Richard Edwards

OPEN DAYS

9th to 17th June 1967

STL Research

Standard Telecommunication Laboratories Limited
London Road, Harlow, Essex

Telephone: Old Harlow 2061

Managing Director and Director of Research: S. B. Marsh

Contents

General Information

Opening Times The laboratories will be open from 10 am to 5 pm.

Parking Ample parking facilities will be available for those wishing to travel by car.

Transport For the convenience of visitors coming by train, transport to and from the laboratories and Harlow Town station will be provided. Train time-tables are as follows:

Liverpool Street	*Harlow Town*	*Harlow Town*	*Liverpool Street*
09.12 11.12	09.55 11.55	14.31 16.31	15.16 17.16
09.42 11.44	10.25 12.29	15.01 16.51	15.46 17.36
10.12 12.12	10.55 12.55	15.31 17.11	16.16 17.56
10.44	11.29	16.01	16.46

Badges Visitors are requested to wear the badges provided.

Exhibits Locations of exhibits can be found by referring to the plan on page 28 of this brochure.

Hostesses Hostesses will be on duty at various points in the laboratories to assist visitors in locating the exhibits, arranging for external telephone calls, etc.

Catering Luncheon and refreshments will be served in the marquees (for location see page 28) at the following times:

Coffee: 10.30-11.30 am Luncheon: 12.30-1.30 pm, 1.30-2.30 pm Tea: 3.30-4.30 pm

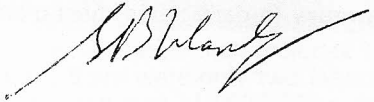
You will be asked to surrender the luncheon tickets provided, at the appropriate sitting.

Message from the Managing Director

In welcoming you to STL, I should explain that by our series of Open Days we are marking two events. Firstly, it is 21 years since the idea of a Central Laboratory in the U.K. was put into practice in our organisation; secondly, we are completing a further step in our expansion by officially opening our fourth main laboratory block. The past period of 21 years has been one of continuous growth, in line with the ever-widening search for knowledge to improve the scientific and engineering skills in the telecommunication industry. We look forward to even further expansion in the future.

With the extremely rapid advance in technology, we all find ourselves inevitably becoming more and more specialised in our own particular skills, and knowing less about what the other fellow is doing. I therefore welcome an occasion such as our Open Days which afford an opportunity, not only for you to see what we are doing, but also for us to exchange ideas and trends of thought with you.

I hope you will find the exhibits we have provided interesting—and perhaps stimulating.



S. B. Marsh

Publications

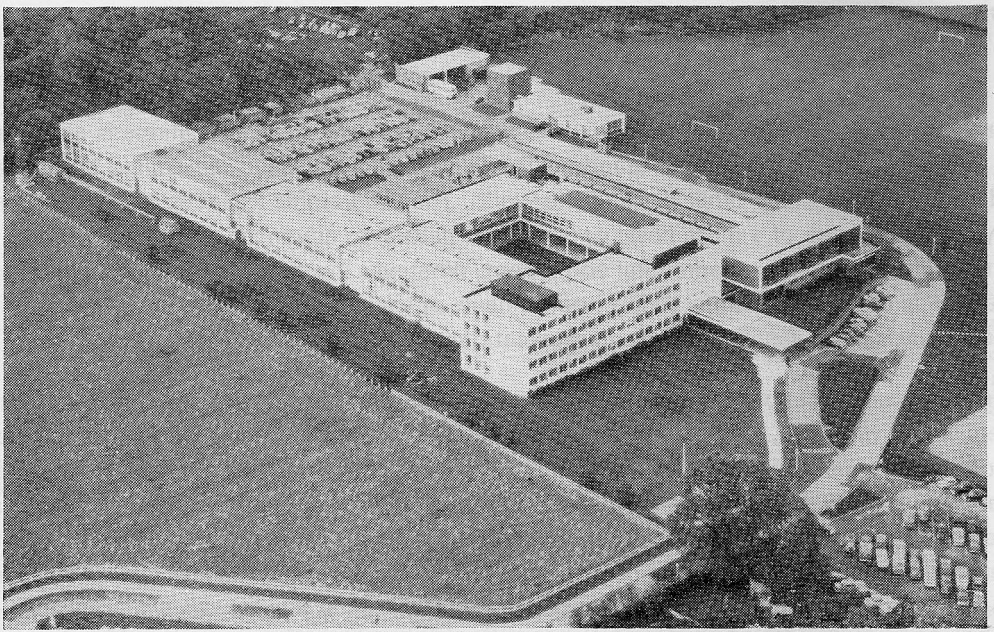
Publications relevant to STL activities are on display. These include:
Electrical Communication (a high-class technical journal covering all ITT activities; published quarterly in English, French and German).

STC News Bulletin (gives items of popular interest; for distribution to customers; published quarterly.

STC News (published fortnightly; includes local news items; distributed to all employees)

Components Standard (STC's newspaper for designers and builders of electronic equipment)

STC News Summary (a daily news sheet distributed to a limited selection of employees).



The present site of Standard Telecommunication Laboratories Limited, which includes 17 acres of grounds, was completed and occupied in 1959. At that time, there were only two laboratory wings, but another two have since been added to provide a present total area of 140,000 sq. ft. of functionally designed laboratory space, occupied by about 650 employees. A pavilion is now being built on the adjoining STC/STL sports field, to cater for the many sports and social activities available to the staff.

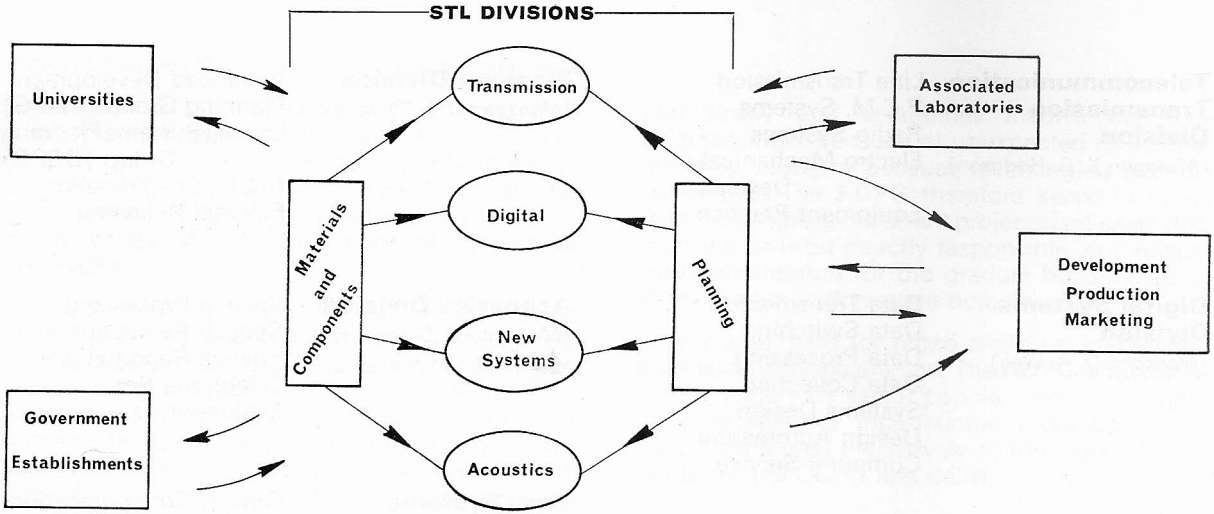
The Work of STL

The research programme carried out at STL in the broad field of telecommunications is aimed at providing for the longer-term needs of Standard Telephones and Cables in the United Kingdom and associated companies in many other parts of the world. The programme includes projects of many different types, from those of a more basic or long term nature, to advanced development work involving the construction of experimental equipment. Whatever the nature of the work, however, the prime objective is to ensure manufacturing houses have, at their disposal, information on the latest development trends in all aspects of telecommunications.

Reseach in telecommunications requires the practice of a wide variety of skills, ranging from the fields of the chemist and physicist, to the engineer designing systems. Advances made by the chemist or physicist on, say, the use of material properties may, in the long term, completely alter the system concept of the engineer through new component principles. Thus, at STL, great importance is attached to the interchange of ideas and trends between all scientific disciplines. Also, close contact is maintained with Universities, Learned Societies and Government Establishments to promote the exchange of scientific information in relevant fields.

STL's work may thus be summarised as covering the spectrum of activities from objective basic research through applied research to advanced development. Its product is knowledge and information which in the hands of its manufacturing affiliates becomes, in turn, new products and systems.

The General Organisation Plan of STL



A combined programme of research is put into effect by the Research Divisions, and is fully reported to the Associated Manufacturing Companies. Close liaison is maintained with Universities and Government Establishments.

The Planning Division, through the medium of the consultants in its Advanced Development Planning Group, advises the Divisions of general performance objectives, and constantly reviews factors which may affect their programmes.

The Divisions of STL

Telecommunication Transmission Division
(*Manager:* K. G. Hodgson)

- Line Transmission
- P.C.M. Systems
- Radio Systems
- Electro Mechanical Devices
- Equipment Practice

Digital Systems Division
(*Manager:* D. A. Weir)

- Data Transmission
- Data Switching
- Data Processing
- Data Collection
- Systems Design
- Design Automation
- Computer Service

Materials and Components Division
(*Manager:* J. Evans)

- H. F. Electron Devices
- Materials (General)
- Chemical Laboratory
- Materials Synthesis
- Materials Properties
- Semiconductor Devices

Planning Division
(*Manager:* D. L. Thomas)

- Advanced Development Planning Group (ADPG)
- Overall Systems Planning Group (OSPG)
- CCITT Co-ordination
- External Relations

Acoustics Division
(*Manager:* H. S. Leman)

- Speech Processing
- Speech Perception
- Speech Recognition
- Telephone Set Evaluation

New Systems Division
(*Manager:* P. White)

- Optical Communication Systems
- Advanced Microwave Circuits
- Network Synthesis
- Control Systems
- Radio and Navigation Sub-systems

Activities of the Planning Division

The Advanced Development Planning Group

Although STL is not concerned with the final development of commercial products, its ultimate objective is, of course, practical rather than purely scientific. It is important, therefore, that the divisions should work on projects for which there are ultimately reasonable prospects of commercial application.

It is the primary task of the ADPG to assist in planning the laboratory programme by attempting to assess the prospects of application of new ideas arising from internal or external sources. This involves feasibility studies and consideration of probable fields of use, growth rates, relative costs and so on. Economic studies take into account possible alternative solutions, quantities required, and long-term trends of costs.

Projects to be undertaken by the Research Divisions must have general performance objectives clearly established and, in formulating them, the ADPG co-operates with the divisions concerned. Many such projects have to be reviewed periodically and sometimes involve complete re-assessment because of unexpected difficulties affecting costs, or because of changing external conditions. The ADPG therefore keeps in touch with the progress of current projects and examines, with the division directly responsible, any necessary reorientation for the gradual building up of more precise performance objectives.

This work calls for broad technical knowledge combined with experience. The ADPG is therefore staffed mainly by senior people, several of whom have established international reputations and have contributed extensively to the work of such bodies as the CCITT and CCIR.

The Overall Systems Planning Group

The function of the Overall Systems Planning Group is to plan and make recommendations so that new requirements of the associated manufacturing companies' customers are met by using the best systems available for the purpose. To this

end, the section keeps in close touch with all sources of information including not only STC and all its foreign associates, but also such bodies as the CCITT. Engineers from the section travel frequently to all parts of the world for discussion with administrations whose planning activities they often assist. Problems on land-line, line-of-sight microwave, tropospheric scatter and v.h.f. multi-channel radio systems are passed to the section which recommends what system should be provided and indicates the expected performance during the tendering stage of many large projects.

The Systems Planning work of this group is undertaken in conjunction with members of the ADPG in a wide range of application. Users of their competence range from the Military Service, through Police, Railways, Administrations, to Office Organisation.

Activities of the Technical Services Division

Technical services provided by this division include information, library, drawing office, reproduction, photographic, mechanical design office, and mechanical engineering workshop including glassblowing.

The information department, in addition to serving STL, provides a service for some 28 widely dispersed STC locations. The technical library, which takes over 650 publications, has both reference and lending facilities.

Planning Division—Exhibits

Assistant Manager: W. Thompson,

Location

Corridor C2 **Overall Systems Planning Group activities,** with samples of previous projects. The Group studies projected telecommunication systems, and its studies include:
a) selection of terminal and repeater station locations by using maps and making on-site appraisals.
b) considerations of system performance expected on selected route.

Technical Services Division—Exhibits

Assistant Managers: B. O. Candy, J. T. A. Woodward

H1—13 / J1 **Mechanical engineering workshop**, with means for precision machining and fitting, welding, glass-blowing etc.

C2—20 / C2—40 **Library and Information Department** which acquires and scans literature in telecommunications, electronics and related subjects, and deals with queries from all parts of STC and Associate Companies.

F2—24 **Mechanical design department,** available for advice and assistance on all aspects of mechanical design work.

F2—2 / F2—8 / F2—7 **Print room**, with the means available for the printing and binding of STL Technical Reports and Memoranda. Equipment includes: Xerox variable ratio camera and copiers, Multilith offset litho printing machines, a dyeline printer, and collating and binding equipment.

Activities of the Telecommunications Transmission Division

The Division is concerned with the design and evaluation of Terminal and Line or Radio Equipment for transmission of all types of intelligence by Land Cable, Submarine Cable or Microwave Radio.

Linear Systems Laboratory. New components and new techniques are having a considerable impact on the development of multi-channel communication systems. For terminal equipment, new methods of modulation are being studied, with analysis and synthesis of passive and active networks for frequency selection. Feedback amplifier design for line repeaters is required to cover ever larger bandwidths.

P.C.M. Laboratory. This laboratory is concerned with the coding and transmission in digital form of speech and other types of signal. Signals in this form can be recognised in the presence of high levels of noise or interference and can be regenerated so that noise or distortion is not cumulative in successive amplifier sections. Integration of transmission and switching to avoid the need for successive coding and decoding offers substantial additional advantages and is an important feature in future developments.

The Radio Systems Laboratory is mainly concerned with the design of mainline broadband microwave systems, though developments directed to this area often find application in other parts of the radio field. Development of low noise input devices and microwave sources, including varactor multipliers and 'Gunn' oscillators are important parts of this work. Another section is engaged in the development of wave-guide filters and other components with the objective of reduced size and cost.

The Equipment Practice and Miniaturisation Laboratory is mainly concerned with the study and application of new concepts of miniaturisation to complex electronic equipment and the development of specialised components and sub-assemblies for particular types of equipment. Also studied are the general problems of size and layout, reliability and serviceability of large equipments.

Present objectives of this laboratory include study of the applications of Thin Film and Semiconductor Integrated Circuits and the development of advanced methods for their mounting and interconnection.

The laboratory provides a link between new device concepts and their introduction to advanced system developments in association with other groups in the laboratory. A particularly important example is the development of computer-aided design and manufacturing automation methods in conjunction with the Digital Systems Division.

The Electromechanical Filter Laboratory is engaged in research and development of high grade filter networks using metals and insulators as vibrating elements with magneto-strictive or piezo-electric input and output transducers. Highly selective filters in the frequency range 50 to 500 kc/s are under development for use in telecommunications equipment.

Telecommunications Transmission Division—Exhibits

Assistant Managers: K. W. Cattermole, K. A. Matthews

Location	
D1—3	**Frequency selection by electro-mechanical resonance** of coupled flexural resonators driven by a piezo-electric transducer.
D1—9	**Microelectronic techniques,** including thin-film and printed circuit processing by computer control.
E1—4	**P.C.M. and digital communication network,** demonstrating how the scope of p.c.m. systems may be enlarged by digital multiplexing of 24 channel groups to form larger groups.
E1—5	**Miniaturized tuned-reed element,** comprising a metallic element in the form of a cantilever, mounted over conducting plates which form input and output electrostatic transducers. The four-pole network, thus realised, functions as a high Q resonant circuit, and is compatible with integrated circuits.
E1—5	**Polyphase modulator** consisting of a number of identical branches uniformly spaced in phase. The circuit is realised by switches and frequency selective networks, which are amenable to integration using thin film and monolithic technology, with possible advantages in cost, reliability and size.
E1—5	**New active filter circuits** using only resistors, capacitors and amplifiers developed to exploit the advantages in cost and reliability of integrated circuits.
D2—3	**Evanescent mode waveguide components** which are both simpler and smaller than conventional components.
D2—3	**Solid-state transposer** for receiving, amplifying and retransmitting combined sound and vision signals in Band 3.

Activities of the Acoustics Division

The Acoustics Division is concerned with all the problems which arise in converting speech sounds into an electrical signal, suitable for transmission to a distant subscriber, and its recognition by the listener. This includes fundamental studies of the properties of speech which can be used in its processing for new communication systems, and psycho-acoustical problems involved in its perception.

The group has a forward-looking programme and includes the processing of speech signals by vocoder and other techniques for transmission as digital signals. The many current projects include development of a speech recognition system to enable electronic equipment to be operated directly by the spoken word.

Studies on microphones and telephone sets are carried out both in the objective field and with groups of people in the subjective assessment field in order to determine the properties which are most desirable in a communication system. The work includes fundamental research in addition to the early development of new ideas which are applicable to telephone, sound reinforcement and public address systems.

Acoustics Division—Exhibits

Assistant Manager: R. W. A. Scarr

Location

S1—4 **Voice-excited voice-coder,** or 'vocoder'; an experimental equipment for the real time analysis and synthesis of speech.

S1—4 **Dissected speech,** showing how timed segments are removed from recorded speech for perception experiments.

S1—4 **Psychoacoustic testing facilities;** this includes an experiment to assess how well human beings can recognise certain recorded words; these results can then be compared with the performance of 'speech recognition machines'.

Activities of the Digital Systems Division

Digital Systems Division. The last few years have seen the gradual spread of the digital approach to real-time applications such as telegraph message switching, telephone switching, complex control arrangements and even communication transmission itself.

The various aspects—data collection, processing, transmission and dissemination—are the chief interests of the Digital Systems Division. At present we are particularly engaged upon the development of improved data dissemination machines covering the practical character speed ranges involved, control arrangements for dependable systems, i.e., those for continuous operation, data transmission systems and the correction of errors which can occur in such transmission. Such work relies upon the advances in device and circuit technique which together provide the new tools required for such system advances.

These varied interests involve a blend of study, design, experiment and model realisation.

Field trials of equipment developed in the laboratory are undertaken and the equipments are demonstrated at STL, at other locations of the Company and its Associates and at exhibitions both in the U.K. and overseas. Close liaison is maintained with manufacturing companies during the transference of information for production.

The Division is responsible for providing computer services to STL and maintains and operates a modern medium power computer (IBM 360/30) backed by less powerful systems. Our specialist systems analysts and programmers undertake a variety of projects both for this Division and for the other Divisions of STL and STC.

One of our current preoccupations is the application of computers to aid design to accelerate manufacture.

Digital Systems Division—Exhibits

Assistant Managers: A. E. Brewster, A. D. Odell

Location	
D1—10	**Non-destructive read-out waffle-iron store,** in which information is written into storage locations once only, on a 'one shot' basis, and can then be read out continously in a non-destructive mode.
D1—10	**Satellite multiplexer, employing redundancy,** for the multiplexing of a number of information channels on to a common highway, which will operate successfully despite faults.
D1—10	**Dependable computer,** incorporating Information, Hardware, and Time (diagnostic routine) redundancy, to enable a single fault to be detected, automatically corrected, and subsequently repaired without otherwise affecting the correct operation of the computer.
D1—10 E2—4	**High speed data link,** to extend the data transmission capability of a 4 kHz channel up to speeds of about 10,000 bits/second.
E2—4	**High voltage isolation:** a method of overcoming the insulation problem in monitoring high voltage (400 kV) power lines, by the transmission of modulated light through optical fibres.
E2—4	**Ferrodot displays:** a direct-vision transient display system based on magnetic recording techniques.
E2—4	**Ferrodot printer:** a versatile non-percussive printing system for use in communications and data processing.
E2—4 D1—10	**Free Space Optical Link:** data transmission by modulated light, for use between positions with difficult mutual access, or where other transmission systems would be susceptible to interference.
U2—5	**IBM 360/30F computer** configuration employing disk files.

Members of the Advanced Studies Department of the Hornsey College of Art, are co-operating with STL in the Application of industrial design principles to an STL project, the Optical Speech Link. A model and drawings will be shown in the peripheral equipment laboratory (location E2—4).

Activities of the New Systems Division

Control Systems. Within this project, considerable progress has been made in the design and simulation of special 'parallel' computers for pattern recognition and control. For the construction of such machines, the group has developed a family of adaptive circuits which will fully exploit the new technology of integrated circuits.

Solid State Laboratory is studying high-field conduction phenomena in thin metal-insulator-metal samples, including Schottky effect, Poole-Frenkel effect, phonon assisted tunnel-hopping processes, etc. New conduction phenomena in thin insulating films discovered at these laboratories, including reversible memory and pronounced negative resistance effect are being actively investigated. A further important aspect of thin film research, which is currently creating a great deal of interest, is hot electron coherent scattering in thin metal films, as well as cold cathode emission in thin film insulators. Both these phenomena were also discovered in these laboratories.

Reliability Study involves the pursuit of novel methods for establishing component and system reliability. One part of this study concentrates on evaporated thin film components, and is aimed towards an understanding of the various physical and chemical processes which may lead to a change of the electrical properties.

Optical Communication Systems. This project is concentrating on the study of the transmission characteristics of dielectric waveguides in glass fibre form, using an optical surface-wave mode at an optical interface within the fibre. Future work will be directed toward any systems aspects of optical communication by dielectric cables.

New Systems Division—Exhibits

Assistant Managers: E. Bush, K. W. Pearson, A. H. Reeves, H. T. Roettgers

Location	
U2—8	**Vibrational companding codec,** or p.c.m. encoder-decoder combination which can be made cheaply and small enough to fit into a telephone subscriber's subset.
U2—14	**Special-purpose computer techniques,** with application to automatic control, radar and navigation systems.
S2—3	**Two-dimensional leaky-wave antenna,** excited by two klystrons at different frequencies, to illustrate the possibility of frequency scanning.
S2—5	**Thin film RC frequency discriminator** of low distortion, produced as a miniature thin-film circuit, used for demodulation of f.m. signals with very wide deviations.
S2—6	**Thin film resistive memory device:** a new circuit element whose impedance can be set by application of a voltage or pulse.
S2—6	**Linear waveform power generator,** which provides a large variety of sawtooth or square waveforms over a wide frequency range.
S1—3	**Electron emission of metal-insulator-metal device;** a thin film device which can be utilized as a visual display element.
S1—11	**Photospectrometer for measuring materials with very low optical losses.**
S1—11	**Optical transmission,** in which fast light pulses travel along appreciable lengths of low loss optical fibre.
S1—11	**Dielectric fibre surface waveguide,** forming a transmission medium for an optical communication system, capable of carrying very wide-band signals.
S1—11	**Ellipsometer** used for measuring the thickness of deposited thin dielectric films on substrates, and the surface properties of optical material samples.
U1—4	**High speed p.c.m. coder** working on the 'equilibrium' principle which, without extra complexity, can achieve a faster operating speed than a sequential coder, and can approach the speed of the parallel variety.

Activities of the Materials and Components Division

Materials Synthesis Group. New Materials are the key to progress in science and technology. The Materials Synthesis Group searches for materials with unusual properties and invents unconventional techniques for preparing them. Our main fields of interest are :

Vapour Phase Techniques. Glow discharge induced reactions give unusual non-crystalline materials, e.g., vitreous silicon carbide. These reactions are now being applied to make new dielectrics of high breakdown strength. More generally, vapour phase preparational techniques are being pursued with high energy gap semiconductors and ultra-pure metals.

High Temperatures. The main emphasis has been on preparing ultra-pure metals and alloys by our 'silver-boat' processes. These eliminate container contamination of the melt by means of short-range electromagnetic repulsion. The most refractory metals and intermetallic compounds can be handled, and single crystals have been pulled from melts at 3,000°C and above. Other work in this area includes the pulling of anisotropic piezo-electric oxide single crystals from the melt.

Magnetics. This covers both the preparation of ferrimagnetic materials and special application of novel magnetic phenomena to devices.

Very High Pressures. At 100,000 atmospheres, phase diagrams differ greatly from their one atmosphere forms, and entirely new phases become stable. The recovery of such phases at one atmosphere metastably, like diamond, offers an existing new field of materials research. The very high pressure group studies new materials, provides help for other groups for physical measurements under extreme stress conditions, and its mechanical engineers design new machines for reaching pressures in excess of 3,000,000 p.s.i.

The Materials Properties Group works towards better understanding of solid state phenomena, and falls into five main sections at present. The electron microscope activity is concerned with fundamental investigations of physical defects in bulk, vapour deposited and evaporated materials, together with a study of the nucleation processes in thin layer metal growth.

In the x-ray crystallography section, the main work with single crystals is directed to a study of imperfections in semiconductor crystals. For polycrystaline materials we make x-ray studies of materials under high temperatures and study phase relations in ceramic and in specially prepared high temperature compounds. Non-destructive chemical determinations are carried out using x-ray fluorescence and absorption methods. The temperature dependence of electrical properties of materials including semiconductors, is investigated and interpreted in the low temperature section. A variety of infra-red techniques is employed in order to understand more about materials behaviour.

Electron probe microanalysis is being used for examining the surfaces of bulk specimens. Scanning electron microscopy is providing useful results in semiconductor device development.

The Electrical Measurements Laboratory is concerned with the electrical evaluation of newly developed materials and components. The emphasis is on the development of precise measurement techniques and the interpretation of results rather than on routine measurement.

Semiconductor Devices Laboratories undertake the design, development and characterization of novel devices such as epitaxial diffused transistors, metal-oxide-semiconductor devices, injection lasers and varactors, and make use of new solid state phenomena. Emphasis is placed especially on research into new device concepts and technologies.

Solid State Bulk Effects Laboratory is concerned with the study of bulk effects in semiconductors, in contrast to junction effects, with the object of realising entirely new devices for the generation, amplification and detection of high frequencies. It is hoped in this way eventually to replace many of the present microwave tubes by solid state devices. Bulk effects may also play a part in the realization in the solid state of many imaging and display systems at present using electron tubes.

The solid state phenomena which are being investigated to this end include high field instabilities such as the 'Gunn' effect, electroacoustic interactions, plasma interactions and helicon waves.

Activities of the Materials and Components Division (continued)

Novel Electronic Conduction Processes Group covers methods of preparation of complex inorganic materials, and their electrical properties; provides exciting prospects of both theoretical advances and of the creation of quite new types of solid state devices.

Microelectronics Techniques Laboratory is directly concerned with the development of novel techniques for processing, fabricating and interconnecting of microelectronic devices and circuits.

The work is aimed at making advances in the basic technology which will overcome the deficiencies of existing processes and eventually lead to complete computer control of design and fabrication.

Many new aspects of fabricating thin film and semiconductor integrated circuits are involved, particularly the development and application of focused electron and laser beams and the associated control equipment.

The Plastics and Dielectrics Laboratory deals with the more technological aspects of the application of synthetic resins, and provides an advisory service on materials problems arising from the application of all types of insulating materials. Development of cable materials and component encapsulation techniques forms a major part of the current programme.

The Capacitor Laboratory has been established to study the more fundamental aspects of capacitor structures. Present activities are concerned with research into the operating mechanisms of solid electrolyte capacitors and processes for their manufacture, in particular the formation of anodic oxides and the physico-chemical properties of semiconductor oxide contact materials.

The Chemical Laboratory undertakes several types of work, including:

1 Qualitative and quantitative analysis of a wide variety of materials, using both wet chemical methods and instruments such as a spectrograph and polarograph.

2 Radiochemistry, involving radioactivation analysis, radio-tracer experiments and compound labelling.

3 Synthesis of materials in bulk or as thin films of polymers and ceramics, and general material characterisation.

Materials and Components Division—Exhibits

Assistant Managers: K. O. Batsford, E. H. Cornish, S. G. Foord, J. Franks, C. H. L. Goodman, C. P. Sandbank

Location	
N1	**New polymers,** with novel electrical properties, produced by feeding acetylene and cyanogen gases into an r.f. plasma, splitting the molecules into reactive fragments which recombine on a substrate, forming coherent films.
N1	**Gas chromatography** applied to the analysis of organic solvents and small gas samples.
K1—16	**High pressure laboratory** which has a unique research programme into the synthesis of new materials, into semiconductor physics, and into mechanical engineering development involving the new techniques of high pressure.
K1—40	**Glow discharge cold deposition** of inorganic refractories by the action of a radio-frequency field applied to suitable gases.
H1	**H.F. electron devices workshop,** including spark machining and crystal cutting.
Corridor—H1	**Plastics used in telecommunications,** with examples of typical products and some of the equipment employed in determining their characteristics.
G2—15	**Electron probe micro-analyser** which gives qualitative and quantitative mass concentration data in one or two dimensions, with a resolution of 1 micron.
G2—18	**X-ray diffraction topography** (**Lang technique**) for enabling dislocations and other lattice defects to be observed. *Continued Overleaf*

Materials and Components Division—Exhibits cont.

G2—35 **Scanning electron microscope** used to investigate electric potential distributions on semiconductor devices, in particular, microcircuits.

D2—4 **Techniques for large-scale integration,** including all stages in the preparation, processing and fabrication of circuits on a silicon slice.

E2—3 **Gunn effect device** for generation of microwave power.

E2—3 **Domain originated functional integrated circuit (DOFIC),** in which the desired variation of device current as a function of time is obtained by varying the local conductance along the domain path.

U1—5 **Room-temperature GaAs laser;** a compact directional infra-red radiation source.

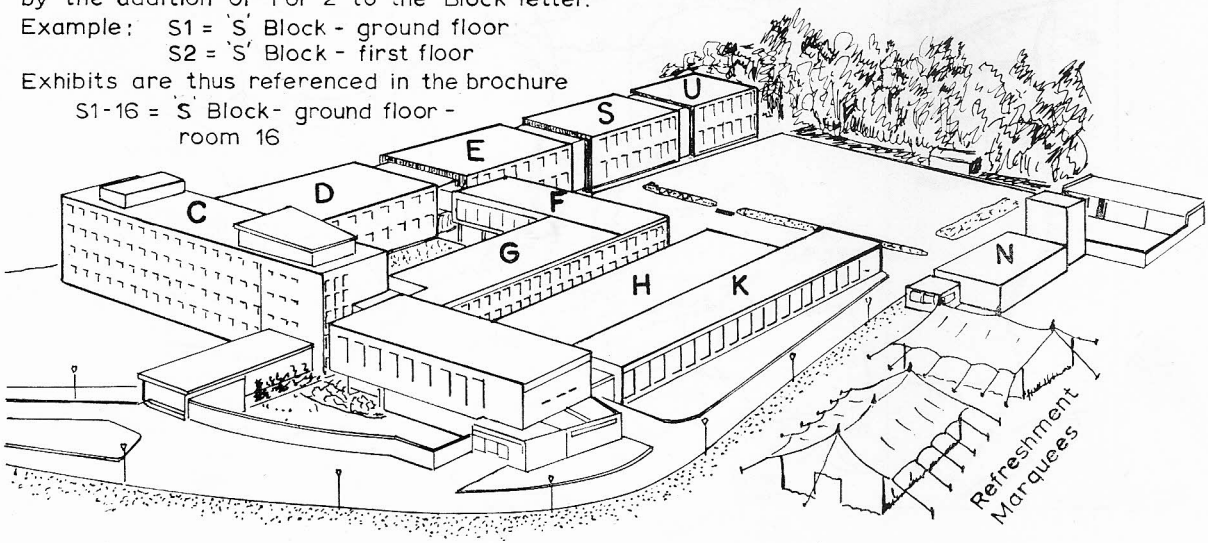
Exhibit Location Referencing

Floors of individual Blocks are designated by the addition of 1 or 2 to the Block letter.

Example: S1 = 'S' Block - ground floor
S2 = 'S' Block - first floor

Exhibits are thus referenced in the brochure

S1-16 = 'S' Block - ground floor - room 16



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