THE P.M.G'S DEPARTMENT AND THE ROLE OF PROFESSIONAL OFFICERS
IN THE ENGINEERING DIVISIONS AT HEADQUARTERS.

Paper No. 5.

P.M.G. Research Laboratories - Functions and Organisation

1. Introductory Remarks

You will know from an earlier lecture that the Research Laboratories is a Branch of the Engineering Planning and Research Division of the Department, and the Laboratories shares with the Planning Branch the responsibility for providing the forward thinking for Departmental engineering activities.

In the Planning Branch the emphasis is on what we are going to do and on predicting the technical facilities that will be necessary to enable us to do what we want to do. In the Research Laboratories our job is to concern ourselves with how we are going to do things; what it is technically possible to do; what new knowledge is available that might have a bearing on communication problems; what gaps in knowledge must be filled before it is possible to go from an interesting scientific fact to a technological development.

Telecommunications is a science-based industry and modern communications employ concepts and technology that were unheard of 15 years ago or even less. If the Department is to retain control of its technical destiny it is necessary that it remain abreast of developments, and experience over many years has shown that to remain up to date in advanced areas of technology it is necessary to participate in advanced work. To have an effective voice in advanced technical discussion it is necessary to have a reputation that commands respect among technical people. Over the years the Department has found it advantageous to maintain research and development laboratories and to devote a significant effort to research and development work, particularly in those areas where overseas research does not provide adequate answers to Australian problems or in areas where new concepts in technology are finding application.

I think it is important for us to realise as engineers that the practice of our profession rests on an expanding base of new knowledge and of new applications of knowledge in modern technology. Without effort on our part to add to this new knowledge and to devise new applications and developments we become dependent on the efforts of others for innovations and ultimately we find our technical judgements and decisions are being influenced by suggestions and pressures from outsiders whose interests are not always identical with the long term interests of the Department.

2. Research Laboratories

2.1 Functions. The functions of the Research Laboratories may be stated as follows:

(i) Research and development into theory and practice of telecommunications, particularly as it relates to the Australian region.

(ii) The appraisal of overseas developments and the determination of their suitability for the Australian network. This function is carried out in association with the Planning Branch.

(iii) The design and development of equipment and, in association with the Engineering Works Division, its introduction and field testing.

(iv) The investigation of problems that arise in the operation of the Department's plant.

(v) The provision of technical and scientific services and consultant activity.

Considering the first function, the Department is conscious that the science of communications is very highly developed and that massive resources are devoted to the solution of communication problems overseas. We do not attempt to compete with overseas but this does not mean that we should not enter the arena. Where the Departmental need is inadequately served by overseas or local research and development, it is appropriate that the Department should fill the gap, and this applies not only to minor problems but to major ones as well. Obviously the Research Laboratories look to the Planning Branch and the Engineering Works Division to point out any of these requirements when they become apparent in the Planning or Works activities.

There will be other cases where particular talents and interests are available in the Laboratories and by using these we may be able to make a useful contribution to knowledge. Real research ability is comparatively rare in any country and wherever it is found it should be given an opportunity to develop without over-much control or restriction. We can be quite sure that in an environment such as the P.M.G., researches that engage the interest of our talented people will be in the field of telecommunications science or its supporting disciplines and the results of their endeavours will be of ultimate benefit to the Department. The reputation of any research laboratory in outside circles is very much dependent on the work of outstanding individuals of this type.

It is not enough that the P.M.G. Research Laboratories live within its own walls. To be effective it must be part of two worlds - the pressing urgent world of the great public enterprise that is the Post Office and which provides its reason for existence, and the academic world of the universities and other research organisations in this country which provide the stimulus of creative thought and criticism and discussion.

In our efforts to conduct research and development in telecommunications, the Department sees it as in its own interests, and in the national interest as well, to stimulate research work in the various academic institutions in this country on problems relevant to telecommunications. By interest in the post-graduate schools of a number of university Electrical Engineering Departments the Department is able to ensure that some of the best young engineers in this country are working on problems relevant to our industry. This contact with universities also serves to ensure that there is no wasteful duplication of effort.

On the matter of appraisal, this is an area of work that demands a good deal of long term effort. If we are to be in a position to appraise new concepts and new technologies we must have competence in advanced fields of work and this does not come from reading books and manufacturers' specifications, but only from working in the field, from knowing the concepts and from using them to achieve engineering ends. Work of this nature is at the frontier of new technology and there will be occasions when our efforts will result in worthwhile new developments as well as providing us with the knowledge necessary to appraise the developments of others.

The task of designing and developing equipment is one of the grey areas in the Departmental organisation. Our colleagues in Engineering Works have a responsibility to design and develop equipment that may be necessary for them to provide the engineering service for which they are responsible. As a general rule these designs are "state of the art" designs utilising known techniques although there is no question that in some cases these developments break new ground and represent significant contributions to the particular technology.

There are other design and development tasks that require skills only available in the Laboratories or which require an experimental approach or for which there is a definite need that cannot be met from the resources at the disposal of Engineering Works and these are carried out in the Laboratories.

Obviously there is no point in developing a piece of equipment that no one wants and on these projects there must be very close liaison with Engineering Works and Planning in deciding a specification for the equipment to be developed and in its eventual field testing and finally its manufacture and introduction into service.

Problems that arise in the operation of the plant are an area of work in which the Laboratories is pleased to participate, not only because of the need to overcome the problems but also because of the first hand information they give on the needs and deficiencies of the plant. There is a great danger that a research laboratory gets out of touch with reality, and situations that remind us that we are part of an organisation that operates a large and complex technical machine and that we have a direct and valuable contribution to make, are welcome.

A further aspect of our work is the provision of technical and scientific services and the provision of consultant advice. We have, in the Laboratories, facilities and skills that are not duplicated elsewhere in the Department and with these we provide a service to other groups that need them. For example, a group of physicists, chemists and metallurgists provide scientific skills and techniques for investigation of problems on materials, deterioration,

environmental effects, etc. The Post Office frequency standard, provided and maintained by the Laboratories, is the basis of the Speaking Clock time service as well as the H.F. time service broadcast from Lyndhurst, and our engineers are working to improve this service and to provide a standard frequency broadcast as well. The Laboratories is the custodian of the Department's standards of measurement, particularly electrical standards, and measuring equipment in use by the Department can be calibrated against these standards.

Information, engineering library and patents services are also provided by the Laboratories - in fact, the small sectional libraries in the Planning and Engineering Works area come under the control of the Research Laboratories' Senior Librarian. Whilst on the subject of libraries, I would like to emphasise the importance of keeping up to date with advances in science and technology and to warn you that this is no easy task. Each one of you has spent a number of years of intensive study and you are now more or less on top of your subject. To keep there will require effort on your part and if you do not make this effort you will find that in ten or fifteen years much of your hard-won knowledge has become obsolete and you have not replaced it with new knowledge. The experience which you have gained in the meantime, although valuable, will be insufficient to make up for the loss of effectiveness which results from your having failed to acquire the new knowledge which lies behind many of the developments which will have occurred in this period.

Facilities for re-education of professional engineers are not well developed in this country and you will be dependent very much on your own efforts. Joining in the activities of professional societies is one way of obtaining new knowledge and the other, and probably the most important, is the disciplined study of current literature. It is important too to recognise that you do not know everything and that it is not possible to read everything that is published. Consequently, when you are presented with a new technical problem one of the first things is to study the literature. It is important to develop the habit of using libraries. There is no reason from our point of view why an engineer from any part of the Department should not spend a day or a week, or longer if necessary, in the Engineering Library studying some particular problem. The F.P.O'Grady Reading Room on the 1st. floor of 59 Little Collins Street is open to all and we hope you will use it both for particular studies and for general browsing.

Another point I wish to mention is that of patents. In the past the Department has not been over concerned with patenting the work of its staff as there did not seem to be much to be gained. However, with more sophisticated research and development work being done in Australia and an increasing interest in export markets, there is a realisation of the value of the inventive talents of the staff and that other organisations may be prepared to pay to use Departmental designs and inventions.

At the present time the whole Departmental policy on this matter is under review but you should be aware that there is a Departmental organisation for securing patent, design or copyright protection, and if you believe that any of your work has features that are likely to be of interest in fields outside the Department you should bring them under notice as early as possible.

You will gather from what I was saying earlier that the investigational work carried out in the Research Laboratories falls into three classes.

The first class are fundamental long term projects. These are usually initiated within the Laboratories and concern aspects of communications or related disciplines but there is no immediate plant objective.

The second class are developmental projects where an engineering need has been foreseen and the Laboratories set out applying known knowledge and filling in gaps in known knowledge with the object of producing a practical answer to the need. Projects of this type arise from three sources :

(i) from knowledge within the Laboratories of a Departmental need and of what can be achieved with the current state of knowledge and technology, and

(ii) from problems referred by other Sections and Branches.

The third class of projects are those where urgent plant problems arise. These are normally referred from other Branches.

An unusual aspect of the Laboratories activities is the position it occupies in relation to the Department's engineering activities. In the Department we become accustomed to each organisational group having direct responsibility for some aspect of the Department's activities and this is true of the Research Laboratories too, but in a different way. It is the responsibility of the Laboratories to see that advanced knowledge is brought to bear on Departmental problems and this leads to the Laboratories tendering advice and information and offering solutions to meet particular situations. But no one is obliged to take that advice. Our responsibilities are advisory only. To be effective in the Laboratories we must be ready with the right advice and we must be able to persuade our clients that they should act on our advice. The maintenance of close liaison and co-operation with Plant and Planning Sections is an important responsibility of our Laboratories engineers and I suggest to those of you outside Research that it is an important part of your responsibility to be aware of the advice and services available from the Research Laboratories and to make use of them.

I now wish to turn to the formal organisation of the Research Laboratories and this is set out in an organisation chart attached. Key members of staff are named in the accompanying staff list. You will see that the Research Laboratories has a Branch status and is divided into three Sections, each under the control of an Assistant Director-General.

There is a total of 32 Divisions and in round figures the staff comprises 90-odd engineers, 20 scientists, about 180 technical and trades staff, and 90-odd administrative staff, typists, etc. Our activities are centered in five buildings and two other buildings are used for special activities. There is a field site about 20 miles out of Melbourne and field tests are done at locations in various parts of Australia.

2.2 The Systems Section. The Systems Section, which is under the control of Mr. S. Dossing, is divided into three Sub-Sections or Groups - Principles, Switching, and Transmission. The organisation in this Section is a mixture of basic fundamentals and plant-oriented activity. At first sight this may appear

incongruous and to some extent it is - nevertheless, the mingling of these two activities does result in the approach to plant oriented activities having a depth that otherwise might not occur, and the exponents of the more fundamental studies are reminded continually of the existence of the telecommunications plant which is our reason for existence.

In the Principles Group we have the Circuit Theory and Probability Divisions, both basically theoretical and mathematical activities, and the Telephone Standards Division where we endeavour to define what it is that we really expect of a telephone connection and to assess the various parameters that affect the performance of the connection. The Electrical Standards Division also forms part of this Group. (It is largely self contained and its activities provide the basis for the calibration of the Department's electrical measuring equipment.)

The Switching Group is the area where we try to keep up with developments in switching systems. I think you all know that this is an area of intense development in the world scene. Electro-mechanical systems of the step by step and crossbar type are still being manufactured in large quantities - in Australia it is crossbar only - and the increasing demands made on our networks call for further development of crossbar devices. At the same time it does not require a great deal of foresight to see our networks getting beyond the capacity of electro-mechanical equipment of the conventional type and intensive development of electronic and semi-electronic switching equipment is proceeding on a world scale.

Huge sums of money are involved and the Laboratories is active in this area so that we remain abreast of developments. It is an area too where our activities are on the frontier of technology and the Australian experts are treated with respect in the world scene.

At the present time it is expected that the first application of electronic switching in the Department will be in large trunk switching exchanges and the Laboratory is co-operating with other interested Sections of the Department in defining our requirements. In the long term, integrated switching and transmission systems using PC transmission and time division switching are seen as having great possibilities and such systems are being investigated.

The Transmission Group is largely concerned with transmission problems, particularly in areas where the Departmental needs are poorly served by industry or overseas development. A particular example is rural radio telephone services where the Laboratories is working on low cost radio party line services that will work into the main network. It is hoped that radio systems of this type may help in finding a more economic answer to the problem of providing improved telephone services to outback telephone subscribers. This group too is collaborating with the Switching Group in the work Integrated Switching and Transmission system.

2.3 The Apparatus and Services Section. This is under the control of Mr. E. Sandbach. Even in the largest of research organisations, major advances in communications are comparatively rare. Many advances are of a marginal nature - an improved material, a faster assembly technique, or a modified design. Although small in themselves, in the aggregate, substantial advantages accrue from these improvements, and there is a great deal to be gained by ensuring that the best materials and the latest techniques are incorporated into equipment, and the resources of modern scientific or engineering knowledge are brought to bear on existing equipment problems as well as on future developments.

The Physics & Polymer and the Chemistry and Metallurgy Groups are staffed with physicists, chemists and metallurgists, whose responsibility is to bring the knowledge of their respective disciplines to bear on the material and equipment problems of the Department. These scientists cannot operate without the tools of their profession and the Groups are equipped with a wide range of physical, chemical and metallurgical equipment, including facilities for Gas Chromatography, Infra-Red Spectrography and X-ray Fluorescence Analysis. Whilst not always spectacular, the efforts of these groups have made a big contribution in identifying points of weakness in materials and equipment and in the application of physical and chemical methods to plant problems. The introduction of epoxy resins for component encapsulation and for cable jointing techniques is a typical project by the Physics and Polymer Group, and has been of considerable importance to the work of the Engineering Works Division.

The Equipment Development Group has responsibility for mechanical and electrical design, for radio equipment development and for development and assessment of subscribers' apparatus. In this group the emphasis is on items of equipment and apparatus rather than on integrated systems. In conjunction with the Scientific Groups these Divisions are responsible to oversight and advise on the techniques and materials that are incorporated in the items of equipment which go to make up the communications systems. A further aspect of this responsibility is the very practical task of assisting local manufacturers with problems arising in the manufacture of equipment in Australia. A typical project is the development in association with Broken Hill Pty. Co. Ltd., of a grade of soft magnetic iron that is a suitable substitute for iron that is otherwise only available from Sweden. Another is the development of an Australian design of telephone dial for local manufacture.

Although the interest of the Engineering Division is primarily in telecommunications, the Laboratories are mindful that the Department has a huge responsibility for mails and that mechanisation and automation, although of long standing in Australia, are being introduced in this area to an increasing extent. Considerable advances in mechanisation have already been made by the Postal Services Division and the Laboratories have assisted in several of these projects. In future developments it can be expected that there will be an increasingly complex component concerned with address coding, reading devices and memory techniques, and the Mail Handling Division will deal with these problems in collaboration with the Postal Services Division.

Essential requirements in any laboratory are well organised Library and Information Services, efficient equipment control and maintenance and a competent Model Shop. These functions are the responsibility of the Laboratories Services Group and the Library. The Library works in close association with the Information and Patents Service to provide the latest technical information when and where it is needed. As mentioned earlier, Engineering Sectional and Branch Libraries are under the control of the Senior Librarian and are administered from Research. The Model Shop is equipped to carry out precision machine work as well as the more routine fabrication tasks. It is expected also to be up to date with the latest manufacturing and assembly techniques and to carry out experimentation and trials in this area. Printed circuits, solderless wrapped connections and epoxy encapsulation are typical projects appropriate to the Model Shop and its controlling engineers.

The whole Laboratories depend on an efficient system of equipment maintenance and calibration and this, together with a specialist instrumentation service, is provided by the Laboratory Equipment Division which also has overall responsibility for the purchase and control of equipment.

2.4 The Advanced Techniques Section. This is under the control of Dr. A.J. Seyler. The activities dealt with so far have been activities that can be described as applied research and development - or the application of effort to achieve practical goals that can be fairly precisely defined. I mentioned earlier that there is also research activity in the Laboratories when the final engineering application is less clear, although it is in a field of recognised potential value. For want of a better name this can be described as objective basic research. Activities of this type are found in the Advanced Techniques Section intermingled with activities of a more practical nature.

Thin film phenomena receive attention in this Section together with microwave and pulse techniques. Bandwidth compression for TV signals is the object behind fundamental studies of the statistics of TV signals and of the psycho-physics of human perception. Satellite communication systems and adaptive echo cancellation devices are othere projects in this Section, as well as more practical investigations concerning radio propagation and microwave switching.

An investigation of particular interest which is just being completed (August 1968) is the microwave propagation studies being made on the Nullarbor Plains to provide engineering data for the East-West microwave system. A more or less leisurely investigation to gather propagation data on desert paths had been transformed into an emergency activity by the detection on a number of occasions of fading occurrences that were sufficiently severe to render a microwave system inoperative for periods of an hour or more in duration. An alternative route has been mapped out to dodge the suspect terrain and has been tested.

Despite the gravity of the situation and the urgency to obtain engineering data, our research workers were delighted to have found such an occurrence as it gives an opportunity for detailed work to unravel and explain some of the propagation mechanisms involved. The practical work went hand in hand with the more fundamental studies and we hope that knowledge gained here will be of great value in dealing with propagation problems that we expect to encounter when the microwave network is pushed into some of the more inhospitable parts of central and north-western Australia.

Satellite communications is a fascinating but costly area of work. Nevertheless, it is a field of work in which the Research Laboratories and the Department must be interested and informed, and in these situations we are sometimes able to get our information and know-how indirectly. At the present time an Engineer, Class 2, from the Laboratories is working as a Systems Analyst with the NASA satellite ground station at Cooby Creek, near Toowoomba. This station is part of the NASA A.T.S. satellite project involving work with five experimental satellites. Our engineer operates as a full member of the station staff with a special concern for the communications experiments. In addition an Engineer Class 3 from the Laboratories has been attached to the Space Flight Control Centre at Goddard U.S.A. on an 21 month assignment where he is making a valuable contribution to the communication aspects of the A.T.S. project.

The Department has access to all the results and in addition has an opportunity to arrange experiments using the ground station and satellite facilities. In this connection we have been able to arrange data transmission and signalling experiments over the A.T.S. satellite from the Research Laboratories and further experiments are being planned.

2.5 Staff. To do all the things that we set out to do, the Research Laboratories has need of talented staff and we are always on the lookout for young men of ability. Many, but not all, of our positions involve work for which honour degrees or higher degrees are desirable and young engineers are encouraged to take advantage of the various opportunities for post-graduate training that are offered. More senior staff play an active part in the activities of C.C.I.R. and C.C.I.T.T. and in appropriate cases are sent overseas to investigate latest developments and current research work in their particular specialty.

Supporting staff are classified mostly in the technical grades except at the base level where we have a number of Technician positions. Recruits for these positions come from Technician-in-Training schemes and trainees for the Laboratories are trained in a Training Annex. We are also recruiting lads as Technical Assistants Grade 1 and giving them on the job training and requiring them to undertake part-time technical study.

3. POST-GRADUATE TRAINING.

I now want to say a few words about post-graduate training. Post-graduate opportunies open to Departmental officers are set out in considerable detail in Engineering Instruction A1100 - Training, Professional Officers; any engineer or scientist contemplating post-graduate work should study this. If you are proposing to make an application you should start your preparation well before the due date for applications. You should know what you want to study, where you want to study it, why you selected the particular topic, why you selected the particular institution and whether you would be admitted, what you hope to achieve and how the Department might benefit. Althought the Department is not the awarding authority, in most cases it is asked for a recommendation and you will not win Departmental support with a half-baked application.

In general, post-graduate studies fall into two categories:

(i) Non-acedemic studies intended to augment an officer's professional experience and knowledge and so improve his practice of his profession. These studies are normally carried out overseas and are described Departmentally as studies within industry.

(ii) Academic studies leading to a higher degree by way of post-graduate studies in an Australian or overseas university.

The term "studies within industry" is somewhat of a misnomer as, in addition to scholarships offered by major British companies and groups of companies for study in the United Kingdom, this group of scholarships also includes the Churchill Memorial Trust Scholarships which permit any type of overseas study, French Government scholarships which provide for the holder to undertake a course of study sponsored and controlled by the French Government, and a Japanese Government scholarship which enables an Australian Government research worker to spend up to a year working in a Japanese Government research institute.

Basically all of these scholarships are intended to give overseas experience to men who have already established themselves in their profession, and a minimum of two years professional experience is usually considered necessary before the Department will support such an application. Some of these scholarships are comparatively poorly endowed and intending applicants should make sure that acceptance of the scholarship will not cause financial embarrassment. In suitable cases the Department is prepared to recommend that scholarship allowances by subsidised and anyone contemplating such a scholarship is advised to make sure that the Department can support the application whole-heartedly.

With regard to academic post-graduate studies, it is important that intending applicants and also the Department understand quite clearly the objective of the studies.

At the present time, in University circles in Australia, there is an almost hypnotic fascination with the title of Doctor and it is the height of academic achievement to acquire this standing. As far as the Department is concerned, we are not concerned with inflating egoes but we recognise that we need men with the training that results in the award of a higher degree. Extended cadetships leading to Masters' degrees are quite common for men who complete their Bachelor's degree with good Honours and in many cases they are followed by requests to continue straight on and complete Ph.D. degrees. A number of such applications have been supported either by a recommendation for a Public Service Board Scholarship or by a recommendation for financial assistance to a student who has won some other type of scholarship such as a Commonwealth post-graduate scholarship.

Post-graduate training at a University whether in Australia or overseas involves two major components. The first is formal course work by which the student obtains knowledge in depth around a particular research topic and by which he learns the advanced analytical skills which he needs to pursue his research project to a successful conclusion. The second component is training in research. He undertakes to investigate a broad topic and, in carrying this through, he learns the discipline of scientific or engineering research. He learns the need to master the present state of the art; the need to supplement his skills and knowledge in particular areas to meet the requirements of the task; he learns the need to tackle an objective and to pursue it through to a stage where not only is he master of the art but also he is able to contribute to the state of knowledge. He learns to communicate his ideas and findings both verbally and in writing and to argue them with his co-workers and if need be to modify them. We hope too, that he learns to express his ideas in a way that can be understood by his sponsors.

At this point a problem arises. He has completed his study and has been awarded the coveted Ph.D. degree. By virtue of his research he is on top of his subject and leader in the field. He is now faced with four or five years to work off his bond and the prospect of a further 30 years of employment.

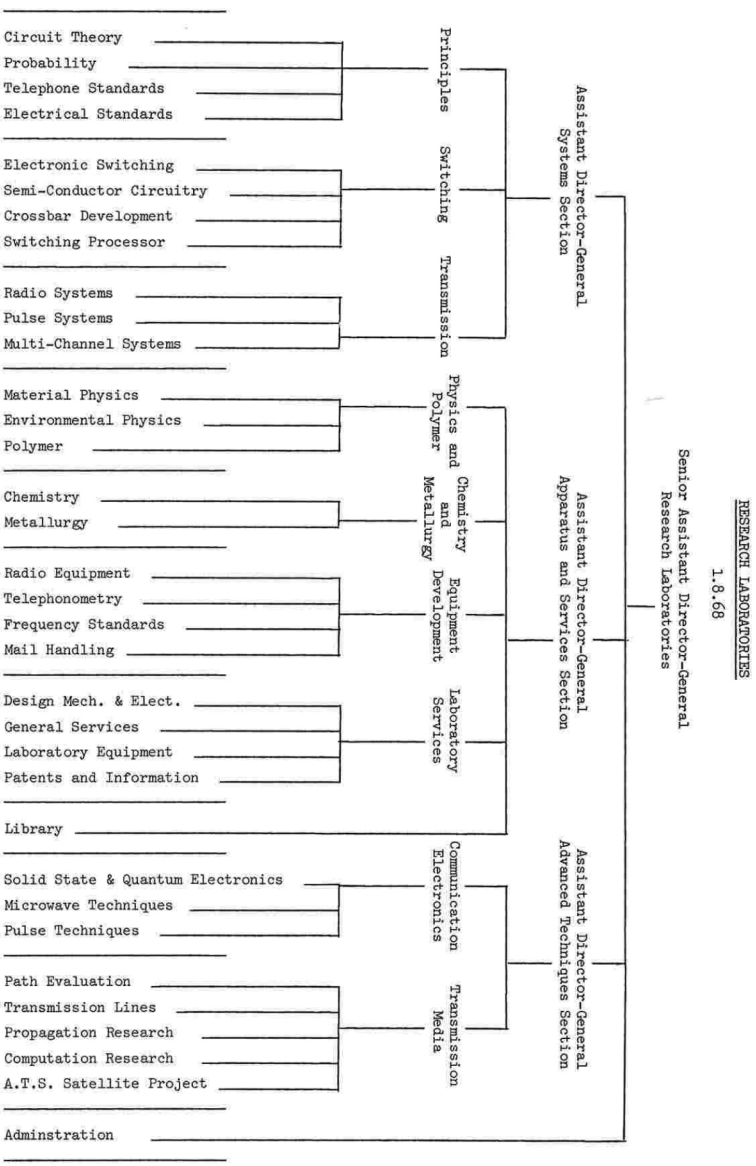
The Department is faced with a man with highly specialised training in a particular field of research and who wishes to continue working in this field. Obviously it will sometimes happen that although the Department is interested in his research field, it is not interested to the extent of providing facilities for continuing research and the new Ph.D. is faced with the necessity to change to a different field of research. This is sometimes hard to take but can be more palatable if the young man recognises that the Department has supported his advanced training for just this reason. We want men trained to tackle any appropriate project in depth and not trained merely for one narrow project. We need these trained men so they can tackle any of the many and varied problems facing the Department. All this may sound a little harsh but in the long run it is in the interests of a young engineer to broaden his experience. Life offers limited opportunities for narrow specialists and young men are advised to seek opportunities to widen their experience even if it means leaving a field in which one has secured a measure of success and working hard to achieve the same success in a new field.

After this little homily I feel I should hasten to reassure you that the Department is fully conscious of the value of post-graduate training and the Engineering Instruction which I mentioned earlier gives you details of the opportunities that are open to you and suggestions on how to go about preparing your application.

4. CONCLUSION:

I hope that what I have said has given you some idea of the part the Research Laboratories plays in the overall activity of the Department and of the ways available to Departmental staff to prepare themselves for the more demanding work that is ahead of us. I would like to close by saying that in the Research Laboratories it is important that we keep in touch with the engineering requirements of the organisation which we serve, because we realise that without the network and the postal services there would be no Research Laboratories. To those of you who belong to the Laboratories I urge you to take every opportunity to discuss your work with your colleagues in other Branches to determine its relevance and to benefit from their experience.

To those of you who are outside the Laboratories I suggest you find out more about us, the talents we have, the facilities and equipment available and the projects in hand or contemplated. I suggest too that you make it your business to discuss your problems with us, that you feed information back to us and that you call on our aid when it appears that we can help.


RESEARCH LABORATORIES
1.8.68
Senior Assistant Director-General
Research Laboratories
Assistant Director-General
Systems Section
Assistant Director-General
Apparatus and Services Section
Assistant Director-General
Advanced Techniques Section
Principles
Switching
Transmission
Physics and Polymer
Chemistry and Metallurgy
Equipment Development
Laboratory Services
Communication Electronics
Transmission Media
Circuit Theory
Probability
Telephone Standards
Electrical Standards
Electronic Switching
Semi-Conductor Circuitry
Crossbar Development
Switching Processor
Radio Systems
Pulse Systems
Multi-Channel Systems
Material Physics
Environmental Physics
Polymer
Chemistry
Metallurgy
Radio Equipment
Telephonometry
Frequency Standards
Mail Handling
Design Mech. & Elect.
General Services
Laboratory Equipment
Patents and Information
Library
Solid State & Quantum Electronics
Microwave Techniques
Pulse Techniques
Path Evaluation
Transmission Lines
Propagation Research
Computation Research
A.T.S. Satellite Project
Adminstration

ORGANISATION OF RESEARCH LABORATORIES

1.8.68

First Assistant Director-General, Planning and Research: Mr. L.M. Harris			
Senior Assistant Director-General, Research, ERW.1.: Mr. P.R. Brett			630 7900
Assistant Director-General, Systems, ERW.2: Mr. S. Dossing			630 7901
Principles Group: ERW.3, Mr. D. Gray		(Class 4)	630 6409
Circuit Theory Division: ERW.4, Dr. E. Rumpelt		(Class 3)	630 7623
Probability Division: ERW.5, Mr. P. Glick		(Class 3)	630 7306
Telephone Standards Division: ERW.6, Mr. E.J. Koop		(Class 3)	630 7619
Electrical Standards Division: ERW.8, Mr. J.M. Warner		(Class 3)	630 7303
Switching Group: ERW, 152, Mr. H.S. Wragge		(Class 4)	630 7592
Clerk, Mr. T. Dillon			630 7614
Switching Processor Division: ERW.322, Mr. F. Symons		(Class 3)	630 7154
Electronic Switching Division: ERW.13, Mr. G. Crew		(Class 3)	630 7591
Semi-Conductor Circuitry Division: ERW.244, Mr. A Domjan A/g		(Class 3)	630 7288
Crossbar Development Div.: ERW.159, Mr. D Mattiske		(Class 3)	630 6343
Transmission Group: ERW.9, Mr. R. Smith A/g		(Class 4)	630 7607
Clerk, Mr. N. Walker			630 7632
Radio Systems Division: ERW.10, Mr. D. Snowden		(Class 3)	630 7927
Multi-Channel Systems Division: ERW.12, Mr. D. Shaw		(Class 3)	630 7316
Pulse Systems Division: ERW.11, Mr. A. Fowler		(Class 3)	630 7605
A.D.G., Apparatus and Services, ERW.14: Mr. E. Sandbach			630 7903
Principal Officer, Physics and Polymer: ERW.265, Mr. G. Flatau			630 7984
Material Physics: ERW.59, Mr. D. Mckelvie			630 7985
Environmental Physics: ERW.267, Mr. G. Goode			387 1552
Polymer: ERW.38, Mr. H. Ruddell			630 7995
Principal Officer, Chemistry and Metallurgy: ERW. 266, Mr. R.D. Slade A/g			630 7992
Metallurgy Division: ERW.194, Mr. K.G. Mottram,			630 7993
Chemistry Division: ERW.32, Mr. G.J. Walker			630 7997
Clerk, Mr. D. Raines A/g			630 7821
Equipment Development Group: ERW.15, Mr. L. Murfett		(Class 4)	630 7916
Clerk, Mr. K. Minnitt			630 7322
Radio Equipment Division: ERW.17 Mr. I.C. Lawson, A/g.		(Class 3)	630 7917
Telephonometry Division: ERW.18, Mr. R.W. Kett		(Class 3)	630 7620
Frequency Standards Division: ERW.7, Mr. R. Trainor		(Class 3)	630 7948
Mail Handling Division: ERW.269, Mr. A. Baddeley		(Class 3)	630 7327

Laboratory Services Group: ERW.19, Mr. R. Pitkethly	(Class 4)	630 7307
Design, Mech & Elect. Division: ERW.16 Mr. D. Sheridan	(Class 3)	630 7325
General Services Division: ERW.20, Mr. F. Arter	(Class 3)	630 7308
Laboratory Equipment Div.: ERW.21. Mr. A. Collins	(Class 3)	630 7980
Patents Officer: ERW.196, Mr. L.R.A. Melton	(Class 3)	630 6295
Information Officer: EP.22, Mr. J. Lewis	(Class 2)	630 7932
Library Group: ERW.181, Miss M. Cuzens (Senior Librarian)		630 7935
A.D.G., Advanced Techniques, ERW. 22: Dr. A.J. Seyler		630 7940
Communication Electronics Group: ERW.26, Dr. W. Otto	(Class 4)	630 7041
CLERK, Mr. A. Robertson.	(Class	630 7608
Microwave Techniques Division: ERW.28, Mr. O.F. Lobert	(Class 3)	630 7943
Pulse Techniques Division: ERW.11, Mr. G. Rosman	(Class 3)	630 7953
Solid State & Quantum Electronics: Dr. W. Williamson A/g ERW.324.	(Class 3)	630 7945
Transmission Media Group: ERW.23, Mr. E.R. Graig	(Class 4)	630 7912
CLERK, Mr. D. Wellington A/g.		630 7608
Path Evaluation Division: ERW.27, Mr. J. Reen	(Class 3)	630 7921
Propagation Research Div.: ERW.233, Mr. G. Jenkinson	(Class 3)	630 7922
Transmission Lines Division: ERW.24, Mr. R. Buring	(Class 3)	630 7611
Computation Research Division: ERW.323 - VACANT.		
Satellite Research Division: ERW.235, Mr. B.R. Perkins (outposted)		
Administrative Officer: ERW.44, Mr. T. Broughton		630 6344
Administrative Assistant: ERW.45, Mr. A.B. Conroy		630 7904
Branch Clerk: ERW.40, Mr. B. Christensen		630 6294
Steno-Secretaries: ERW.183, Miss M. McDonald		630 7902
ERW.158, Mrs. S. Lafferty		630 7905
ERW.52, Miss. L. Varrasso		630 6399
ERW.51 Miss. L. Peoples		630 7881
Equipment Officer, ERW.46, Mr. E. Scates		630 6360
Procurement: ERW.41, Mr. M. Shanahan A/g.		630 7910
Typist-in-Charge: CA 111 Mrs. M. Zara		630 7931
Records: ERW.46 Mr. B. Lafferty A/g.		630 7908
		630 6360
Staff. Clerk: Mr. F. Kelly A/g.		630 6952