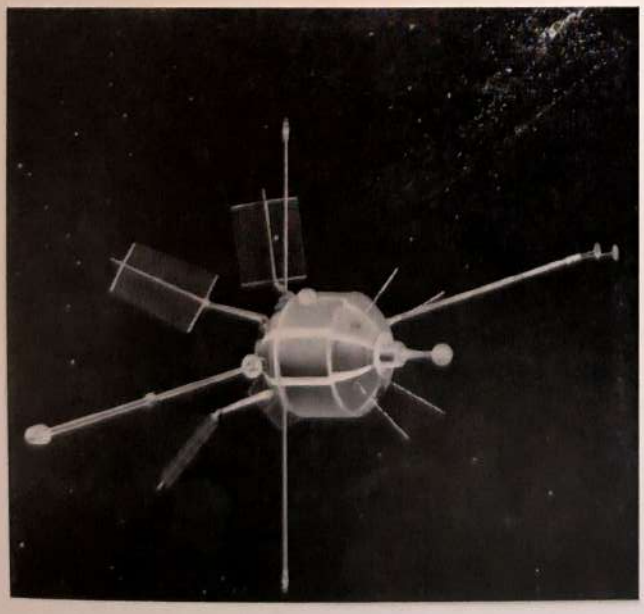
British scientific achievement

(Photo by courtesy of British Aircraft Corporation)

The Bristol Type 188 Research Aircraft

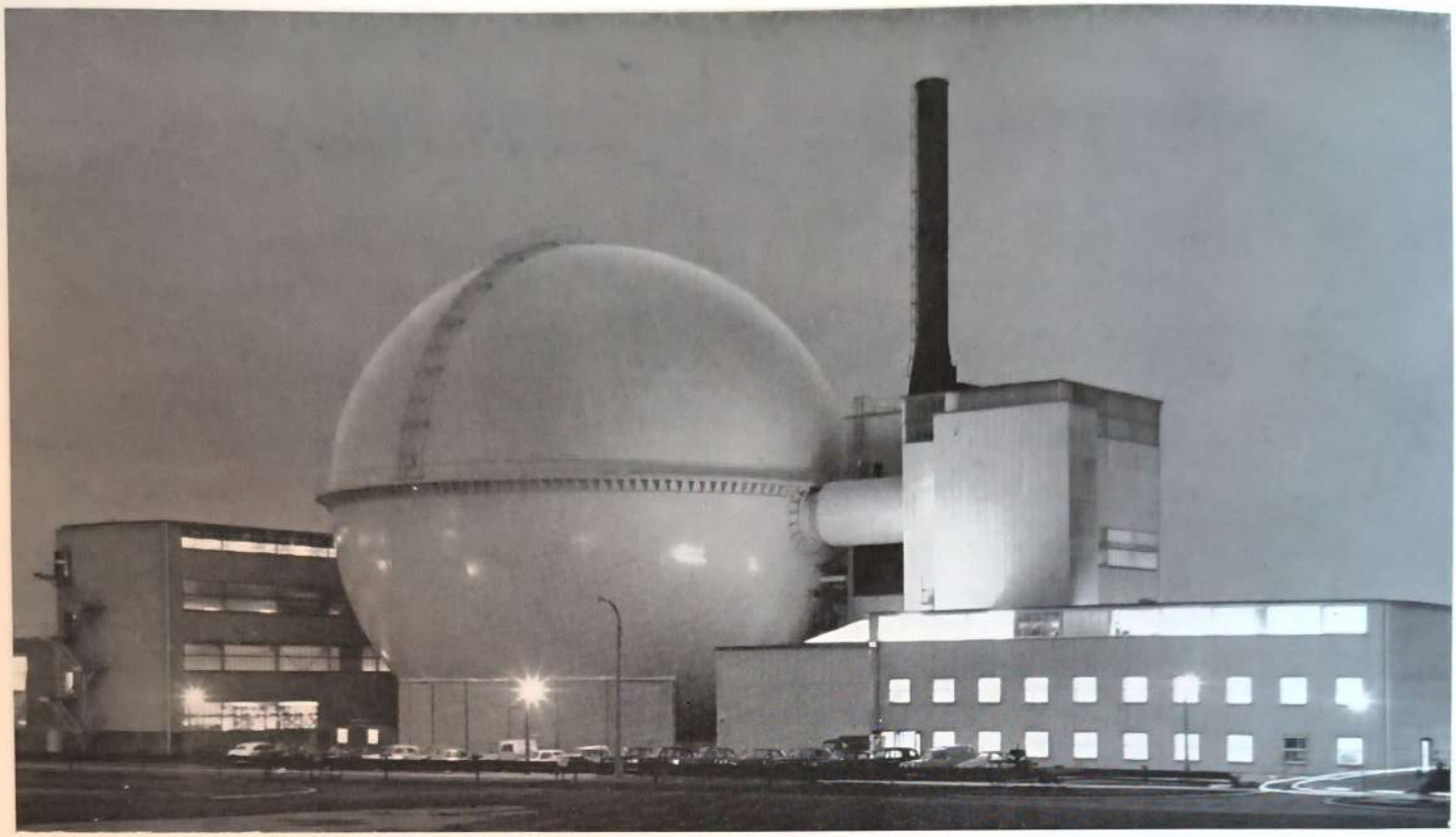
Having surmounted the sound barrier, aeronautical scientists are now confronted by the heat barrier. At high supersonic speeds aircraft have to withstand very great heating of their surfaces from friction with the air. The Bristol T. 188 is, for this reason, made of stainless steel instead of conventional light alloys. It is beginning a career of research flights to investigate the problems of high speed flight—potentially it is the world's fastest jet aircraft. It carries more instruments than any previous British research aircraft and the data will be recorded, processed and analysed by very advanced equipment. The aircraft is powered by two de Havilland Gyron Junior DGJ.10 reheated turbojets.

(Photo by courtesy of the Central Office of Information)



Research Satellite: Ariel

Ariel, the first Anglo-American satellite, is now orbiting the Earth. Carrying experiments designed by British scientists, it was put into orbit by the Americans. The British team brought to the project scientific insight and several years' experience with firing small rockets for space research. The Americans gave generously of their skill and facilities. The result was this satellite for collecting information about the ionosphere and cosmic rays, and a milestone in the era of international co-operation in the exploration of space. The "paddles" are covered with solar cells to convert sunlight into electrical power. The probes on the long booms to left and right test the electrical state of the upper atmosphere ; the knob in front of the satellite collects data on the cosmic rays.

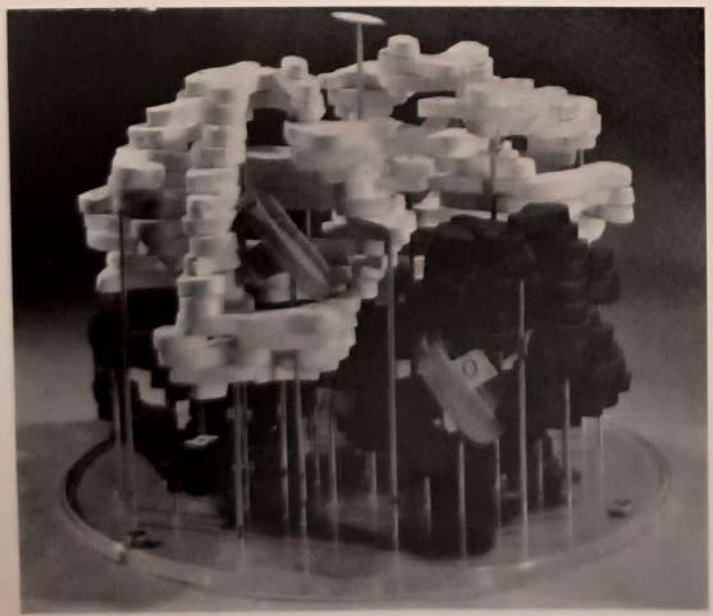


(Photo by courtesy of the United Kingdom Atomic Energy Authority)

The Dounreay Experimental Reactor Establishment

Britain has embarked upon a large programme for generating electricity from nuclear power. At present, power stations are being built on the basis of the "Calder Hall" concept. But nuclear power stations of the 1970's may well be based on the experiment going on within this huge steel sphere at Dounreay on the north coast of Scotland. It is a large-scale experiment on the "fast breeder reactor", in which the reactor itself is very small, and non-fissile material can be turned into useful nuclear fuel at the same time as the reactor is producing heat.

(Photo reproduced by permission of A. F. Cullis, H. Muirhead, M. F. Perutz, M. G. Rossman, and A. C. T. North, Proc. Roy. Soc. London)



Haemoglobin Molecule

The picture shows a model of the red protein molecule, haemoglobin, that is found in the red blood cells and carries oxygen around the body. This piece of chemical sculpture has been elucidated by Dr. M. F. Perutz at Cambridge after many years of experiment and frustration. He shot x-rays through haemoglobin, studied the pattern of scattering of the x-rays and fed the measurements into a computer: the model is a result. The real molecule contains about 10,000 atoms.

The Influenza Virus

Recently, there has been remarkable progress in the study of viruses which cause a wide variety of diseases. Side by side with the development of new vaccines and anti-viral drugs have been fundamental studies on the chemistry, genetics, etc., of viruses. The majority of viruses are too small to be seen in the ordinary light microscope, and can only be seen in the electron microscope. Final magnifications of over one million times can be obtained from pictures taken on the electron microscope. Viruses appear to be seen as spheres, rods, polyhedra, tadpole-like structures and brick-shaped particles.
Particles of influenza virus are roughly spherical in shape, showing well-defined surface projections. The particles release a coiled inner structure containing the infective genetic material once the 'spiky' coat has been disrupted.
(R. W. Horne and A. P. Waterson, Cambridge.)

The SR. N2 Hovercraft

The idea of the Hovercraft—a vehicle riding on a cushion of air—has been quickly translated from an experimental version into a practical operating passenger craft. The essential idea is a downward-acting jet of air right round the bottom of the craft to make an invisible wall to contain the air cushion.
The craft illustrated is the SR.N2, designed and manufactured by the Saunders-Roe Division of Westland Aircraft Ltd., as a joint venture with Hovercraft Development Ltd.
The 27 ton SR.N2 is fitted with four 815 h.p. Blackburn Nimbus gas turbine engines and can cruise at 80 m.p.h. with 66 passengers, up to a range of 200 miles. It will be used on experimental routes to prove its operating capabilities.

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Chelmsford County High School, Essex
Canterbury County Technical School, Kent
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Calder High School, Liverpool
Cheadle County Grammar School for Girls, Cheshire
Chosen Hill School, Churchdown, Gloucestershire
Caerffili Girls' Grammar School, Glamorgan
Cranley School, Edinburgh

Devonport High School for Boys, Devonshire
Duncannon High School for Girls, Co. Tyrone
Dyffryn Grammar School, Glamorgan

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Farnborough Grammar School, Hampshire

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Gordon Schools, Huntley, Aberdeenshire
Grove Academy, Dundee
Gainsborough High School, Nottinghamshire
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Hove County Grammar School for Girls, Sussex
Holy Cross Academy, Edinburgh

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Knightswood Secondary School, Glasgow
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King Edward's School, Birmingham, Warwickshire
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Kesteven & Grantham Girls' School, Kesteven, Lincolnshire
King Edward VI Grammar School, Stafford, Staffordshire

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Long Eaton Grammar School, Derbyshire
Lawside Academy, Dundee
Leeds Girls' High School, Yorkshire
Lewis School, Pengam, Monmouthshire
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Leeds Grammar School, Yorkshire
Lewis School for Girls, Hengoed, Glamorgan
Leith Academy, Edinburgh

Morgan Academy, Dundee
Merchant Taylors' School, Crosby, Lancashire
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Northampton School for Girls, Northamptonshire
Neath Boys' Grammar Technical School, Glamorgan

Orton Longueville Grammar School, Huntingdonshire

Peterhead Academy, Aberdeenshire
Penzance Girls' County Grammar School, Cornwall
Poole Grammar School, Dorset
Peter Symond's School, Winchester, Hampshire
Plympton Grammar School, Devon
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Retford County High School, Nottinghamshire
Roedean School, Sussex
Royal High School, Edinburgh

Spondon Park Grammar School, Derbyshire
St. Mungo's Academy, Glasgow
St. Austell Grammar School for Boys, Cornwall
St. Austell Grammar School for Girls, Cornwall
Sexey's Boys' School, Bruton, Somerset
Stratton School, Biggleswade, Bedfordshire
Stretford Grammar School for Girls, Lancashire
Spalding High School, Lincolnshire
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Totnes High School, Devonshire
Trinity Academy, Edinburgh
Tynecastle School, Edinburgh

Wisbech High School, Cambridgeshire
Whitley Bay County Grammar School, Northumberland
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Worldfriends and the British Association would like to express their sincere thanks to the Education Authorities, School Heads and Science Staff who have made participation possible.

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Announcements

Present plans are for the Fifth Science Fortnight to take place in July 1963.

Arising out of the success of the Science Fortnight, Worldfriends has arranged with the Corporation of the City of Bristol to hold an INTERNATIONAL YOUTH INDUSTRIAL FORTNIGHT in Bristol during 1963 covering technology, science and design. Requests for information should be addressed to Worldfriends, 308 Earl's Court Road, London, S.W.5.

UNESCO has sponsored a report on the Science Fortnight and copies can be obtained from Worldfriends post free.

Our grateful acknowledgements and thanks are due to:—

The industrial concerns and research establishments which have invited groups to visit them during the Fortnight. Without their co-operation the Science Fortnight could not have taken place.

The Education Committee of the Federation of British Industries for their help in augmenting the programme of visits.

The Speakers, Lecturers, Discussion Group Leaders and others not mentioned in the Programme for their interest and help.

The President and Council of the Institution of Electrical Engineers who have most generously given the hospitality of their premises.

The London Transport Executive for their consideration and help at all times. In countless ways they have contributed to the success of the Fortnight. To Mr. H. Dennis and Mr. T. H. Trussler goes our especial gratitude.

Unilever Ltd., The Shell International Petroleum Co. Ltd .,The Gulbenkian Foundation, Bovril Ltd. and others wishing to remain anonymous who have made donations to the Science Fortnight funds, and thus facilitated the months of preliminary planning.

The Shell International Petroleum Co. Ltd. for offering the Council and Administrative Committee the use of their Committee Room for meetings.

The Ford Motor Co. Ltd., Rank Precision Industries Ltd., and Hoover Ltd., who donated Souvenir Programmes in 1959, 1960 and 1961 respectively.

Schweppes Ltd., for the generous gift of this fine Souvenir Programme.

English Electric Co. Ltd. who have agreed to print the Science Fortnight Report.

The World Friendship Federation for obtaining a grant from UNESCO for a Science Fortnight Report.

Mr. K. A. Harder, D.F.C., Assistant General Secretary of Worldfriends, for his help in arranging the return visits abroad.

Letter from Sir Frederic Hooper, Bt.

The older I become, the more do I admire the young people of today. Indeed, my company is about to record some stories of their enterprise and skill in a book—PROSPECT—to be published this Autumn. Our production of this book, and of this present Programme, is just part of the tribute we gladly pay to the Youth of 1962.

Frederic Hooper,
Managing Director
Schweppes Ltd.

June, 1962.