THIRTY NINTH

LONDON INTERNATIONAL YOUTH SCIENCE FORUM

1997

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Founded by the late Philip S Green, MBE in 1959, the Science Forum aims to give a deeper insight into Science and its applications for the benefit of all mankind and to develop a greater understanding between young people of all nations.

10 DOWNING STREET
LONDON SW1A 2AA

THE PRIME MINISTER

I am very pleased to welcome all young scientists to the International Youth Science Forum and I wish you an enjoyable stay here in London.

In taking part in the Forum, you are demonstrating a quality that will be invaluable throughout your life. A curiosity about the world around us, coupled with the urge to replace ignorance with knowledge, is vital to the pursuit of both science and travel.

By choosing to pursue your interest in science, you have shown an awareness of the fascinating and vital role science plays in all our lives. And by coming to the United Kingdom and perhaps also studying a foreign language, you have shown an eagerness to explore other cultures, languages and peoples. Linked to your desire to understand the scientific nature of the world, you will be better prepared than many people to meet the challenges of the future and the next Millennium.

During the two weeks of the Forum, you will have the opportunity to meet and spend time with many young scientists from around the globe. I hope you will take advantage of this chance to share ideas, make friends and learn more about the ever-expanding world of science.

John Major

January 1997

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British Council

The British Council

The British Council is the principal sponsor of international participation.

This list was based on attendance at the London International Youth Science Forum in 1996.

LONDON INTERNATIONAL YOUTH SCIENCE FORUM 1996

The following countries were represented

Albania
Australia
Austria
Bahrain
Bangladesh
Belgium
Brazil
Bulgaria
Canada
Colombia
Croatia
Cyprus
Czech Republic
Estonia
France
Fyrom
Germany
Greece
Grenada
Guatemala
Guernsey
Hong Kong
Hungary
India
Indonesia
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kenya
Korea
Kuwait
Latvia
Lebanon
Liechtenstein
Lithuania
Luxembourg
Malaysia
Malta
Namibia
New Zealand
Norway
Oman
Peru
Philippines
Poland
Portugal
Puerto Rico
Romania
Russia
Sierra Leone
Singapore
Slovakia
South Africa
Spain
Sweden
Switzerland
Taiwan, ROC
Thailand
Trinidad & Tobago
Tunisia
Turkey
United Kingdom
United States of America
Venezuela
Yakutsk Republic
Zambia

ACKNOWLEDGEMENTS

The Science Forum offers its thanks to all those who so generously assisted in the planning and preparation of the 1997 meeting, and in particular to:

The Institution of Electrical Engineers for providing its premises and facilities for lectures and seminars.

The Lecturers and Speakers whose contributions are invaluable.

The Academic, Commercial and Industrial Organisations, Research Establishments and Museums which have arranged Visits and Lectures.

RTZ-CRA for its generous support and particularly for the donation of this programme booklet.

The Wardens, Bursars and Staff of College Hall, International Hall and Nutford House where participants are accommodated.

Chef in a Box Ltd, and Michael Warner for assistance with catering arrangements.

Capital Group Travel, and Peter Campling for coach transportation.

Jim Green for sound systems and programmes at the Welcome and Farewell Discos.

Courtwood Film Service Ltd and Jill Newby for group photograph processing.

British Airways plc for its generous assistance with travel facilities for participants from a number of overseas countries.

ICI Group R&T Affairs and ICI Paints Division for their generous sponsorship of overseas participants.

Engineering & Physical Sciences Research Council, Fife Industry Committee, ICL, plc, 3M Healthcare, Pfizer Ltd, Pilkington plc, Roche Products Ltd for their sponsorship of participants from the United Kingdom.

The schools, colleges and Local Education Authorities which nominate candidates from Britain to attend the Science Forum and the industrial, commercial, foundation and charitable sources which sponsor them, notably the International Contact Trust.

The British Association for Central & Eastern Europe for its support and assistance with recruitment.

The British Council, the principal sponsor of overseas participants, for its generous support, assistance and unfailing courtesy in so many countries, where participation is made possible through its involvement.

Gene Shaw of New York for the photograph on page 9, and Hendryk Mohnfeld for various photographs of speakers throughout the booklet.

All those who have assisted, and who are not included in this list, whose support has made the organisation of the Science Forum possible.
(List compiled 7 February 1997)

UNIVERSITY OF CAMBRIDGE
DEPARTMENT OF CHEMISTRY
Lensfield Road
Cambridge CB2 1EW

Brian F. G. Johnson FRS
Professor of Inorganic Chemistry (1970)

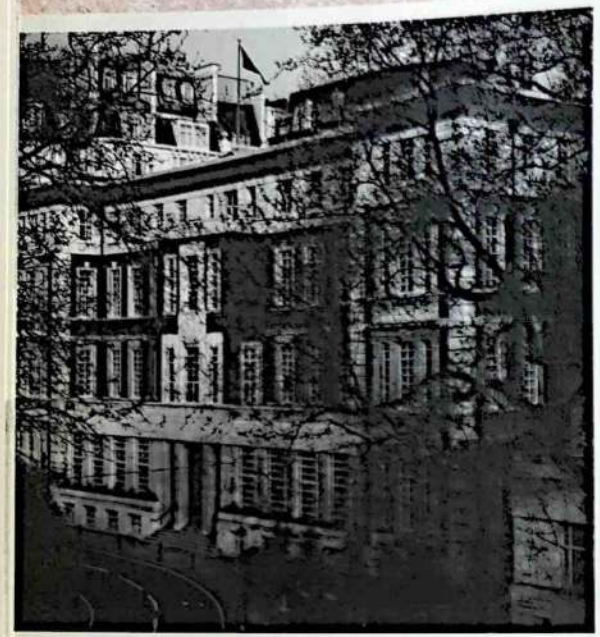
Like all simple, successful ideas, the Youth Science Forum seems to have been around for ever. Imagine, a meeting of young scientists from all over the world to discuss modern concepts and ideas with experts from a wide range of disciplines. Sounds good, doesn't it? And it is good.

As I welcome you to the 1997 Science Forum, I know you will be delighted by the contacts you will make; be stimulated by the lectures you will attend; and excited by the places and demonstrations you will visit.

Welcome to Great Britain, enjoy yourselves and learn from this unique experience. I look forward to greeting all of you in July, 1997.

Brian F G Johnson
President
London International Youth Science Forum

PROGRAMME VENUES



Institution of Electrical Engineers
Savoy Place
London WC2
(Venue for Principal & Specialist Lectures and Seminars)

University College London
Mortimer Street/Newman Street
London WC1
(Venue for Specialist Lectures & Seminars)

Carisbrooke Hall
Seymour Street/Edgware Road
London W2
(Venue for Social Events)

HALLS OF RESIDENCE

COLLEGE HALL
Malet Street
London WC1E 7HZ
Tel: Int +44 (0)171 636 8982
Fax: Int +44 (0)171 636 6591

Science Forum Host:
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INTERNATIONAL HALL
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London WC1N 1AS
Tel: Int +44 (0)171 837 0746
Fax: Int +44 (0)171 278 9720

Science Forum Host:
Tom Ingram

NUTFORD HOUSE
Brown Street
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Tel: Int +44 (0)171 723 5020
Fax: Int +44 (0)171 258 1781

Science Forum Host:
James Weir

LONDON INTERNATIONAL YOUTH SCIENCE FORUM 1997

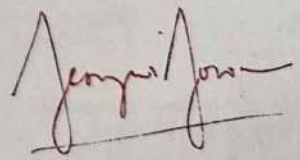
We're not trying to ***teach*** you anything at the *Science Forum* . . . but we think you will ***learn*** a lot!

During your two weeks in London you will meet other science students – like yourself – from about seventy countries. It is doubtful that you will ever again live in such a truly international community. For two weeks you will have opportunities to see the application of scientific techniques in industry and research – at first hand. Contrast that with the theoretical manner in which science has been revealed to you during your education. You will also hear presentations from some thirty scientists from more than ten countries – a third of these speakers were – like you – in their time participants at the Science Forum.

So, this is your chance, to look and to learn, to listen and to learn. The science will be exciting but don't be surprised if your main area of learning is about ***yourself.*** Living in such an international community will inevitably mean that you will be exposed to cultures and customs to which you are unaccustomed. In turn you will find yourself explaining your attitudes. You won't always agree with other participants! You should, however, learn to ***respect*** their point of view. After all, if you can't accept their views, what right do you have to expect others to respect ***your*** opinions? Think carefully about whether what you previously accepted as fact, might have another interpretation, and might, in reality, be simply an opinion or an assumption.

Once again, the Science Forum doesn't set out to teach you anything new. We do hope that the programme will help improve your perspectives. What you will learn and what you will retain from your visit to London will be decided by you. Your recollections and your lasting impressions will be of the people you will meet, and in your assessment of them you might find it helpful to be able to . . .

*'. . . trust **yourself** when all men doubt you*
*But make allowance for **their** doubting too.'*



George McGowan
Director
London International Youth Science Forum

PROGRAMME OF EVENTS

Wednesday, 23 July
Arrivals
Welcome & Orientation in Halls of Residence

Thursday, 24 July
10.00 Introductions & Programme Briefing*
11.00 OPENING CEREMONY*
14.15 Lecture/Demonstration*
'Hello, Who have we here?'
20.00 Welcome Disco at the Carisbrooke Hall

Friday, 25 July
Half Day Visits to Research & Industrial Establishments
15.00 Lecture/Demonstration*
'Egyptian Mummies: What, Why, Who & How?'
20.00 Student Topics at College Hall

Saturday, 26 July
10.00 Lecture/Demonstration*
'Colour is Fun'
14.15 Optional Half Day Panoramic Sightseeing Tour of London
17.30 Inter Hall Swimming Gala
Optional Theatre Visits

Sunday, 27 July
09.00 Optional Day Excursions to
(a) Stonehenge and Salisbury
(b) Portsmouth
20.00 Feature Film in College Hall:
'Some Like it Hot'

* *at the Institution of Electrical Engineers Savoy Place, London WC2R 0LB*

Monday, 28 July
10.00 Specialist Lectures*
14.15 Lecture/Demonstration*
'Haematology & Transfusion Medicine'
20.00 Student Topics at College Hall

Tuesday, 29 July
Day Visits to Research & Industrial Establishments
21.00 Topics for Tonight
(Informal discussions in Halls of Residence)

Wednesday, 30 July
09.15 Group Photograph at the Natural History Museum
10.00 Visits to Scientific Museums
14.15 Seminars
20.00 Lecture/Demonstration*
'Michael Faraday Lives'

Thursday, 31 July
08.00 Day Visit to Oxford and Cambridge
Morning: Visits to University and Research Establishments
Afternoon: Free

Friday, 1 August
10.00 Specialist Lectures*
14.15 Lecture/Demonstration*
'Chemistry and Light'
20.00 International Cabaret at Carisbrooke Hall

Saturday, 2 August
10.30 Lecture/Demonstration*
'Musical Squares'
14.15 Inter Hall Rounders Match in Regent's Park
Optional Theatre Visits

Sunday, 3 August
09.00 Optional Day Excursions to
(a) Hampton Court & Windsor
(b) Canterbury
20.00 Feature Film in College Hall
'Blazing Saddles'

Monday, 4 August
10.00 Seminars
(introduced by former participants)
14.15 Lecture/Demonstration*
'What does it mean to see?'
20.00 *'Songs of Home'*
Folk Songs in Nutford House

Tuesday, 5 August
10.00 Participants' Forum*
14.15 Lecture/Demonstration*
'Immunological Approaches to Cancer Diagnosis and Management'
16.15 CLOSING CEREMONY*
20.00 Farewell Disco at the Carisbrooke Hall

Wednesday, 6 August
Departures

PRINCIPAL LECTURES & DEMONSTRATIONS

Thursday 24 July — 11.00 OPENING CEREMONY

Presiding
Professor Brian F G Johnson, FRS
President London International Youth Science Forum

Thursday 24 July — 14.15 *'Hello, Who have we here?'*
Dr David Lowe, MD, FRCS, FRDPath, FIBiol
Department of Histopathology
St Bartholomew's Hospital Medical College, London

In forensic medicine, the full identification of human tissues and secretions needs input from many scientific services. These include biochemistry to identify proteins, molecular biology to investigate DNA, haematology to type bloodstains and histopathology to show a microscopic picture of the tissues and allow them to be examined for damage by poisoning, drowning, strangling and other untoward events. The most basic variable is the sex of the patient.

Relatively simple examination of bones has allowed us for years to distinguish the remains of human beings from those of other animals and to determine the sex, weight and approximate height of a person, whether alive (using x-rays) or deceased. Some of the person's life history may also be apparent. New techniques of DNA fingerprinting permit almost certain identification of a person from any secretion that contains cells. It is now easier than ever to tell a man from a woman.

The ways of identifying a person will form the basis for discussion and the practical session will include examples of bones, x-rays and DNA analyses for participants to try their detective skills. The six ways of defining sex will become apparent.

Friday 25 July — 15.00 *'Egyptian Mummies: What, Why, Who and How?'*
Dr Ron Snaith, BSc MA PhD
Department of Chemistry,
University of Cambridge

The lecture begins by describing how the speaker (a chemist by training) first became interested in Egyptology, in the restoration and conservation of antiquities, and in particular in the study of mummies. Examples of his early restoration work are shown, and the rather simple chemistry employed is discussed briefly. The talk goes on to try to answer questions about Egyptian mummies: what is a mummy; why did the Ancient Egyptians have themselves mummified after death and how was this done, chemically what scientific methods can be used to investigate mummies and what information can be gained by this? Answering these questions involves some chemistry, but also history, symbolism, medicine and pathology. The lecture closes by considering what has happened to Egyptian mummies: although hundreds of thousands of them were 'made', relatively few of them have been found, let alone found intact. Despite its rather (to some) macabre subject, overall the lecture is meant to be quite humorous.

Saturday 26 July — 10.00 *'Colour is Fun'*
Dr Arthur Tarrant, PhD FInstP FCIBSE CPhys CEng
Honorary Fellow
University of Surrey
Assisted by John Webb

The precise specification of colour is vital to many branches of industry, and particularly to the consumer industries. We have to be able to specify colours with tolerances, just as we have to specify engineering dimensions with tolerances. But colour is not just a physical quantity like the diameter of a shaft; it is a psycho-physical phenomenon which occurs as our eyes and brain try to make sense of all the physical signals that come into them.

The lecture will describe the processes by which a specification of colour can be achieved and will go on to examine some of the many factors that affect the appearance of colours. It will show how a plain technical problem of commerce can, on analysis, offer an intellectual challenge of the highest kind to scientists. Perhaps it will also convey something of the delight of the scientist who works in this fascinating field.

Monday 28 July — 14.15 *'Haematology and Transfusion Medicine'*
Dr Ricardo Marques da Costa, MD MCB*
Director: Blood Department
Hospital de Leiria, Portugal

Haematology was once defined as 'the science that studies blood, and all the organs it irrigates', which is perhaps the best definition of the scope of this medical speciality which had its birth about two decades ago.

In some countries the science of studying blood is already divided to deal with two separable domains: while Haematology deals with the normal and abnormal formations of blood and its components and with the treatment of diseases originating in the several elements that constitute this tissue, Transfusion Medicine deals with the problems involved with the interchange in man, of whole blood or any of its components.

Both of these medical areas have recently seen advances in terms of the understanding of the basic mechanisms that regulate cell growth and the maintenance of the normal cellular functions. One of the processes that has gained wide acknowledgment is that of bone marrow transplantation, which implies knowledge of both these specialities.

A brief overview of the constitution of blood and the explanation of some of the most up to date forms of diagnosis and treatment specific to diseases that have to do with blood will be presented.

Wednesday 30 July — 20.00 *'Michael Faraday Lives . . .*
The Excitement of Chemical Demonstrations'
Professor Ronald Ragsdale, BA MS Phd
Dr Jerry Driscoll, BS MS PhD
Department of Chemistry
University of Utah, United States of America

Michael Faraday, a gifted lecturer, set the standard for all of us to aspire. He opened the world of science to the general public through lectures which were filled with demonstrations of the wonders of nature. Faraday did all he could to urge his listeners to see and judge for themselves, to experiment – to question nature directly – whenever they discovered something out the ordinary. We strongly advocate the hands on approach to the study of science. Our lecture will convey the importance of illustrating chemical and physical phenomena with dynamic demonstrations. The audience will be involved in making observations, drawing hypotheses, and developing theories to respond to questions raised by the spectacular demonstrations. The hand is not faster than the eye, so the Science Forum participants will discover answers to many chemical phenomena. By the conclusion of the lecture, the audience will agree with us that chemistry is both exciting and exhilarating. Woven into the lecture will be vignettes of Michael Faraday, Joseph Priestley and Ira Remsen.

Friday 1 August — 14.15 *'Chemistry and Light'*
Professor Andrew Mills, BSc PhD MRSC CChem
Dr Peter Douglas, BSc PhD
Department of Chemistry, University of Swansea

The aim of the lecture is to increase the awareness of the audience of the importance of photochemistry in our modern world. The lecture begins with a series of illuminations to show how light may be generated electrically, thermally and chemically. In some cases light can generate light and this is demonstrated by the luminescence of everyday objects such as plastics, powders and drinks. We then look at the uses of chemistry and light and highlight its application in medicine, communications, electronics, photography and plastics through a series of demonstrations. Finally we consider ways in which sunlight, an alternative source to fossil fuels, can be converted into electricity or a chemical fuel with *state of the art* devices.

Saturday 2 August — 10.00 *'Musical Squares'*
Dr Mike Gluyas, BSc PhD and
Mrs Wendy Gluyas, BA CertE DipTEFL

'Musical Squares' is a scientific 'fun' lecture which is packed with sound and visual illustrations.

The lecture explores many exciting aspects of sound and examines the vital role that it plays in our everyday lives – from communications and the production and enjoyment of music, to its medical and industrial uses. Covering the whole range from infra-sound to ultra-sound, the physical properties of sound are highlighted to illustrate its importance both to human beings and in the animal kingdom. The amazing capabilities of the human ear are discussed and demonstrations of ways in which our ears may deceive us are given. The causes and effects of various types of deafness are considered and 'lie detection' tests are presented which will reveal people who are feigning deafness!

Colour slides, music, sound effects, the sounds of animals – and even the internal sounds of the human body – are used throughout the lecture to highlight the features and uses of sounds and hearing! Several 'on the spot' experiments and demonstrations are performed and some of these involve the participation of (volunteer) members of the audience.

Monday 4 August — 14.15 *'What does it mean to see?'*
Amir Raz, MSc
Hebrew University of Jerusalem, Israel

Most of our ideas about the world and our memory of it are based on sight. How do we see? How do we perceive the movements of objects in space? How do we distinguish colours? Studies of artificial intelligence and of pattern recognition by computers have made us realise that the brain recognises movement, form and colour using strategies that no existing computer begins to approach. Simply to look out into the world and recognise a face or enjoy a landscape entails an amazing computational achievement, more difficult than that required for solving logic problems or playing chess. Vision is the process of discovering from images what is present in the visual world and where it is. It turns out that these two tasks, identifying what and where, are carried out by distinct anatomical pathways. Furthermore, it has recently become clearer that visual processing involves parallel pathways rather than one serial pathway. This lecture will attempt to demonstrate how insights into the visual cortex, mechanisms of visual attention and neural integration teach us a great deal about why some blind individuals can actually see and how we can use our scientific knowledge to concede visual illusions and magic tricks. 'Believe nothing that you see and half of what you hear!'

Tuesday 5 August — 14.15 *'Immunological Approaches to Cancer Diagnosis & Therapy'*
Professor Richard O'Kennedy, BSc PhD MIBiol MIBiolI DipFS DipCS*
Head of School of Biological Sciences
Dublin City University, Ireland

The immune system is a vital part of the body's defence mechanism, that detects and destroys disease and removes *worn out* components. Recent advances in research on cancer have highlighted the role that the immune system plays in the detection, development and elimination of tumour cells. This lecture will examine these studies and describe how we can use components of the immune system to detect, localise and destroy malignant cells and tissues. For example, scientists have now managed to manipulate the immune response so that antibodies can be produced, labelled with drugs, toxins or pharmaceuticals and targeted to tumours. It is also possible to produce a range of antibody derivatives that may provide novel ways of detecting and treating cancer. New sensors are also under construction that allow the detection of tumour-related molecules, secreted by cells, which have been characterised and may act to destroy or inhibit tumour growth. By combining basic knowledge of the molecular events occurring in cancer development and immunological approaches the potential for understanding and treating cancer can be greatly increased.

16.15 CLOSING CEREMONY

**Former participant of the London International Youth Science Forum*

SPECIALIST LECTURES

These Lectures take place at
The Institution of Electrical Engineers (IEE)
or at University College London (UCL) as indicated

Monday 28 July — 10.00

Lecture A, IEE — *'Exploration of the Solar System'*
Professor Alan Johnstone, BA MSc PhD
Mullard Space Science Laboratory, University College London

Over the last 30 years most of the large bodies of the solar system have been visited by spacecraft from Earth. They have revealed a richness and variety of worlds which are fascinating in their own right but which, when compared with the Earth, help us to understand much better our own place in the Universe. Amongst the discoveries there have been many new planetary satellites, volcanoes, both alive and dead; massive canyons, hostile atmospheres; methane seas; and radiation almost as intense as in the heart of a nuclear reactor. I will review these discoveries and attempt to draw some conclusions about their implications for the Earth.

Lecture B, UCL — *'Elementary, my dear Watson'*
Martin L Perkins, MA(Oxon) CMaths FIMA FRSA
Senior Master and Head of Mathematics
St Olave's Grammar School, Orpington

'Mathematics' said Bertrand Russell 'may well be defined as the subject where we do not know what we are talking about, neither whether what we are saying is true.' In this lecture we shall be considering together the roles of logic and other rational processes in extending and confirming our knowledge. We will cover reasoning and inference – how much we can safely assume? – looking at formal methods and the contributions of John Venn and Lewis Carroll. We shall look at the differences and similarities between scientific proof and mathematical proof and examine more closely some methods of proof. We shall consider deduction, induction and proof by contradiction, for, as Sherlock Holmes would remind us, 'when you have eliminated the impossible, whatever remains, however improbable, must be the truth'.

Approximations to the truth, and even lies, will lead to a consideration of fallacies, false proofs and paradoxes, starting with the Greeks such as Zeno and Epimenides and coming through to the twentieth century and Russell. We shall include in our discussion logical paradoxes, paradoxes of the infinite and visual paradoxes. As Tweedledum remarked: 'Contrariwise, if it was so, it might be, and if it were so, it would be; but as it isn't, it ain't. That's logic.'

Lecture C, UCL — *'Ecstasy or Agony? Potential Neurotoxic Effects of the Psychoactive Drug Methylenedioxymethamphetamine (MDMA)'*
Dr Marcus Rattray, BSc PhD
United Medical & Dental Schools, Guy's & St Thomas's Hospitals

The psychoactive drug 'ecstasy' (methylenedioxymethamphetamine) is a widely used illegal substance, but the consequences of its effect on people are not well known. Over the past decade, evidence has accumulated from studies on animals that this drug may be a potent neurotoxin. Upon administration of between four and eight high doses of the drug the level of a chemical, serotonin, drops to very low levels. Nerves which contain serotonin become broken and abnormally swollen. Since many thousands of young people regularly use this drug, it is clearly important to determine what the long term effects actually are.

In this presentation, I will describe the way in which ecstasy is thought to produce its psychoactive effects, and how the drug may cause death of nerve cells. As well as introducing the role of the chemical neurotransmitter serotonin, in the function of the brain, my presentation will include details of recent work from my own laboratory, where we study the ways that drugs influence the activation of genes in specific types of nerve cells. I will also discuss the problems and similarities of extrapolating findings from animal studies to humans.

Lecture D — *'Fossils, Evolution, and the Origin of Species'*
Dr Peter R Sheldon, BSc PhD FGS FLS
Department of Earth Sciences, The Open University, Milton Keynes

Fossils – the remains of ancient animals and plants – give us an historical perspective on evolution that cannot be obtained from a study of living organisms alone. Fossils are more easily found than most people realise and, unlike most progress in science today, significant discoveries are often made with little more than a hammer and chisel. The lecture will begin with illustrations of a wide range of fossils, and we shall see how organisms often get preserved in rocks for hundreds of millions of years.

One of the hottest debates in evolutionary biology concerns the pattern of change by which new species evolve from their ancestors. Until the mid-1970's it was generally believed that if a fossil record was complete we would see a continuous series of gradual changes between successive forms of life. The theory of punctuated equilibrium challenged this picture of gradual evolution. It was proposed that evolution took place in remarkable jumps, with new species appearing suddenly and then persisting with little or no change before becoming extinct. We will look at some of the latest evidence in this debate, including work on tribolites, beautiful extinct marine creatures distantly related to the crabs and lobsters of today. A recent general model suggests a surprising relationship between patterns of evolution and different environments.

We will end by discussing a variety of intriguing mysteries of evolution that remain to be solved in the years ahead.

These Lectures take place at
The Institution of Electrical Engineers (IEE)
or at University College London (UCL) as indicated

Friday 1 August — 10.00

Lecture E — UCL
'Watching Proteins at Work: A Look at Molecular Machines in Biology'
Dr Alan Berry, BSc, PhD
Department of Biochemistry & Molecular Biology, University of Leeds

Although we use static representations to describe and display the structure of a protein, real protein molecules are highly dynamic. This lecture will look at the motions that protein molecules undergo and will relate them to the function and fundamental properties of proteins. I will describe movements ranging from simple bending and stretching of bonds, through the opening and closing of enzyme active sites by movements of loops, to changes in the whole protein structure and will finally look at movements of whole proteins within protein complexes. We will look at how these motions are fundamental to a wide variety of processes such as the activity and control of enzymes, the binding of oxygen by haemoglobin, the folding of growing polypeptide chains and in the production of ATP. Protein dynamics therefore holds the key to protein function. It is now becoming clear that a change in protein motion is also a critical feature of several disease states, including the highly topical amyloid diseases such as BSE. Through recent research into protein dynamics of amyloidogenic proteins we hope to develop novel therapies for these diseases.

Lecture F — IEE
'To Die or Not to Die?'
Dr Frances M B Calman, MB BS FRCP FRCR
Guy's & St Thomas's Cancer Centre, St Thomas's Hospital, London
and Dr John Ellerenshaw, MB BCh MRCP
Liverpool Marie Curie Centre

Throughout history, the physician's guiding rule, which is central to the essential doctor-patient relationship, is that he should 'first do no harm'. Medical care is directed towards sustaining and supporting life, even within the severe limitations of chronic disablement or a terminal illness.

Increased patient participation in medical and ethical decisions, in some countries spearheaded by a young and articulate Aids patients' lobby, has led to a re-examination of the traditional philosophies. In the Netherlands, physician-assisted death is now condoned in hopeless terminal illness. In the United States of America, many patients carry Advance Directives, clearly setting out what resuscitation and support measures are acceptable to the patient. In both the United Kingdom and America the law has allowed the withdrawal of life support from patients whose existence has been perceived to be meaningless.

We will examine some of the ethical, philosophical and practical arguments for and against active euthanasia, and discuss where we as patients and as future physicians and scientists stand in the debate.

Lecture G — IEE
'From Oil Barrel to Market Place - The Role of the Chemical Industry'
Dr David Parker, CChem FRSC
ICI Group R&T Affairs

In this presentation I propose to demonstrate the various ways in which raw materials derived from oil are transformed into products recognised in the market place. Products such as the clothes we wear, the food we eat and our methods of transport all depend on chemicals derived from oil.

However, recognition is given not just to the chemistry involved in the various transformations, but also the role played by process technology, with particular emphasis on the importance of catalysts and catalytic processes.

Routes to simple molecules, such as methanol and ammonia will be covered, followed by a discussion of the important raw materials for films and fibres - polyethylene terephthalate (polyester). The lecture will be concluded with a review of some recent developments in Agrochemicals and Pharmaceuticals linking these important 'final products' back to their raw material source.

This lecture has been arranged by ICI (Group R&T Affairs, Middlesbrough)

Lecture H — UCL
'Energy in the 21st Century'
Professor Trevor M Letcher, PhD FRSC CChem FRSSA
University of Natal, South Africa

Our present way of life is largely dependent on oil for transport and the production of electricity from oil, coal or nuclear fuel. Unfortunately, however, the oil reserves of the earth are being depleted, coal burning produces carbon dioxide and nuclear fuels are not accepted by everybody. What energy options do we have for the 21st Century?

The aim of the lecture is to investigate every form of energy available to us and to make a logical and informed decision on our energy future.

SEMINARS

These Seminars take place at
The Institution of Electrical Engineers (IEE)
or at University College London (UCL) as indicated

Wednesday 30 July — 14.15

Seminar 30/1 — IEE
'Marconi - a Dramatised Enactment'
Ralph Barrett, CEng, MIEE, MIERE

'It was a good road, the invention had taken life - the gunshot signalled the birth of wireless - Spark that changed the world - I was surprised no-one had thought of it before.' As a youth Guglielmo Marconi called himself the ardent amateur of electricity, and was soon sending messages the length of his parents' mansion, into the garden. To make use of the invention on ships, at the age of 21 he came to Britain, at the height of its maritime power. Signals across the Atlantic in 1901 brought worldwide acclaim, and success to his wireless company.

Guglielmo Marconi was born in Italy in 1874. This event is set in 1936, the year before Marconi died: a dramatised enactment with demonstration apparatus and illustrations of his life and achievements.

This year is the centenary of Marconi's in Chelmsford in England, the first wireless factory in the world.

Seminar 30/2 — UCL
'The Physiology of Human Behaviour: What is known and, What are the Parameters?'
Ariane Bazan, Bachelor in Biology
Ghent University Hospital, Belgium

Stimuli are continually produced by man's natural environment. Conceived by his sense organs, they eventually lead to a pattern of motor performance (eye, lip, and hand movements,) which we generally designate as 'behaviour patterns'. Associated events in the brain link these incoming (sensitive) and outgoing (motor) pathways. When neurons are activated simultaneously, they form a *network*, encoding sensitive information as a primary image of the perceived environment. Access is gained to previously encoded networks and the neuronal activity shifts to associative areas, resulting in a new representation of 'reality' via a process of 'internalisation'. For decades, psychologists approached cerebral events in terms of immaterial concepts. Nowadays, advances in neurobiology show that underlying tissue structures and physiological pathways are entirely responsible for bringing forth specific behaviour patterns to given stimuli. Three parameters determine the internalisation process.

1 Genes are responsible for setting the principal features of a general and individual pattern of neurological organisation.
2 During development, redundant neuronal and synaptical communications are eliminated via 'epigenesis through selective stabilisation'.
3 Finally, a memory of past experience will facilitate certain synaptical connections.

Seminar 30/3 — IEE
'Space Astronomy'
Dr Graziella Branduardi-Raymont, PhD
Mullard Space Science Laboratory, University College London

Scientists in virtually all branches of astronomy make use of instruments in space to learn more about the Universe. Space is a harsh environment, satellites go through tough ground preparations and are tested to the limit of destruction, to ensure they will survive launch and an extended life in orbit; precise ground calibrations are the key to the success of a satellite mission, if we are to disentangle with confidence the mysteries of the cosmos.

Once in orbit, reliable and frequent communications are the vital link by which commands are sent to configure the instruments for observations and useful data are retrieved. This is only the starting line for the space astronomer. The Universe is just beginning to unravel.

This is a fascinating, often personal, account of how space astronomy is carried out and of some of the most recent and exciting astronomical discoveries. The focus is on some of the most energetic, violent and exotic objects in the Universe. The most dense stars, where energy production is more efficient than in nuclear reactions; the explosive death of stars; the mysterious power house in the active, ever changing nuclei of galaxies; the immense energies stored in the hot gases embedding galaxies in clusters; ultimately, the origin and fate of the Universe.

Seminar 30/4 — IEE
'The Role of Nuclear Power in World Energy Requirements'
Harry A Cole, MIEE
Formerly of UK Atomic Energy Research Laboratory, Harwell

Present and future world energy requirements are discussed and compared with the world's current resources. The relationship between standards of living and energy consumption is considered and comparisons made between the richest and poorest countries in the world.

The political, economic, social, environmental and safety aspects associated with burning of fossil fuels (coal, oil, gas) are discussed and comparisons made with alternative forms of energy and the introduction of conservation measures.

Renewable energies (sun, wind, waves, etc) are introduced and an assessment made of their likely impact on future energy requirements. Energy density, reliability and predictability are discussed and comparisons made with the established sources of energy.

The present world nuclear power programme is reviewed and comparisons made between the installed nuclear generating capacities of various countries. Different reactor types are briefly discussed and an introduction given to the expressions 'nuclear fuel cycle', 'reprocessing', 'burn up', and 'plutonium production'.

The seminar ends with a discussion on nuclear accidents, waste disposal sites and the relationship between nuclear power and nuclear weapons.

Seminar 30/5 *'Water Use in Hill Slope Agroforestry Systems – Problems and Possibilities'*
UCL Nicholas Jackson, BA(Hons) MSc PhD
Institute of Hydrology, Wallington, Oxfordshire

In many parts of the Tropics, forests are being cleared or degraded at a rapid rate, mainly to satisfy the basic subsistence needs of poor rural communities. Monitoring studies in the Sahel and East Africa shows a considerable reduction in wood cover in the past thirty years. Fuel-wood provides 63% of the total energy consumption of developing African countries. One possible solution for the resulting problems of degradation and desertification is the use of multi-purpose tree species (MPT's) in agroforestry systems. These are able to fulfil several roles simultaneously – improving soil stability and fertility, providing shade, fodder and firewood.

The presentation will comprise data from field trials of agroforestry species in Israel and in Kenya, looking at potential uses of such species in improving productivity and water use efficiencies. The problems of implementing scientific recommendations at a local level will be discussed in the seminar.

These Seminars are conducted by former participants of the Science Forum and will take place at The Institution of Electrical Engineers (IEE) or at University College London (UCL) as indicated

Monday 10.00
4 August

Seminar 4/7 *'Research for Self Motivation'*
IEE Roongrueng Bhidayasiri, BEng AMIEE (participant in 1990)
Postgraduate Student, Imperial College of Science, Technology and Medicine, London

Research is a systematic investigation towards increasing the sum of human knowledge and the answer to human curiosity. Research is an intellectual process stimulated by an individual achievement motive, and may lead to one's own satisfaction. How can research improve our attitude in everyday life? What is the distinction between knowledge and belief? Procedures used in scientific research include experiment, measurement, relation, concepts and universal argument which can direct us to the art of reasoning, and be clear of limitations which our methods involve; and above all that we tread a path between the extremes of technological imperatives. Research is a good example of methodology and is essential for success not only to one who will become a great scientist but also to everyone planning a career in management.

Seminar 4/8 *'Chills, Sweats and Bed Nets'*
UCL Dr Rhian Hayward, BSc DPhil (Oxon) (participant in 1989)
Department of Zoology, University of Oxford

Parasitologists strive to understand the organisms that feed on living human beings. Many of the lethal, disease-causing bacteria, protozoans, worms and flukes appear poorly adjusted to their roles as parasites – why is it then that scientists repeatedly fail to eradicate the more prevalent tropical parasitic diseases such as malaria, schistosomiasis, leprosy and sleeping sickness?

Malaria is a fundamental parameter for and determinant of human history in subtropical and tropical regions. Two hundred million people are infected annually with the malaria parasite, *Plasmodium*. In this seminar we will explore the epidemiology of fatal human malaria and the pathology of disease. As the protozoan is constantly adapting to its environment we will also take a look at the strategies the parasite employs to evade the human immune response and enhance its transmission within the human populations.

The rapid emergence of multidrug resistant *Plasmodium* and mosquito vectors able to withstand recently developed insecticides suggests greater numbers of malaria cases in the next millennium and the reappearance of the disease in countries previously 'malaria free'. We will discuss the future possibilities for both parasite and vector control and the recent failure of malaria vaccine trials in Africa which highlights the enormous problems now facing scientists after centuries of research into the eradication of this disease.

Seminar 4/9 *'Drugs in Sport – Good or Bad?'*
UCL Dr Ewan Jack, BSc MB ChB (participant in 1989)
Glasgow, Scotland

The sporting world has been rocked by various drug scandals in recent times. Just how rife is drug abuse in the sporting world? What drugs can enhance your performance in the sporting arena and how safe are they? What 'natural' methods are used to improve sporting achievements and how safe are they? If we have the technology to improve the limits of human achievement why don't we use them? All of these questions will be presented and supported, if not answered ! See you there, sports dudes !!

These Seminars are conducted by former participants of the Science Forum and will take place at The Institution of Electrical Engineers (IEE) or at University College London (UCL) as indicated

Seminar 4/10 *'Rambling through Complex Protein Landscapes'*
IEE Mehul Khimasia, BSc ARCS (participant in 1990)
Postgraduate Student, University of Cambridge

Science is undergoing a revolution.

In life, we often find that the whole is greater than the sum of its parts – many examples of these complex systems come from biology. It is a fact that many new interesting problems in physics will arise from biological systems. It is already happening around us as physicists strive to understand biological systems, involving DNA, and forge links with bio-scientists.

Protein physics is no exception. One of the greatest problems in life is understanding the *HOWs, WHATs* and *WHYs* of proteins. Not only are they the building blocks of life but they are our invaders and defenders. Predicting their various shapes describes their function and enables us to combat diseases even more effectively. The problem is of great importance and should involve scientists from all disciplines in biology, chemistry and physics. Individually there is little headway in solving this problem, but together . . . well, the whole is greater than the sum of its parts!

We will discuss the issues behind protein science – the latest ideas in the *WHATs, HOWs* and *WHYs* – from a biochemical and physics point of view. The aim will be to get a broad view of the subject, illustrating how biology, chemistry and physics can work together.

Seminar 4/11 *'Waterworld in Current Life'*
IEE Lastyo Kuntoaji Lukito (Participant in 1993)
ST Bachelor in Environmental Engineering
Bandung Institute of Technology, Indonesia

In the Hollywood movie *'Waterworld'* the earth is pictured as drowning in sea water, bringing problems for human life. Currently water occupies over 70% of the earth's surface. It is essential to life and civilisation. Water is used for many domestic and industrial purposes, but it can also carry deadly organisms and toxic wastes as a result of pollution. The expansion of human population and its activities has increased the importance of water pollution control. For that reason, water conservation is essential, as is water protection, development and the efficient management and treatment of water resources.

Water Supply Engineering is a branch of Civil and Environmental Engineering, concerned with the development of sources of supply, transmission, distribution, and treatment of water. Water Treatment uses physical and chemical processes to make water suitable for human consumption and other purposes. Drinking water must be bacteriologically safe, free from toxic or harmful chemicals, and comparatively free of turbidity, colour, and taste-producing substances. Excessive hardness and high concentrations of dissolved solids are also undesirable. The treatment processes of greatest importance are sedimentation, coagulation, filtration, disinfection, softening and aeration.

In short, we will talk about the scientific and engineering journey of water from its source, through our daily activities and back to the environment. We will be focussing on the efforts made to minimise the decrease in water quality due to usage and pollution.

Seminar 4/12 *'Virtual Medicine: The application of artificial neural networks and virtual reality technology to medical diagnosis and treatment'*
UCL Dr Keith Martin, MA (Cantab) BM BCh (Oxon) MRCP
Addenbrookes Hospital, Cambridge

Medicine is changing. If it were possible to look twenty years in the future, would we recognise the process of medical training, the procedures of medical diagnosis or the mechanisms of medical treatment?

Artificial neural networks technology offers numerous possible advantages to medicine. Networks can learn by experience to recognise patterns and apply this 'knowledge' to novel situations. Already, networks exist which can diagnose the retinal changes in diabetes with an accuracy which rivals that of conventional human screening programmes. Yet they share some of the irritating, but some would say essential, idiosyncrasies of conventional doctors and they certainly make mistakes. We will look at the principles of neural network functions and how they can be applied to medical problems. Is it true that, although to err is human, to really foul things up needs a computer?

We will continue on a different but related voyage when we consider how virtual reality techniques are being embraced in medical training and treatment. From 'virtual eyes' in the training of ophthalmic surgeons to 'cyberpatients' in neurosurgery, the field is alive with potential, but will there ever be a substitute for 'the real thing?'

STUDENT TOPICS

Participants who wish to give a paper based on a project or investigation they have undertaken will be allocated a period during one of the sessions listed below. Papers will be grouped by category and a schedule giving summaries and details of presentation times will be circulated at the beginning of the Science Forum.

Friday 25 July	20.00	College Hall, Malet Street, London WC1
Monday 28 July	20.00	College Hall, Malet Street, London WC1

TOPICS FOR TONIGHT

Tuesday 29 July	21.00	**Informal discussions in Halls of Residence initiated by the Directors of the Science Forum**
COLLEGE HALL		***'Is freedom good for you?'*** Introduced by John Needle
INTERNATIONAL HALL		***'Who's in charge?'*** Introduced by George McGowan
NUTFORD HOUSE		***'Is this the end of human contact?'*** Introduced by Roberto Lenti

SOCIAL PROGRAMME

Thursday 24 July	20.00	Welcome Disco Carisbrooke Hall, Seymour Street, London W2
Saturday 26 July	17.30	Inter Hall Swimming Gala University of London Union, Malet Street, London WC1
Sunday 27 July	20.00	Feature Film: ***'Some Like it Hot'*** College Hall, Malet Street, London WC1
Friday 1 August	20.00	International Cabaret Carisbrooke Hall, Seymour Street, London W2
Saturday 2 August	14.15	Inter Hall Rounders Matches Regent's Park, London NW1
Sunday 3 August	20.00	Feature Film: ***'Blazing Saddles'*** College Hall, Malet Street, London WC1
Monday 4 August	20.00	*'Songs of Home'* International Folk Song Evening Nutford House, Brown Street, London W1
Tuesday 5 August	20.00	Farewell Disco Carisbrooke Hall, Seymour Street, London W2

HALF DAY SCIENTIFIC VISITS FRIDAY, 25 JULY

25/1 British Broadcasting Corporation, Television Centre

The visit will begin with an introductory talk on the structure of the British Broadcasting Corporation, followed by a general tour of the studios, viewing them from the observation galleries. The group will view the live transmission of the One O'Clock News, and it is hoped that the BBC's Science Correspondent will be able to meet the group.

25/2 City University, School of Engineering

CITY University

City University is situated to the north-west of the City of London. The School of Engineering teaches and conducts research in the main disciplines of engineering: Aeronautical, Air Transport, Civil, Mechanical and Electronics. It has excellent laboratory and computational facilities, including exceptional wind tunnel testing capabilities.

During the visit we will show examples of the way in which scientific principles are applied to engineering problems and in particular how stresses can be measured in aircraft structures and oil rigs. We will demonstrate some of our current research projects, focusing on aerodynamics and fluid flow, but also looking at some of our other projects, including work on robots. The importance of generating information for design engineering by testing models of major projects will be illustrated by examples from recent work we have been involved in. These include generation of power from the wind, high lift wing flows, or the wind effect on major urban developments.

25/3 English Heritage: The Ancient Monuments Laboratory

English Heritage is the Government adviser on the conservation of the built and archaeological heritage. It is also responsible for maintaining some 300 historic sites and buildings and for caring for collections associated with them. The Ancient Monuments Laboratory provides scientific and technical support to all aspects of the work of English Heritage.

There are three teams:

Conservation and Technology investigates artefacts from excavations to understand how they were manufactured and used, provide conservation support to the curators of the English Heritage collections and advise on the conservation of mural paintings and decorative finishes.

Archaeometry undertakes non destructive geophysical surveys of buried sites and co-ordinates scientific dating, principally by 14c and Dendrochronology.

Environmental Studies investigates past environment through pollen analysis, study of macro-botanical remains and soil micromorphology; animal husbandry is investigated through study of animal bones and human development and disease through human skeletal remains.

25/4 Imperial College of Science, Technology & Medicine, Department of Biochemistry

The visit will give an insight into exciting new developments in Biochemistry. The rapid progress which is being achieved in the subject is largely dependent on the development of sophisticated techniques for investigating and controlling biochemical reactions. You will view such research areas at Imperial College.

Laser Spectroscopy

Extremely fast energy transfer reactions within protein complexes are studied by laser technology. The capture of sunlight in photosynthesis is a major interest in this laboratory. In this process the initial energy transfer reactions involving chlorophyll molecules takes place in just femtoseconds (10^{-15} sec) and the process which produces electrical energy is completed in no more than picoseconds (10^{-12} sec). The speed of light and differences in the path length of laser beams are the basis for some of the techniques used.

Biochemical Pharmacology and Mass Spectrometry

The discovery of biologically active substances depends on techniques for their purification from biological sources, measurement of their physiological functions and exact determination of their identity. A group of scientists work together to make these discoveries at Imperial College. A range of pharmacological bioassays are in use and significant achievements have been made by the development of mass spectrometry equipment which exploits high field atom bombardment and electrospray techniques. The group has had many successes, including identification of the Enkephalins (the brain's natural opiates), the Asthma Factor (leukotriene D), differentiation including factor and human Calcitonin Gene Related Peptide.

25/5 Imperial College of Science, Technology & Medicine Department of Chemical Engineering & Chemical Technology

The Department of Chemical Engineering is one of the largest in the United Kingdom. There are 300 undergraduate students in the department who attend a four year course. There are also about 200 research students (MSc and PhD). The visit will be a general tour of the department. Some of the laboratories will be opened up for the visit and the pilot plant and computing facilities of the department will be shown.

25/6 King's College London, Department of Pharmacy

The work of a university pharmacy department is extremely varied. Drug substances must be analysed and assayed, formulated into medicines, packaged and tested for stability before being put on the market. New therapeutic substances from all sources are constantly being sought and tested in the laboratory. The multidisciplinary work brings together the various expertise of pharmacy, pharmacology, pharmaceutical chemistry, pharmacognosy and pharmaceutics, with additional input from toxicology and drug metabolism. The exhibition and demonstrations arranged will illustrate some of this varied work and include aspects involving the detection of drug misuse in sporting competition.

25/7 King's College London, Department of Biophysics

The work of the department covers a wide range in the area of cell and molecular biology. The main areas of interest include neurobiology, muscle and cell motility and the structure of aukaryotic genome in relation to expression of genetic material.

25/8 National Institute for Medical Research

The morning's programme will begin with an introduction to the function of the National Institute for Medical Research. Thereafter there will be a series of talks given by members of the scientific staff and an opportunity to visit the laboratories.

25/9 Royal Botanic Gardens, Kew

The Royal Botanic Gardens, Kew is primarily a botanical research institute. The central role is to ensure the better management of the Earth's environment by increasing knowledge and understanding of the plant kingdom.

The organisation has five departments:

The Living Collections Department which maintains at Kew and its satellite garden at Wakehurst Place, the largest and most diverse living plant collection in the world.

The Herbarium which is the repository of one of the largest collections of preserved plants in existence, and whose staff undertake research on plant classification and distribution.

The Jodrell Laboratory, which is a centre for taxonomy-related research on the anatomy, physiology, cytology, genetics and biochemistry of plants.

An Administrative Department and an Education & Marketing Department.

There is also a School of Horticulture which administers the Kew Diploma, a three year full time course offering a broad training in amenity horticulture. The aim of the course is to provide students with an opportunity to study scientific, technical and management subjects at first degree level, whilst gaining practical experience and responsibility working in this foremost botanical garden.

The visit to Kew will consist of a guided tour of part of the living collections.

25/10 Royal Naval College Greenwich, Department of Nuclear Science & Technology

The Department of Nuclear Science & Technology conducts post-graduate courses for Naval Officers and civilians who have been appointed to the Nuclear Propulsion Programme. The visit includes a health physics demonstration together with demonstrations of the electron microscope and the simulator. If time permits a tour of the Painted Hall with a short talk on the history of the college will be given.

25/11 The Royal Hospital of St Bartholomew, Department of Histopathology

St Bartholomew's Hospital is one of the main teaching hospitals in London. The visit to the Department of Histopathology will include:

- the Pathology Museum, which houses tissue specimens, historical collection and medical instruments
- the electron microscopy unit, where cells can be magnified up to 140,000 times, and related X-Ray particle analysis unit
- the image analysis unit, in which computer assessment of the shapes and textures of tissue components takes place
- the diagnostic department, where biopsies and excision specimens are examined and discussed with the referring clinician
- the immunohistochemistry unit, which uses antibodies to demonstrate hormones, viruses and other tissue components
- the cytology department, where slides are screened for breast and cervical cancer and lung, bladder and stomach and other tumours are investigated.

25/12 University College London, Department of Chemistry

Modern Chemistry is a blend of the traditional and the new and both will be found in this programme. Most people are impressed by the many dramatic chemical phenomena, such as explosions, vivid colour changes, smells, the formation of beautiful crystals and so on. Most practising chemists were first attracted to the subject by such observations and have searched for the chemical basis for their observations through careful applications of physical methods.

The visit will start with a lively lecture-demonstration by Andrea Sella and Graeme Hogarth showing some of the phenomena attracting them to the subject. The visit continues with visits in small groups to a number of research activities in the Department of Chemistry at UCL to gain some insight into how modern physical methods are employed in widely different areas of chemical research to understand the real world in terms of molecular structure and behaviour.

25/13 Zoological Society of London, Institute of Zoology, Department of Veterinary Science

The Department of Veterinary Science is a part of the Institute of Zoology, which is the scientific arm of the Zoological Society of London. The department is responsible for the health and welfare of the zoo's animals and undertakes research in fields of relevance to the zoo and free living wild animal medicine.

SCIENTIFIC VISITS TUESDAY, 29 JULY

29/1 Esso Petroleum Company Ltd/ Exxon Chemical Ltd, Fawley, Hampshire

Situated on Southampton Water is the UK's largest petroleum site and home of ESSO PETROLEUM and EXXON CHEMICAL. Both companies are part of the worldwide Exxon Corporation.

The combined site occupies a total of 3,200 acres of which about a third has been developed. It provides a fascinating example of science at work. The huge Steam Cracking Plant and Catalytic Cracker are at the heart of the operation, taking the raw material through a series of processes, turning it into refined product and feedstock for a number of chemical uses. This is all carefully monitored and controlled by skilled operators who use the latest and safest technology in their work.

One of the plants you may visit is the Energy Chemicals Plant which makes a variety of products used in drilling for oil. Or you may look in on the Butyl Rubber Plant which makes products primarily for the tyre industry.

It will prove to be an interesting and informative day for any student, as the site tour is generally conducted by young graduates who can still vividly remember the excitement they found in studying science. So come and join ESSO and EXXON CHEMICAL and have a good day out.

29/2 Magnox Electric & Nuclear Electric, Dungeness, Kent

The visit will be in two parts. The morning will be spent on Magnox Electric Dungeness 'A' Power Station, which has been in commission since 1965 and was one of the first such power stations developed in Britain. After a buffet lunch at the Information Centre, the afternoon will be spent at Nuclear Electric Dungeness 'B' Power Station, which became operational in 1983 and is of the Advanced Gas Cooled Reactor type.

In addition, there will be an opportunity to spend time on the nature trail and environmental exhibit (created in 1993) and to study the formation of shingle ridges and water tables from the ice age to the present.

29/3 Pfizer Limited, Sandwich, Kent

Pfizer is a research-based, global health care company. Its mission is to discover and develop innovative, value added products that improve the quality of life of people around the world and help them enjoy longer, healthier and more productive lives. The company has three business segments: health care, consumer health care and animal health. Its products are available in more than 150 countries.

Pfizer at Sandwich in Kent employs some 2,800 people of whom about 1,420 are engaged in research which is involved in the search for new and more effective human and animal medicines.

The visit will give an opportunity to follow the process of new medicine from concept to manufacture and marketing. This will include visiting some of the most modern and up-to-date research laboratories in the world, including the latest analytical techniques and molecular modelling.

Once a new compound has been discovered the challenge is then to manufacture it as efficiently as possible. The tour will include the manufacturing area to see how the latest techniques in control technology are utilised in one of the oldest biotechnology processes, fermentation.

29/4 Royal Air Force School of Aviation Medicine, Farnborough, Hampshire

The RAF School of Aviation Medicine is based at Farnborough in Hampshire. The school is responsible for aviation medicine research and teaching for both military and civil aviation medical aspects. After two illustrated lectures there will be visits to departments of the school to see the work of investigators in their laboratories.

29/5 Royal Marsden National Health Service Trust, Sutton, Surrey

After an introduction to the work undertaken by the Institute of Cancer Research and the Royal Hospital, the group will be divided. Each group will visit the Radiotherapy Research Unit, CT (Computerised Tomography) and MRI (Magnetic Resonance Imaging) Units, Radiotherapy treatment areas and the Department of Nuclear Medicine and Ultrasound. There will also be a discussion on the psychological aspects of cancer. The combined group will see a film on Bone Marrow Transplantation and will visit the Leukemia Ward.

29/6 RTZ: The Exploratory, Bristol

The Exploratory was the first Hands-on Science Centre in the UK, started in the early 1980's and occupying the Engine Shed built by Isambard Kingdom Brunel, the great 19th century engineer, in Temple Meads Railway Station. Hands-on Science Centres encourage their visitors to investigate scientific phenomena for themselves, without direct supervision and with the emphasis on enjoyment. The Exploratory has over 150 such experiments, called 'plores,' and also provides demonstrations, workshops and support for school programmes.

RTZ-CRA is the world's leading mining group. It is based in the UK and operates in many parts of the world. RTZ-CRA operations use best contemporary practice in mining and processing of ores with due consideration of the environment. This requires good science together with good scientists and engineers. The Exploratory shows visitors how exciting and useful science can be. It improves public understanding of scientific matters and encourages the recruitment

and education of the next generation of scientists. RTZ-CRA has been a major sponsor, deciding to pioneer a chemistry programme in the Exploratory since much of the previous development is related to physics.

After arrival at Temple Meads, the day's programme opens with a brief introduction by both Exploratory and RTZ-CRA staff. This is followed by a short address by the distinguished scientist Professor Douglas Everett, FRS, a Trustee of the Exploratory. Much of the rest of the morning is devoted to individual exploration and fun with the plores. The Exploratory Shop contains a wide range of scientific games and materials to provide souvenirs of the visit as well as a continuation of these activities away from the Exploratory. A demonstration finishes the morning with a bang - quite literally, since the staff enjoy making explosions as a teaching aid!

Lunch will be taken onboard a boat during a tour of the Bristol Docks. This large area of water has been developed for modern business and leisure purposes, but still contains landmarks from Medieval and Early Industrial Age periods. Not least of these is the first iron, propellor-driven, ocean-going steam ship, Brunel's SS Great Britain was launched from Bristol in 1843 and returned for good in 1970. There are memories from even earlier periods including the exploration of North America at the end of the 15th century.

Back at the Exploratory, further time will be spent with the plores during the afternoon before the return to London.

29/7 Rutherford Appleton Laboratory, Chilton, Didcot, Oxfordshire

Rutherford Appleton Laboratory (RAL) is a multi-disciplinary laboratory offering world-class facilities at the forefront of science and technology to over 8000 users annually from the UK and abroad. RAL's facilities support work across many fields of science and engineering including physics, chemistry, space, materials, the environment, microelectronics and information technology.

There are a number of scientific facilities at RAL:

ISIS is the most powerful pulsed neutron source in the World, used by groups from academia and industry to carry out materials research in many areas of physics and chemistry.

Vulcan is a neodymium glass laser able to deliver over ten thousand joules of energy in a pulse lasting just one billionth of a second. Titania, the world's brightest source of ultraviolet light is a krypton fluoride gas laser which employs the techniques of chirped pulse amplification (CPA) and Raman beam combining to achieve its very high performance.

The Space Environment Test Facility is used to study the response of space instruments to various forms of vibration, and to heating and cooling under vacuum. Scientists and engineers at RAL are involved in providing instruments for various satellite launches to study the surface of the sea and oceans, the cosmos and solar system.

29/8 Severn Trent Water Ltd, Birmingham

Clean water for drinking has contributed more towards health than anything else. Do you know how raw water is treated for drinking? What happens after you flush the loo?

Water is a precious resource - vital for life. Come and see for yourself how a major UK and International company provides a drinking water and sewage disposal service for over eight million people and industry every day. The integrated service Severn Trent Water provides for its customers reflects the highest international quality.

Severn Trent Water, serving the heart of England, has over 200 water treatment works supplying over 1900Ml of drinking water each day; and 1062 sewage treatment works treating 2800Ml of sewage and disposing of over 175,000 tonnes of sludge each year completes the integrated system.

The day's visit will focus on these two major aspects of Severn Trent Water's internationally acclaimed work carried out in five continents. A presentation, guided tours of water treatment and sewage works will form an interesting and informative day.

29/9 SmithKline Beecham Pharmaceuticals, New Frontiers Science Park, Harlow, Essex

SmithKline Beecham is a transnational pharmaceutical company specialising in all areas of Healthcare. New Frontiers Science Park is a Research and Development site concentrating on the development of ethical drugs to cure and alleviate diseases prevalent in man. The North Campus has facilities for Discovery Research including Medicinal Chemistry, Analytical Sciences, Neurosciences, Genomics, Molecular Screening Technology, BioPharmacology etc plus Chemical Development facilities. The South Campus has a new Pharmaceutical Technologies facility and also accommodates a significant amount of office based business support. Overall our premises house modern laboratory facilities for carrying out research, highly sophisticated computing facilities, a number of service operations such as engineering, human resources, facilities management etc, a first class library, various conference suites and lecture theatres. These facilities are located within seventy-eight acres on the Harlow Industrial Estate.

Students visiting SmithKline Beecham will attend a presentation given by senior members of discovery research, outlining the process of drug development from innovation through to registration. They will be given an overview of the various activities at Harlow and have the opportunity of visiting appropriate areas and of asking questions.

29/10 Unilever Research, Port Sunlight, Bebbington, Wirral, Merseyside

The visit will take place on Merseyside, some 300 kilometers from London and will be reached by travelling by train from London to Liverpool.

Unilever is an Anglo-Dutch company which makes and sells food, detergents, perfume and toiletries in nearly every country of the world.

In the Unilever Research Laboratory at Port Sunlight, the technology for new products is created from an intimate blend of physics, chemistry, chemical engineering and sensory science. At the heart of the research programme is a deep understanding of the science behind the everyday processes of caring for teeth, skin, hair and clothes. The visit will give direct experience of how research progresses over several years from the very fundamentals of chemistry and biochemistry to products on the supermarket shelf.

Port Sunlight on the southern shores of the River Mersey is also the site of a fascinating 'industrial garden village' built about a hundred years ago by William Hesketh Lever to provide high quality housing for his workers. A tour of the Port Sunlight village is also planned as part of the day visit to Merseyside.

29/11 University College London, Department of Space & Climate Physics Mullard Space Science Laboratory

The Laboratory contains the largest University space science research group in the United Kingdom. By exploiting the capabilities of rockets and spacecraft as platforms for scientific instruments it tries to understand our physical environment and our place in the Universe. The fields of research include the climate of the Earth, spectacular natural phenomena such as the aurora borealis, the sun and its effects on the Earth, exotic objects in the Universe, such as comets and black holes. The laboratory includes academic scientists, engineers and technicians who devise, design and build instruments which have been flown on more than 250 rockets and satellites in the British, American, Japanese and European programmes. In the future instruments will be flown on Russian spacecraft as well. The programme is global in its scope and international in its approach.

VISITS TO SCIENTIFIC MUSEUMS WEDNESDAY, 30 JULY

30m/A Natural History Museum, Cromwell Road, South Kensington, London SW7

The Museum is renowned throughout the world for its exciting interactive exhibitions about the natural world. Divided into Life and Earth Galleries, the Museum offers visitors of all ages a wide range of lively and stimulating exhibitions.

Dr Bob Bloomfield will give an introductory talk about the scientific research and the background behind some of the displays. The talk will be followed by a behind-the-scenes tour. Each student will have the opportunity to visit one of the five scientific departments (Botany, Palaeontology, Mineralogy, Zoology and Entomology) and see the spectacular collections. The students will be able to talk to the scientists about various aspects of their work and the many projects undertaken by the Museum.

After the tours there will be a chance to explore the exhibitions. Dinosaurs became extinct around 65 million years ago, but the animated display brings them very much alive! In the *Dinosaur* exhibition, see the amazing selection of dinosaur skeletons and gain an insight into the dinosaur's fascinating way of life. Other exhibitions worth a visit in the Life Galleries are *Human Biology, Origin of Species* and *Mammals*. The first phase of the new Earth Galleries is now open.

Visions of Earth puts our world in perspective. Climb aboard the giant escalators and you'll begin a journey that will take you through a huge revolving Earth sculpture on your way to *The Power Within and Restless Surface*.

30m/B Science Museum, Exhibition Road, South Kensington, London SW7

The visit to the Science Museum will include a presentation by Simon Joss, who is a Research Fellow, currently working on various forms of public debate on biotechnology in different cultural contexts.

Science is seen by many people as an entity evolving independently from the rest of our culture. However, the view that science develops only according to its own rules and mechanisms is flawed. Science and technology are as much part of our culture as are, for example, art and philosophy. And as such the interaction between science and society is not a one way process, but a multiple one in which society not only takes from science but also feeds back into it.

This dual relationship between science and society can be exemplified on the new biotechnologies. The more recent history of biotechnology shows how its development has been as much a subject of debate among the general public as among scientists.

The basics of the new biotechnologies will be explained and the most relevant applications explored. It will be demonstrated that the development of the new biotechnologies is part of an ongoing societal debate. A few examples of practical initiatives in the public understanding of biotechnology will be presented and discussed.

30m/C Wellcome Centre for Medical Science, Euston Road, London NW1

'Science for Life' is a permanent exhibition about biomedicine, featuring extensive use of the latest interactive technology. A wide range of sophisticated and imaginative exhibits allows the visitor to become a scientist for a few hours. The highlight is a walkthrough cell magnified a million times.

If you thought Science could be dull, be prepared for the surprise of *Life!* This exhibition is a unique insight into the workings of the body and the science that has made these revelations.

OXFORD & CAMBRIDGE SCIENTIFIC VISITS
THURSDAY, 31 JULY

University of Cambridge

31/C/1 University Botanic Garden

The University Botanic Garden is more than two hundred years old. There had been several earlier attempts to found a Botanic Garden, dating back to 1588. From its inception the garden has had a threefold function, namely to provide facilities for research, education and amenity. The importance of the Garden to the University as a research facility has greatly increased in recent years. More recently, with the growth of horticultural colleges, the Garden has been providing the middle year's training of a three-year course. There are also opportunities for young people in the Cambridge area to work as 'trainee technicians.'

31/C/2 Department of Chemistry
University Chemistry Laboratory

The visit to the University of Cambridge Department of Chemistry will provide an opportunity to see some of the sophisticated analytical instrumentation in action, preceded by an introductory talk by a member of the Department's teaching staff.

31/C/3 Department of Engineering

After an introductory talk outlining the Department of Engineering's teaching and research activities, small group tours of the department will see something of current research activity.

31/C/4 Department of Physics
Cavendish Laboratory

The visit will begin with an introductory talk describing the history of the laboratory and the many discoveries which have been made there. This will be followed by a tour of the museum. Participants will then visit two of the research groups. Each participant will have a choice of visiting:

a) Microelectronics Research Centre *to see examples of novel nanometre-scale structures and advanced microelectronic devices, such as single-electron memory and logic devices, together with the state-of-the-art facilites used for fabricating and evaluating them.*

b) Polymers and Colloids Group *where both theoretical and experimental studies of long chain molecules, both natural and synthetic, are carried out. New developments in electron microscopy permitting the study of wet systems in ambient conditions will be demonstrated.*

c) High Speed Photography Group *which studies the effects of erosion on liquid drop, solid particles and cavitation. Fracture processes are also studied and will be illustrated with exploding Rupert's drops.*

d) Low Temperature Physics Group *where studies are carried out on high-temperature superconductor materials and heavy-fermion systems in very high magnetic fields and at very low temperatures.*

31/C/5 Department of Physiology

The morning's programme will demonstrate some aspects of the teaching and research currently being undertaken in the laboratory. Participants will be introduced to the breadth and fascination of the study of Physiology. Both theoretical and practical examples taken from the undergraduate course will be used to illustrate the importance of the subject, both as a scientific discipline in its own right and as an essential foundation for clinical research.

31/C/6 British Antarctic Survey

The British Antarctic Survey is responsible for almost all the British Government's research in Antarctica. The Survey began in 1943, as a wartime naval operation. BAS is one of the research institutes of the Natural Environment Research Council. Four scientific stations in the Antarctic are manned: Halley is a geophysical observatory; Signy and Bird Island are biological stations; and Rothera is the centre for studies in Earth Sciences. All aspects of the research programme are organised from Cambridge. The stations are supplied annually from Britain by two Royal Research Ships, and the Air Unit's Twin Otter and Dash 7 Aircraft from Rothera Research Station.

31/C/7 Arcom Control Systems Ltd

Arcom Control Systems designs and manufactures industrial computers and printed circuit board products. The company was established in Cambridge in 1982 where its main manufacturing base is retained today. Now part of the Fairey Group plc and trading worldwide, Arcom today manufactures STEbus, PC compatible and Eurocard computers. The visit will show the design and development of computer boards since 1982, demonstrating the evolution from early 8 bit microcomputers to complex 64 bit computer designs. A tour of the factory will include all aspects of manufacturing computers, including surface mount board production.

This visit is suitable for those interested in Computer Sciences, Electronics and Engineering.

University of Oxford

31/O/8 University Botanic Gardens

Britain's oldest Botanic Gardens. The educational and scientific roles will be explained, using plants to explain various aspects of Plant Science.

For over 370 years it has stood on the banks of the River Cherwell in the centre of Oxford. In that time it has evolved from a collection of medicinal herbs for seventeenth century physicians to the most compact diverse collection of plants in this country.

In two hectares 8000 species, representing almost every botanical family, can be found.

9th European Union Contest for Young Scientists

MILAN, ITALY

9-14 September, 1997

●

Details from:

European Commission
Directorate General XII
Science Research and Development
200 Rue de la Loi, B-1049 Brussels, BELGIUM

Telephone: Int + 32 2 295 5822 **Facsimile: Int + 32 2 269 3270**

31/O/9 Department of Engineering Science

The Department of Engineering Science at Oxford provides teaching and research facilities for approximately six hundred undergraduates and one hundred and seventy post graduate students, as well as academic and research staff. All the main fields of engineering are covered in the Department: Mechanical, Electrical, Civil, Chemical and Information Engineering.

Exhibitions and demonstrations of the work and teaching undertaken in the department will be provided. For example: visits to robotics and computer vision laboratories; medical engineering; turbo machinery; wind and power engineering; control engineering; illustration of soil reinforcement techniques. During the tour visitors will have ample opportunities to ask questions and discuss items of interest.

31/O/10 Pitt Rivers Museum
South Parks Road, Oxford

The Pitt Rivers is an Ethnographic Museum: a University teaching collection, as well as a museum of international renown. It is also a very special place and contains the most remarkable and diverse collection of objects – everything from a twelve metre Haida totem pole to a 'silvered stoppered bottle said to contain a witch!' The cases are crammed with treasures; boats hang from the ceiling and sledges from the gallery – there is no other museum like it!

The visits listed are scheduled to take place during the morning. Participants will have an opportunity to explore Oxford and Cambridge on their own before returning to London late in the afternoon.

WHO'S WHO AT THE SCIENCE FORUM

John D Needle
Director, LIYSF Ltd
(Company Secretary)

Jan Lovett
Assistant Director
(Participant & Sponsor Liaison)

Roberto Lenti
Director, LIYSF Ltd
(Chief of Staff 1994-1996)

SCIENCE FORUM STAFF

CHIEF OF STAFF

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(Philippines)
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Environmental Impact Assessment
University College of Wales,
Aberystwyth

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Studying Medicine,
University of Leeds

Deputy Host
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Counsellors
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Final Year
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Northern Ireland

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David Burt
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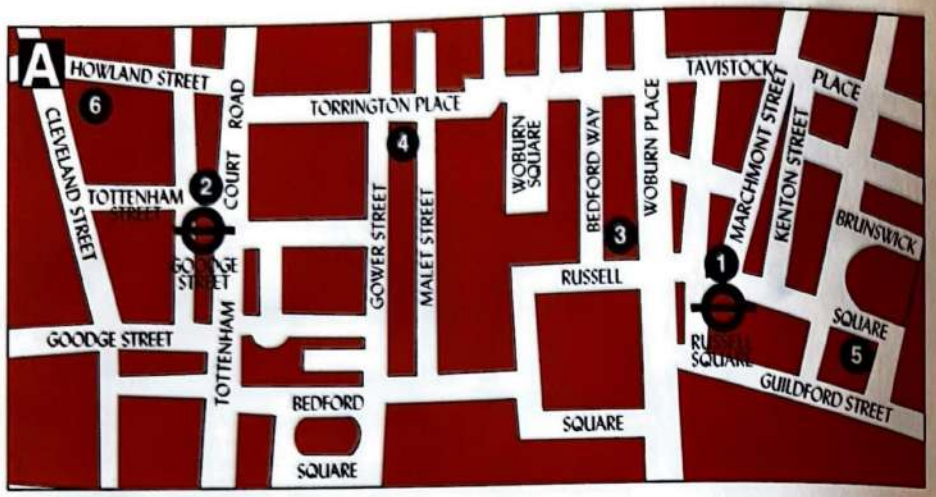
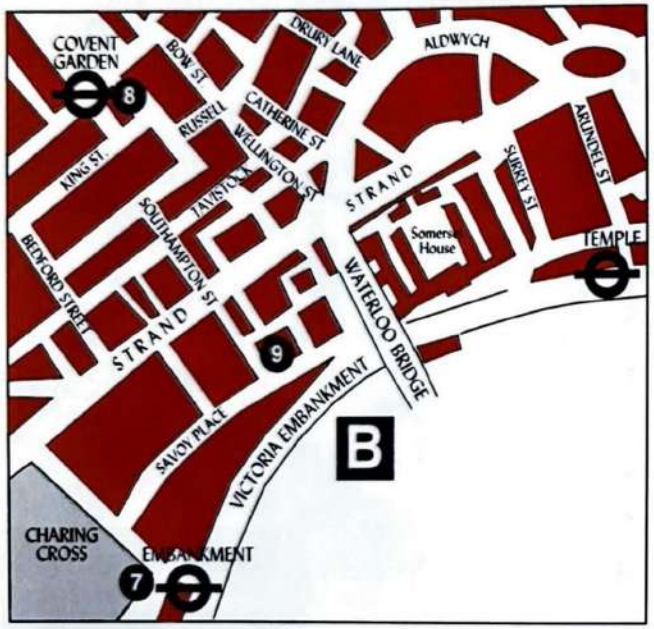
Final year
Colne Community College
Brightlingsea, Essex

The resident staff of the Science Forum is selected from former participants.
Membership of the staff team is by invitation only, direct applications are NOT considered.



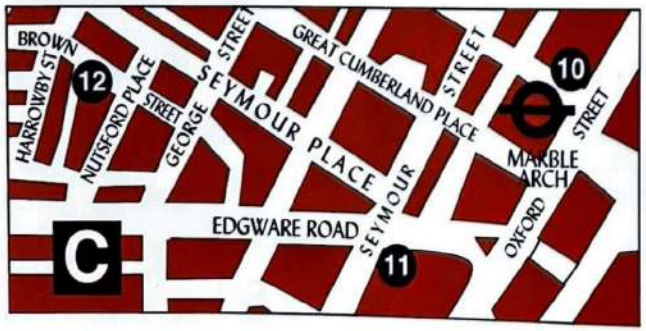


MAP A
(University Precinct)

1 Russell Square Underground Station (Piccadilly Line)
2 Goodge Street Underground Station (Northern Line)
3 Airbus Stop (service to and from Heathrow Airport)
4 COLLEGE HALL
5 INTERNATIONAL HALL
6 University College London (Middlesex Hospital Medical School)

MAP B
(Covent Garden & Strand Area)

7 Embankment Underground Station (District, Circle & Northern Lines)
8 Covent Garden Underground Station (Piccadilly Line)
9 INSTITUTION OF ELECTRICAL ENGINEERS



MAP C
(Marble Arch Area)

10 Marble Arch Underground Station (Central Line)
11 CARISBROOKE HALL
12 NUTFORD HOUSE

RTZ CRA

As a world leader in the natural resources business, RTZ-CRA makes a major contribution to economic prosperity in many parts of the world. But beyond this it also believes firmly in contributing to the well being of the communities wherever it operates. In Britain more than £1.7 million is invested in a wide range of community support programmes each year, both nationally and in the localities where operating companies are active. Worldwide, Group contribution is just over £10.5 million.

RTZ-CRA's policy in Britain is to focus its main community support on education, the arts, the environment and world affairs. In education, RTZ-CRA seeks to develop the talents of young people, broaden their educational experience, and improve their understanding of science and technology, especially in the fields of natural resources, industry and the international economy.

With its own emphasis on youth and excellence, the company is proud to be associated with the Thirty Ninth London International Youth Science Forum 1997.

THE RTZ CORPORATION PLC, 6 ST JAMES'S SQUARE, LONDON SW1Y 4LD

40 Fortieth London International Youth Science Forum 22 July to 5 August, 1998

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