UNION RADIO-SCIENTIFIQUE INTERNATIONALE International Union of Radio Science



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INTRODUCTION

Acknowledgement

The XIX General Assembly of URSI was held at the University College of Technology at Otaniemi in July-August 1978. The thanks and appreciation of the Union are due to the various Committees and many individuals who were responsible for the preparations for the Assembly and for the success of the event and, in particular :

- to the Finnish URSI Committee, which acted as our hosts, and the national organisations represented in it;
- to the Finnish Organising Committee and the Accompanying Persons Committee, which were responsible for the excellent local arrangements and for welcoming the participants;
- to the Chairmen and Vice-Chairmen of Commissions who organised the scientific programme, and to the Session Chairmen and the speakers;
- to UNESCO for the subvention which was used, in part, to cover the expenses associated with the organisation of the scientific sessions;
- to the other international Unions and scientific organisations which sent observers to the Assembly.

Outline of the Assembly

The URSI Council, which consists of the representatives of the Member Committees of the Union, met on 28 and 29 July and on 7 and 8 August. The Resolutions and Recommendations adopted by the Council and by the Commissions are reproduced at the end of this volume. Elsewhere, summary accounts are presented of the business transacted by the Council and the Commissions during the Assembly.

The Opening Meeting, attended by all participants, was held in the Finlandia Hall in central Helsinki. The addresses given by the Secretary General of the Ministry of Education, the President of URSI, the Director of CCIR and other personalities are reproduced elsewhere.

The scientific programme arranged by the nine URSI Commissions included not only the normal sessions devoted to surveys of recent progress, presented by experienced invited speakers, but also five Open Symposia which included many contributed papers. These Symposia dealt with the following topics :

Time and frequency; Biological effects of electromagnetic waves; Optical communications; Radio waves and the ionosphere; and Wave instabilities in plasmas.

In addition, there were two Workshops for the discussion of Wave analysis, and Large digital correlators.

The URSI Awards for distinguished work during the period 1975-1977 were presented, at a special session, to :

Dr. James R. Wait (Balth. van der Pol Gold Medal),

Dr. D. A. Gurnett (J. H. Dellinger Gold Medal),

Dr. P. M. Banks (Appleton Prize).

At the brief formal Closing Meeting, the names were announced of the members of the incoming Board of Officers, and of the newly elected Chairmen and Vice-Chairmen of the Commissions. The URSI Council had, earlier in the day, decided to confer the title of Honorary President on Prof. Dr. W. Dieminger and Prof. H. G. Booker both of whom were present at the Meeting.

At the end of the Meeting, Dr. Minnis handed over his responsibilities to the incoming Secretary General Prof. P. Hontoy and, finally, M. Voge invited the incoming President, Prof. W. N. Christiansen to come to the platform and take the Chair. Prof. Christiansen expressed his appreciation of the honour which his election, as President, represented and looked forward with pleasure to the XX General Assembly in Washington, D.C. in 1981. In conclusion he declared the XIX General Assembly of URSI closed.

List of URSI Office Bearers and Officials of Member Committees

Following the elections in Helsinki, the members of the new Board of Officers and the incoming Chairmen and Vice-Chairmen of Commissions are as given below.

The list of Presidents and Secretaries of URSI Member Committees is based on information available to the URSI Secretariat up to the time of going to press.

HONORARY PRESIDENTS

Prof. H. G. Booker (USA),M. B. Decaux (France),Prof. W. Dieminger (Fed. Rep. of Germany),Mr. J. A. Ratcliffe (UK),Dr. R. L. Smith-Rose (UK).

BOARD OF OFFICERS

President :	Prof. W. N. Christiansen (Australia).
Past Président :	M. J. Voge (France)
Vice-Presidents :	Prof. W. E. Gordon (USA) (Treasurer), Dr. A. P. Mitra (India), Prof. A. Smolinski (Poland), Prof. F. L. Stumpers (Netherlands).

Secretary General : Prof. P. Hontoy (Belgium).

OFFICERS OF COMMISSIONS AND COMMITTEES

COMMISSION A. — Electromagnetic Metrology.

Chairman : Prof. S. Okamura (Japan). Vice-Chairman : Prof. V. Kose (Germany, Fed. Rep.).

COMMISSION B. — Fields and Waves.

Chairman : Prof. L. B. Felsen (USA). Vice-Chairman : Prof. H. G. Unger (Germany, Fed. Rep.).

COMMISSION C. — Signals and Systems.

Chairman : Prof. V. Zima (Czechoslovakia). Vice-Chairman : Dr. J. K. Wolf (USA).

COMMISSION D. — Physical Electronics.

Chairman : Prof. G. W. Farnell (Canada). Vice-Chairman : Dr. J. Le Mézec (France).

COMMISSION E. — Electromagnetic Noise and Interference.

Chairman : Mr. G. Hagn (USA). Vice-Chairman : Prof. S. Lundquist (Sweden). COMMISSION F. — Wave Phenomena in Non-ionized Media. Chairman : Prof. A. T. Waterman (USA). Vice-Chairman : Dr. D. Gjessing (Norway).

Соммізsion G. — Ionospheric Radio and Propagation. Chairman : Dr. B. Hultqvist (Sweden). Vice-Chairman : Dr. P. Bauer (France).

COMMISSION H. — Waves in Plasmas.

Chairman : Prof. F. W. Crawford (USA). Vice-Chairman : Dr. M. Petit (France).

Сомміssion J. — Radio Astronomy. Chairman : Prof. H. Tanaka (Japan).

Vice-Chairman : Dr. V. Radhakrishnan (India).

URSI-CCIR-CCITT LIAISON COMMITTEE.

Chairman : Dr. J. A. Saxton (UK).

STANDING COMMITTEE ON URSI GENERAL ASSEMBLIES. Chairman : Prof. A. Smolinski (Poland).

STANDING COMMITTEE ON URSI MEMBERSHIP.

Chairman : Dr. A. P. Mitra (India).

GROUP FOR COORDINATION OF THE SCIENTIFIC PROGRAMME OF URSI.

Chairman : Prof. W. E. Gordon (USA).

URSI REPRESENTATIVES ON OTHER SCIENTIFIC ORGANISATIONS

ICSU General Committee and General Assembly : Prof. W. N. Christiansen (Australia).

COSPAR Executive Council : Prof. K. Rawer (Fed. Rep. Germany).

COSTED : Dr. A. P. Mitra (India).

SCOSTEP Bureau : Prof. A. T. Waterman Jr. (USA).

SCAR : Mlle G. Pillet (France).

FAGS Council: Prof. R. Coutrez (Belgium), the Secretary General of URSI.

IUCRM : J. R. Apel (USA),
R. Crane (USA),
P. Gudmandsen (Denmark),
Ya. Melnichuk (USSR),
G. Valenzuela (USA),
S. Wickerts (Sweden).

- IUCAF : J. W. Findlay (USA), J. P. Hagen (USA).
- BIH Directing Board : J. McA. Steele (UK).

IUWDS Steering Committee : A. P. Mitra (India).

CPEM : H. Hellwig (USA).

PRESIDENTS AND SECRETARIES OF U'RSI MEMBER COMMITTEES

ARGENTINA :

President : Ing. A. M. Andreu, CORCA, Av. Libertador 327, Vicente Lopez (BA).

Secretary : Prof. V. A. Padula-Pintos, Instituto Tecnologico de Buenos Aires, Av. Madero 351, Buenos Aires.

AUSTRALIA :

President : Dr. B. J. Robinson, CSIRO, Division of Radiophysics, P. O. Box 76, Epping, N.S.W. 2121.

AUSTRIA :

President : Univ. Prof. Dr. O. M. Burkard, Institut für Meteorologie und Geophysik, Universität Graz, Halbärthgasse 1, A-8010 Graz.

BELGIUM :

- President : Prof. L. Bossy, Institut Royal Météorologique, Avenue Circulaire 3, B-1180 Bruxelles.
- Secretary : Prof. R. Gonze, Observatoire Royal de Belgique, Avenue Circulaire 3, B-1180 Bruxelles.

BRAZIL :

President : Dr. Nelson de Jesus Parada, Director INPE, C. P. 515, Sao José dos Campos, Sao Paulo.

BULGARIA :

President : Prof. Dr. K. Serafimov, bld Ruski 1, Sofia 1000. Secretary : Dr. A. Spasov, bld Lenina 72, Sofia 1113.

CANADA :

- President : Dr. F. J. F. Osborne, RCA Ltd Research Laboratories, Ste-Anne-de-Bellevue, Quebec.
- Secretary : Dr. J. Y. Wong, National Research Council of Canada, Montreal Road, Bldg M-50, Ottawa, Ontario K1A OR8.

CZECHOSLOVAKIA :

- President : Prof. Dr. J. Stransky, Faculty of Electrical Engineering, Technical University of Prague, Suchbatarova, 4, Praha 6 -Dejvice.
- Secretary : Dr. L. Kratena, Institute of Radio Engineering and Electronics, Czechoslovak Academy of Sciences, Lumumbova 1, Praha 8 - Kobylisy.

DENMARK :

President : Dr. E. Ungstrup, Danish Space Research Institute, Lundtoftevej 7, DK - 2800 Lyngby.

EGYPT, ARAB REPUBLIC OF :

President : Prof. Abd El-Samie Mostafa, Faculty of Engineering, Alexandria.

Secretary : Dr. I. A. M. Salem.

FINLAND :

- President : Prof. M. Tiuri, Helsinki University of Technology, E. E. Department, Otakaari 5A, SF 02150 Espoo 15.
- Secretary : Dipl. Eng. M. Hallikainen, Helsinki University of Technology, E. E. Department, Otakaari 5A, SF 02150 Espoo 15.

FRANCE :

- President : Prof. M.-Y. Bernard, CNAM, Laboratoire de circuits et mesures, 292 rue Saint-Martin, F 75141 Paris Cedex 03.
- Secretary : M. D. Lombard, CNET, TCR-EFT, 38 rue du Général Leclerc, F 92131 Issy-les-Moulineaux.

GERMAN, D. R. :

- President : Prof. Dr. Ing. H. Frühauf, Technische Universität Dresden, Helmholzstrasse 18, DDR - 8027 Dresden.
- Secretary : Dr. A. Iwainsky, Akademie der Wissenschaften, Zentralinstitut für Kybernetik und Informationsprozesse, Rudower Chaussee 5, DDR - 1199 Berlin-Adlershof.

GERMAN, FED. REP. :

- President : Dr.-Ing. H. J. Albrecht, Postfach 21 01 43, D 5300 Bonn 2.
- Secretary : Ing. K.-H. Kappelhoff, Forschungsinstitut der Deutschen Bundespost beim Fernmeldetechnischen Zentralamt, FI 32-2, Postfach 5000, D - 6100 Darmstadt.

HUNGARY :

- President : Dr. G. Bognar, Member of the Hungarian Academy of Sciences, Münnich F.u.7, H 1055 Budapest.
- Secretary : Prof. K. Géher, Technical University of Budapest, Stoczek u.2, H 1111 Budapest.

INDIA :

- President : Prof. B. Ramachandra Rao, University Grants Commission, Bahadurshah Zafar Marg, New Delhi-110002.
- Secretary : Dr. B. R. Nag, University College of Technology, Institute of Radio Physics and Electronics, 92 Acharya Prafulla Chandra Road, Calcutta-700009.

IRELAND, REP. OF :

- President : Prof. B. K. P. Scaife, c/o Royal Irish Academy, 19 Dawson Street, Dublin 2.
- Secretary : Mr. M. O'Donnell, c/o Royal Irish Academy, 19 Dawson Street, Dublin 2.

ISRAEL :

President : Prof. W. Low, Department of Experimental Physics, The Hebrew University of Jerusalem, Jerusalem.

ITALY :

- President : Prof. G. Barzilai, Istituto di Elettronica, Facolta d'Ingegneria, Via Eudossiana 18, I - 00184 Roma.
- Secretary : Dr. G. d'Auria, Istituto di Elettronica, Facolta d'Ingegneria, Via Eudossiana 18, I - 00184 Roma.

JAPAN :

- President : Prof. S. Okamura, Japan Society for Promotion of Science, Yamato Building, 5-3-1 Kojimachi, Chiyoda-ku, Tokyo 100.
- Secretary : Prof. T. Okoshi, Department of Electronic Engineering, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113.

MEXICO :

(situation under review).

NETHERLANDS:

- President : Prof. F. L. H. M. Stumpers, Philips Research Laboratories, Eindhoven.
- Secretary : Dr. ir. J. B. H. Peek, Philips Research Laboratories, Eindhoven.

NEW ZEALAND :

- President : Mr. E. W. de Lisle, 225 Marina Parade, Seatoun, Wellington 3.
- Secretary : Mr. G. J. Burtt, Physics and Engineering Laboratory, DSIR, Private Bag, Lower Hutt.

NIGERIA :

- *President* : Prof. I. E. Owolabi, Department of Electrical Engineering, University of Ilorin, Ilorin.
- Secretary : Dr. E. E. Balogun, Department of Physics, University of Ife, Ile-Ife.

NORWAY :

- *President* : Dr. B. Landmark, Royal Norwegian Council for Scientific and Industrial Research, Space Activity Division, Wdm Thranesgt. 98, Oslo 1.
- Secretary : Mr. G. Skovli, Directorate of Civil Aviation, Storgatan 10 b, Oslo 1.

PERU :

President : Dr A. A. Giesecke, Instituto Geofisico del Peru, Ministerio de Fomento, Apartado 3747, Lima.

POLAND :

President : Prof. A. Smolinski, Instytut Podstaw Elektroniki, Politechnika Warszawska, ul. Nowowiejska 15/19, 00-665 Warszawa.
 Secretary : Prof. S. Hahn, Instytut Radioelektroniki, Politechnika Warszawska, ul. Nowowiejska 15/19, 00-665 Warszawa.

PORTUGAL :

President : Prof. Dr. L. A. Mendes Victor, Instituto Nacional de Meteorologia e Geofisica, rua C - Aeroporto de Lisboa, Lisboa 5.

SOUTH AFRICA :

President : Dr. F. J. Hewitt, Deputy-President, CSIR, P. O. Box 395, Pretoria 0001.

Secretary : Dr. J. A. Brink, CSIR, P. O. Box 395, Pretoria 0001.

SPAIN :

President : Col. L. Azcarraga, Director General de Protection de Vuelo, Ministerio del Aire, Madrid.

Secretary : Mr. R. Rivas, Paseo della Castellana 98, Madrid 6.

SWEDEN :

- President : Prof. S. Lundquist, The Institute of High Tension Research, S - 755 90 Uppsala.
- Secretary : Mr. P. Åkerlind, Chief Engineer, Frequency Division, Swedish Telecommunications Administration, S - 123 86 Farsta.

SWITZERLAND :

- President : Prof. Dr. Walter E. Gerber, Elfenauweg 64, CH 3006 Bern.
- Secretary : Dr. H. Wehrlin, Auweg 9, CH 3074 Muri/Bern.

TAIWAN :

- President : Mr. Kang-Ping Liang, Directorate General of Telecommunications, Ministry of Communications, P. O. Box 84, Taipei.
- Secretary : Prof. Mei-Hwa Wang, Engineering Department, Directorate General of Telecommunications, Ministry of Communications, P. O. Box 84, Taipei.

UNITED KINGDOM :

- President : Dr. J. A. Saxton, Home Office Directorate of Radio Technology (DRT/DCSS), Waterloo Bridge House, Waterloo Road, London SEI 8UA.
- Secretary : Dr. R. W. J. Keay, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG.

USA :

- President : Dr. C. G. Little, NOAA/ERL/RB 3-A 450, Boulder, Colorado 80303.
- Secretary : Prof. T. B. A. Senior, Radiation Laboratory, Electrical and Computer Engineering Department, The University of Michigan, Ann Arbor, MI 48109.

USSR :

- President : Prof. V. V. Migulin, IZMIRAN, Akademgorodok, 142092 Moscow Region.
- Secretary : Dr. M. V. Persikov, Institute of Radioengineering and Electronics, Academy of Sciences, Prospekt Marksa 18, g. Moskva, Centr, GSP-3.

YUGOSLAVIA :

- President : Prof. R. Horvat, Elektrotehnicki Fakultet, Bulevar Revolucije 73, 11000 Beograd.
 - Secretary : Prof. Dr. B. Popovic, Electrotechnical Faculty of Belgrade, P. O. Box 816, 11001 Beograd.

OPENING MEETING

Monday morning, 31 July 1978

The Opening Meeting was held in the Finlandia Hall, in Helsinki, in the presence of about 1,200 participants and invited guests.

At the beginning and end of the Meeting, and also during the interval, the delegates were entertained to a short programme of musical works by Finnish composers (Jean Sibelius, Sam Sihvo and Toire Kuula) played by the Helsinki Garrison Band.

During the first half of the programme, the Chair was taken by Prof. M. Tiuri, President of the Finnish URSI Committee, who introduced two speakers : Mr. J. Numminen, Secretary General of the Ministry of Education, and Prof. P. Laasonen, Rector of the Helsinki University of Technology. The President of URSI, M. J. Voge, replied briefly to the welcoming remarks made by these speakers.

After the interval, the President took the Chair and invited Dr. Minnis, Secretary General of URSI, to present his Report. Following the Presidential Address, Mr. R. C. Kirby, Director of CCIR, was invited to address the Meeting.

The texts of all the addresses are reproduced below.

Opening Remarks

by Prof. M. TIURI, President of the Finnish URSI Committee

Honorable guests, Ladies and Gentlemen,

On behalf of the Finnish URSI Committee, I welcome you to the XIX General Assembly of the International Union of Radio Science. The General Assembly of URSI is held every three years and this time we, in Finland, have the pleasure of meeting about 800 radio scientists and 150 accompanying persons from abroad.

The scientific programme of the Assembly has been organised by the URSI Commissions, which cover nine different research fields in radio science extending from radio astronomy to measurements and biological effects. I am sure that the 96 scientific sessions which will be held during the Assembly will give a full picture of the achievements of radio science during the past three years, including many fruitful ideas for future research. The XIX General Assembly is a new experiment in URSI since the programme includes five Open Symposia, and since all interested radio scientists have been invited to participate.

In addition to the scientific programme you will have opportunities to participate in social and cultural activities and to see something of Finland during the summer season. Perhaps our summer is a surprise for those of you who had expected to see more snow here so close to the Arctic circle.

We shall do our best to make your visit to Finland worthwhile for you, and I wish every success to the XIX General Assembly of URSI.

Address of Mr. J. Numminen

Secretary General, Ministry of Education

It is a pleasure for us in Finland to have the XIX General Assembly of the International Union of Radio Science here in Helsinki.

Man has been sending out radio waves for only 90 years, but it can be said that these waves changed the world. Research on radio waves has led to numerous applications such as radio communication, radio navigation, television, distribution of precision time, and satellite communication, which we need every day. Especially in a sparsely populated country like Finland, radio links are essential.

Radio science has not only changed the world, it has also changed our view about the universe. Radio astronomy has, in 30 years, produced perhaps as much new information as classical astronomy has done before it in hundreds of years. But radio scientists are not resting on their laurels. Many interesting and promising new research areas are represented in the programme for this XIX General Assembly. I want to mention some which we in Finland consider important.

Remote sensing, or the study of the Earth's surface and its resources using electromagnetic waves, will help us to monitor the environment and to use our resources sensibly. Clouds, rain and darkness will not disturb radio waves. Hence remote sensing is possible in all weather conditions, which is an essential requirement in countries like Finland, especially during the winter time. In Finland, remote sensing research using radio waves is applied to snow cover, ice, and peat lands. The study of the biological effects of radio waves is a fast-growing research field. The effects of electromagnetic fields on living things seem to be more complicated than was thought earlier, and much research is still needed to clarify the situation. In addition to helping in the protection of operating staff, this research promises new methods of detecting and helping to cure certain illnesses.

In 80 years of radio research, and in the development of applications, the expansion has been towards the study and use of shorter and shorter radio waves. The millimetre wave research which is the topic of several sessions during this Assembly is a continuation of the tradition. In Finland we have good possibilities to take part in this research, thanks to the Metsähovi Radio Research Station, which is operated by the Helsinki University of Technology in cooperation with the Academy of Finland. The station has one of the few large millimetre-wave telescopes in the world.

The other large radio science research project supported by the Academy of Finland is the Northern European Incoherent Scatter Radar: EISCAT. The large antennas of EISCAT are just now being assembled in Northern Finland, Sweden and Norway. Other countries participating in the EISCAT are France, the Federal Republic of Germany, and the United Kingdom and about 25 million dollars have already been invested in the project. As one of the most northern countries in the world, Finland is ideally situated for studies of the upper atmosphere in the auroral zone. Hence we consider participation in this research to be our duty.

The examples I have mentioned show that there are many significant research areas in the radio science, and the scope for cooperation offered by URSI is especially important for small countries which have limited resources.

I wish URSI a successful XIX General Assembly.

Address of Prof. Pentti Lassonen

Rector of the Helsinki University of Technology

On behalf of the Helsinki University of Technology, I have the pleasure to welcome the participants of the International Union of Radio Science to the XIX General Assembly. In order to justify this my greeting, may I state the following facts about the rôle of our University in Finnish radio science.

URSI has been known in Finland since 1952 and the Finnish Committee has arranged national meetings every three years, the last of which was partly of Scandinavian character. The Helsinki University of Technology which, as recently as the beginning of the last decade, was the only academic institution in Finland involved in teaching and research in radio science, has always been represented in the URSI Committee and has served as its home throughout the existence of our national activities. Thus it is only fitting that we should have taken the responsibility of serving as host to the General Assembly. The actual work has been done mostly by the Department of Radio Engineering of our University, which has existed here since 1922 and which was first led by the late Prof. Ylöstalo for a period of 30 years, and after him by Prof. Tiuri. Radio science has been practised since those days, both here and in the outside faculties and research institutes, with increasing volume and success. Here it may be worth while to mention the Metsähovi Radio Research Station and the activity of Sodankylä Geophysical Observatory in connection with the European Incoherent Scatter Facility, as well as the facilities of the Electron Physics Laboratory and the Communication Transmission Laboratory of our University.

This very hall, the Finlandia Hall, has offered the facilities for the opening of several large international conferences, especially since the European Security Conference in Helsinki was held in this hall just three years ago. This summer we have already helped to arrange the meeting of the International Federation of Automatic Control, as well as the International Conference of Software Engineering for Telecommunications and, two weeks from now, we shall have the huge conference of the International Union of Mathematics. You may be interested to know that this building, and also the Main Building as well as the main Library Building of our University of Technology at Otaniemi, are all creations of the late Academician Alvar Aalto, one of our former students in architecture.

Dear friends : I hope that you will find that the local facilities, which are mostly located in the premises of our University in Otaniemi, are satisfactory and that you will accept our sometimes unstable climate and strange national manners with tolerance. Finally I wish you interesting and exciting days during the Conference while lecturing and learning about the development of radio science throughout the wide world.

REPLY BY THE PRESIDENT OF URSI, M. J. VOGE

Mr President, Mr. Secretary General, Mr. Rector,

May I thank you for your kind words of welcome and for honouring, with your presence, the opening session of this General Assembly of URSI. I also want, in the name of all our members, to express our thanks to the Finnish National Committee and to its Chairman for having invited us to hold our Assembly in your country.

Although for many of us and for myself, this Assembly is our first opportunity to visit Finland, thanks to the mass media and to the work of our Finnish colleagues in radio science, we all recognise the high position that your country holds today in the arts, in science, sport and economics, and in world diplomacy. Such memorable events as the Olympic Games of 1952 and the great Peace Conference of 1975 and, perhaps even more, the balance which you have managed to maintain between the natural beauty of your forests and lakes, and the development of new architecture, technology and social organisation, have given us the greatest desire to get to know you better.

All our members know the importance of the Earth's magnetic field in the structure of the high atmosphere and in the propagation of radio waves. Our last Assembly was held in Peru, on the magnetic equator, in a country which is famous not only for its remains of Inca architecture, but also for the great radio observatories of Huancayo and Jicamarca. And now, three years later, the Assembly is being held at the highest geographical and magnetic latitude in the history of URSI; we are in the auroral region, dear to the hearts of our research scientists, and here we can find both a very dense network of observatories, and also treasures of architecture which, even though they are modern, are already justly famous. These comings and goings between the new continents and the old one, between the Equator and the auroral regions, exemplify the unlimited range of our investigations. They cover not only our planet, but the whole of the Universe which we can explore using radio astronomical techniques and by more direct contacts using interplanetary probes. I have also noticed with a certain amount of curiosity, as we approach the 60th Anniversary of URSI, that our VIII General Assembly was held exactly thirty years ago in July 1948, relatively near here, in Stockholm. Perhaps we, like the sun, are subject to some sort of cycle? URSI had seventeen members in 1948. As the age of our Union has doubled, the number of our members has more than doubled : today they are thirty-seven. And of course, I am particularly pleased that among these more recent members, is the Finnish National Committee which joined us 26 years ago. May we, although a few months late, celebrate with you this silver anniversary which bears witness to our already long and very fruitful association.

In 1948 the President, Sir Edward Appleton, with whom my predecessor, Sir Granville Beynon, worked for a long time, said as he opened the Stockholm Assembly, that the success of any meeting is in direct proportion to the amount of work which has gone towards its preparation. The success of this XIX Assembly is then, in my opinion, already assured. I wish to express my great satisfaction for the remarkable way in which the Finnish National Committee, under its President, Professor Tiuri, the Organising Committee and its Secretary, Dr. Löfgren, and the Ladies' Committee have carried out this preliminary work. I am sure I speak for all our members when I express our gratitude and say how much the advance preparation has aroused our admiration.

I think I can also assure you, not only of the capacity of our members for work, but also of their capacity to relax and improve themselves by taking full advantage of the social events, the opportunities for sightseeing, and the visits which have been organised for them between the working sessions.

May I then, in the name of URSI, once more offer our thanks to Professor Tiuri and the Finnish National Committee for the warmth and generosity of their welcome, and to you, Mr. Secretary General and Mr. Rector, for honouring us with your presence and for the words of welcome and encouragement which you have kindly expressed as this Assembly opens.

Report of the Secretary General

Dr. C. M. Minnis

One of my responsibilities, as Secretary General of our Union, is to prepare a detailed report for the URSI Council and, at its meetings on Friday and Saturday last week, the Council began its consideration of this report. However, I have an additional responsibility, namely that of presenting, to all the Delegates, a summary of the activities of the Union since the preceding Assembly.

One of the principal activities of all the Scientific Unions is the organisation or the sponsorship of international scientific symposia and other meetings. URSI is no exception and, since we met in Lima three years ago, our Union has participated, in one way or another, in 30 symposia held in 12 different countries. I must admit that, in most cases, the organisational responsibility for these events has been left in the capable hands of the local URSI Committee or some other national body. As on previous occasions, I would like to take this opportunity of thanking these bodies for their support, and for the contributions they have made towards helping to maintain the life of the Union during the interval between Assemblies. I shall not take up your time by referring individually to all these symposia, but perhaps I might mention a few of them so as to illustrate their wide variety.

More than a century has passed since the publication of Maxwell's equations; nevertheless electromagnetic theory still presents many problems and it is appropriate that Commission B should have held another symposium in the important series devoted to this subject, which was initiated by URSI in 1953.

In a comparatively new field, the recent symposium in the USA on Biological Effects of EM Radiation marks a new departure for Commission A, and it will be followed up by another symposium on this rapidly developing subject here in Helsinki.

The Colloquium organised by Commission F last year in La Baule merits special mention because it was designed to bring together, in the same event, practically all those aspects of wave propagation in non-ionized media that are of interest to URSI. Both the purely scientific aspects of the subject and also some of the practical applications to systems of communications were covered; it was even possible to hold several meetings of CCIR Working Groups during the Colloquium. One of the objectives of this event was to provide adequate time for the presentation and discussion of original papers in a relaxed atmosphere, and thereby to relieve the pressure on the scientific sessions of Commission F here in Helsinki. It will be interesting to follow up the results of this experiment which was, in fact, recommended by the URSI Council in 1975.

Although URSI is concerned above everything else with the more fundamental aspects of radiocommunications, it is important that we should not lose touch with reality. We must therefore remain aware of the problems encountered by the ITU and by the people who are concerned with the operation of communication systems. I have already referred to the contacts between CCIR and URSI Commission F at the Colloquium in La Baule. In a completely different field, Commission E participated actively in planning the Symposium on Electromagnetic Compatibility which was held last year in Montreux. In his opening address on that occasion, Mr. Richard Kirby, the Director of CCIR, referred to certain difficult problems such as those encountered in the field of spectrum utilisation. He suggested that, in order to solve these problems, there was an urgent need for exchanges of views between, on the one hand, communication engineers and, on the other, the physicists and mathematicians associated with URSI. I have no doubt that the recently formed Liaison Committee which links together URSI, CCIR and CCITT, and whose Chairman is Dr. John Saxton, will find ways of bringing together the appropriate groups of people.

Radio communication systems are, of course, of great importance in the less highly developed countries of the world. At the European Electrotechnical Conference held in Venice in 1977, several specially arranged sessions were devoted to the various needs for communications in developing countries. On this occasion, URSI made an important contribution by providing financial support for some of the key speakers at these sessions.

At some symposia the first objective is to encourage serious discussions of a few selected topics rather than to aim at the formal presentation of large numbers of papers. This objective can best be achieved by limiting the number of participants, and Commission J has arranged two events of this kind, which will be held, just after this Assembly, in Groningen and in Bonn. A somewhat similar event was the Colloquium on Radio Oceanography held in 1977 in Hamburg on the initiative of the Inter-Union Commission on Radio Meteorology.

Turning now to the question of publications, the papers presented at international symposia are normally published in the recognised journals, or sometimes in specially produced volumes, but usually without any financial support from URSI. So far as URSI itself is concerned, our main regular publications are the URSI Information Bulletin, which appears quarterly, and the Proceedings of URSI General Assemblies which are published about six months after each Assembly. Copies of both these publications are provided, free of charge, to all our Member Committees.

The *Review of Radio Science* will appear for the third time just after this Assembly, and on this occasion copies have been made available to libraries and individuals purchasers, as well as to the registered participants at this Assembly. I think we must express our appreciation of the work done, not only by Prof. Bowhill, who edits the *Review*, but also by the Chairmen of Commissions, and by those in the Member Committees of URSI who undertook the task of providing or editing the basic input material.

Another URSI publication which deserves a special mention is the *International Reference Ionosphere* which will appear soon after this Assembly. This volume is the product of many years of painstaking work on the part of a small international Committee. But I think we must recognise the fact that the difficult task of selecting and collating the information available, and then of presenting it in an appropriate form, has been the responsibility of Professor Rawer who chaired the Committee and his two

colleagues, Drs Bilitza and Ramakrishnan, at the Institut für Physikalische Weltraumforschung in Freiburg.

Those of you who see the URSI Bulletin will have noticed the change in format and the fact that the text is no longer type-set. The photolitho process was adopted, in the interests of economy, following a recommendation made by the URSI Council in 1975. The cost, in Belgian francs, of printing the Bulletin has indeed been reduced but, if you examine our accounts, which are presented in dollars, you will find that the cost has hardly changed. This is just one of the consequences of the international economic events of the past seven years : events which have created great problems for anyone who is concerned with the management of the finances of an international organisation such as URSI.

I shall not burden you with statistics and figures relating to the finances of the Union, but I think it is worth pointing out that the level of activity which URSI is capable of maintaining depends on four factors, all of which vary with time. First, and most important, is the amount of the unit contribution payable by our Members; this is decided by the URSI Council at each Assembly. However, the real value of these contributions depends on two other factors : the purchasing power of the currency used to define them; and the rate of inflation in many countries, which affects air fares, hotel charges, office expenses, printing costs, and so on. The fourth factor is the size of the annual grant that we receive from UNESCO through the International Council of Scientific Unions. It is possible to express all these factors numerically and, in a document that I have prepared for the Finance Committee, there is a Table showing the annual values, since 1969, of a socalled "Activity Index" which is a measure of the potential level of activity of the Union. This Index suggests that, during the next three years, the level of activity in URSI will be 75 %-80 % of what it was about 10 years ago. The actual level will depend on what decisions will be made here regarding the unit contributions for the years 1979-81, and also on what the future policy of ICSU will be in relation to the allocation of grants to the Unions.

I cannot leave the question of URSI finances without offering my thanks to our Treasurer, Prof. Gordon. In spite of his many other responsibilities during the past three years, he has always been ready to discuss our problems and to offer his advice. In this connection, I think I ought also to mention that our freedom from serious financial problems during the past three years has been due to the wise decisions made in 1975 by the Finance Committee in Lima, and I would like to compliment Dr. Saxton, the Chairman, and the members of that Committee for their foresight. In any discussion of the financial support for the activities of the Union, we must, of course, give some thought to what we mean by the word "activities". In URSI, approximately half of the total expenditure on scientific activities in a three-year period relates to the General Assembly, including the scientific sessions that are held at the same time. In other words, the expenditure during the ten-day interval of the Assembly is three times greater than the total expenditure on scientific activities during the twelve months of a normal year.

We must ask ourselves whether the very great emphasis placed on the Assembly can be justified, and whether it may not be preferable to encourage a higher level of scientific activity during the period between Assemblies. The rôle of the Assembly in URSI has been a subject for debate for at least 18 years, and this fact seems to suggest that there has been considerable difficulty in trying to define this rôle.

Ten years ago, the general opinion was that the Assembly was an important occasion for the delegates to review the progress of the Union and, after reflection, to make plans for the activities of the next three years. At that time, it was often stated that the Assembly was not to be regarded as just one more large international symposium covering a very broad range of loosely connected topics. During the past ten years, there has been a swing in the pendulum of opinion and, so far as the present Assembly is concerned, a considerable part of the time will be taken up by the presentation of numerous papers in five Open Symposia. It follows that there will be very much less time for the mature reflection process which was considered to be so important ten years ago.

What will happen during the next ten years? Will the pendulum swingback again, or is it now possible to make a rational decision as to what type of Assembly is in the best interests of URSI? This is a question which merits serious consideration.

It seems possible that, in recent years, we have concentrated our attention too much on the programme of the Assembly as an isolated event, and that we have tended to lose sight of the overall aims of the Union itself. The main objective of URSI is certainly not the organisation of our General Assemblies, but rather the attainment of certain objectives during the intervals between Assemblies. As Prof. Bernard, the President of our French Committee, has pointed out in a recent article in the URSI Bulletin : "If the Union has been inactive during three years, what is the use of the Assembly ?".

It seems to me, therefore, that we ought to place less emphasis on arguments about the Assembly itself. Instead we must devote more attention to making a reassessment of the real objectives of the Union; we must then decide what activities should be undertaken between Assemblies so as to facilitate progress towards these objectives. Once we are clear about the overall objectives of the Union, and how to reach them, it will be possible to see the Assembly in its proper perspective. If I might quote again from Prof. Bernard's article, he states : "An Assembly will be a lively event if URSI is alive, that is if it takes action during the three years between Assemblies".

No reference to the activities of URSI between Assemblies would be complete without a mention of the URSI Secretariat in Brussels. Most of the Scientific Unions elect a new Secretary General at every Assembly, or at alternate Assemblies, and this practice implies frequent transfers of the Secretariat from one country to another. On the other hand, URSI has always preferred to maintain a small permanent Secretariat and also to retain the same Secretary General for as long as possible. The consensus of opinion in URSI, at least up to the present, has been that this system has the advantage of ensuring continuity and minimising delays in dealing with the business of the Union. It is an interesting fact that, since URSI was established in 1919, the Secretariat has always remained in Brussels. Also, apart for two short-term appointments arising out of the War years, URSI has had only three Secretaries General during the 59 years of its existence.

An even more striking fact is that, during this long period, we have had only two Administrative Secretaries. When I joined the Union in 1967 after the unexpected death of Colonel Herbays, Mme Stevanovitch, our present Administrative Secretary, had already served URSI for ten years. It was only thanks to her extensive experience and her intimate knowledge of our affairs that there was no serious break in the management of the Union. I would like to take this opportunity of expressing publicly to Mme Stevanovitch my very sincere thanks for her loyalty and for her unfailing support during the past eleven years. I am quite sure that her abilities will be an equally invaluable asset to my successor and I have no doubt that, after this Assembly, she will once again succeed in ensuring a smooth transition from the outgoing to the incoming Secretary General.

I cannot conclude my Report without referring to our hosts. It is thanks to the invitation of the Finnish National Committee for URSI, under the chairmanship of Prof. Tiuri, that we are meeting here today. The Finnish Committee is one of the few in Europe which organise periodical meetings on radio science and, just before leaving Brussels, I looked again at the last report of the National Convention on Radio Science and the Nordic Antenna Seminar held in Otaniemi, to which reference has already been made by Prof. Laasonen. I think our Finnish Committee is to be congratulated on this initiative, but of course my main reason for mentioning the Committee is to support the remarks already made by the President and to express to Prof. Tiuri and his colleagues our very warm thanks for the invitation to come to Finland. I would like also to mention Dr. Löfgren who, in his capacity as Secretary of the Organising Committee, has shared with Prof. Tiuri the task of trying to satisfy all the requirements for such a large gathering as an URSI Assembly.

Helsinki is the most northerly location in which an URSI Assembly has ever been held, and I know that Prof. Christiansen, and a few others who are present here today, participated also at our most southerly Assembly in Sydney, Australia in 1952. So far as the longitude distribution of our Assemblies is concerned, in the last 15 years the invitations from our Member Committees have made it possible for us to meet in Eastern and Western Europe, in North and South America, and in Eastern Asia.

It is only natural that a Union concerned with radio communications and with the propagation of radio waves over the Earth should have a worldwide distribution of Member Committees. At present we have 36 Committees, but we recently received a request to the URSI Council from the Royal Irish Academy in Dublin for the admission of an Irish Committee. I am glad to report that this request was accepted and with the admission of Ireland, we now have 37 Member Committees. We have also received a provisional application from Indonesia and this is under consideration. Our Committee on Membership would, of course, like to see the formation of many other new Committees but, in the developing countries, there seems to be some hesitation about deciding to adhere to an organisation which is concerned mainly with basic research, rather than with studies likely to yield results of practical value in the near future. On the other hand, I suggest that it would be a mistake to try to increase our membership artificially by means of extensive publicity and undue persuasion. The strength of a Union depends on the level of interest shown by its individual members, rather than on the mere size of its membership. In URSI, although we are one of the smaller Unions, we are fortunate in having so many Member Committees which support and take a genuine interest in our activities. In the years ahead, it will be the continuation of this support, rather than a great expansion in our membership, which will enable URSI to maintain the position it has held for nearly 60 years in the field of telecommunication science.

Monsieur le Président, Mesdames et Messieurs,

Le fait que j'ai présenté mon Rapport en anglais ne signifie nullement que j'oublie le français, qui est et reste une des langues officielles de notre Union. Depuis l'Assemblée de 1969, mon Rapport a été présenté en français à deux reprises, à Ottawa et à Varsovie; je le présente aujourd'hui en anglais à Helsinki, comme je l'ai fait à Lima. Je crois donc avoir respecté l'esprit de nos Statuts. Comme vous le savez, Monsieur le Président, la langue de travail au Secrétariat est le français et, en dépit de mon accent "anglo-belge", c'est dans cette langue que nous avons mené nos nombreuses discussions téléphoniques depuis l'Assemblée de Lima.

A mon avis cependant, l'usage de la langue française au sein de l'URSI est bien plus qu'une formalité imposée par les Statuts. Il découle plutôt de cette longue tradition de coopération amicale et étroite entre le Secrétariat et les Comités français et belge de l'URSI, coopération qui s'amorça dès la naissance de l'Union en 1919. A cette époque, il n'est guère nécessaire de le rappeler, le Président de l'URSI était le Général Ferrié et sa main droite, mon prédécesseur belge, Robert Goldschmidt.

Mais la tradition seule ne suffirait pas à justifier cet usage. C'est avec plaisir donc que j'ai accueilli la contribution du Professeur Bernard, actuellement Président du Comité national français de radioélectricité scientifique, aux discussions sur l'organisation et les objectifs futurs de l'URSI, lesquelles furent entamées en 1975 par son prédécesseur Monsieur Thué. Je suis certain que les relations étroites entre le Secrétariat de l'Union et nos Comités belge et français se maintiendront et je tiens à dire combien je les ai appréciées depuis mon arrivée à Bruxelles il y a onze ans. En conclusion, puis-je vous exprimer, Monsieur le Président, à vous et aux autres membres du Bureau, toute ma gratitude pour l'appui qui m'a été fourni au cours des trois années écoulées.

Address of the President, M. J. Voge

In a recent issue of a business magazine, I read that an organization cannot be regarded as mature and permanent until its age is greater than that of its President. I believe that this XIX General Assembly of URSI is the first at which we can say that our Union has reached this stage in its development : not because of the youth of the President, but simply because next year URSI will be 60 years old, an age which is associated with great sagacity and which merits respect. I would like to believe that these qualities are recognised by the organisations which have sent representatives or messages of good wishes to this Assembly, and with which we have had friendly relations often for very many years. Some of these organizations are even older than URSI, such as the International Telecommunication Union which has already celebrated its centenary while, on the other hand, our sister Astronomical and Geophysical Unions were created at the same time as URSI in July 1919. The younger organizations also have their merits and we are glad to benefit from the dynamism of their youth.

Although the list of representatives is not yet complete, I would like now to welcome those whom I know are here :

- Mr. Kirby, Director of CCIR, one of the organs of the ITU;
- Prof. Westerhout, representing the Astronomical Union;
- Dr. Gendrin, who represents IUGG, and who is also an Officer of IAGA;
- Prof. Rawer has been designated to represent COSPAR;
- Dr. King is Vice-Chairman of SCOSTEP;
- our two Inter-Union Commissions are represented by their Chairmen : Prof. Hagen from IUCAF and Dr. Wickerts from IUCRM.

In addition to welcoming the representatives of these organizations, and indeed all the delegates, I must offer a special word of welcome to those participants who have come to an URSI Assembly for the first time, and particularly the younger delegates.

Those of you who, like myself, have participated in many URSI Assemblies cannot fail to recall memories of our predecessors who are, alas, no longer with us. To many of them we owe a great debt of gratitude for their achievements and their example. I would like to refer first to two of them, both former Honorary Presidents of our Union, whose influence on URSI was of fundamental importance : Balthasar van der Pol, who remained faithful to URSI for about 40 years until his death in 1959, and Samuel Silver whose outstanding personality made such a deep impression on URSI during the past 30 years. We had hoped that Mrs. Le Corbeiller, Prof. Van der Pol's widow, would be able to attend the Assembly but, unfortunately, she has been prevented from undertaking the journey. However, it is a particularly great pleasure for me to welcome Mrs Silver and, on behalf of the URSI Board of Officers, I would like to thank her for having honoured us by accepting our invitation to attend this Assembly.

In 1951, I had the remarkable privilege of working closely for several months with Prof. van der Pol when he was Director of CCIR, and I was

deeply impressed by this intellectual experience. My contacts with Prof. Silver from 1950 onwards were equally enriching for me and I am sure that everyone who knew him must have had a similar experience. After obtaining his doctorate in 1940, Prof. Silver began his career during the Second World War at the famous MIT Radiation Laboratory, celebrated for its work on centimetric radar, and on the development of microwave techniques which were later to lead to spectacular results. Almost at once, Prof. Silver became one of the world leaders in research on antennas. After spending some years at the Naval Research Laboratory, he joined the University of California at Berkeley where he remained until his death in 1976. In addition to his responsibilities as Professor, he was also Director of the Electronics Research Laboratory, and the founder of the Space Science Laboratory. On two occasions he received the Guggenheim Fellowship and in 1968 he was elected to the National Academy of Engineering.

Within URSI too, Prof. Silver's activities were equally outstanding. Only four years after he first participated in an URSI Assembly, in Zurich in 1950, he was elected Chairman of the Commission on Waves and Circuits, which he completely reorganized. After being elected President in Munich in 1966, he remained as Past President from 1969 to 1972, and he then had the unique distinction of being immediately elected Honorary President.

Time does not permit me to describe adequately the many contributions made by Prof. Silver to URSI. He played a key rôle in the discussions on the reorganization of the Union, and many of his ideas were accepted; the prestige of URSI was considerably reinforced thanks to his interventions. He strongly defended the idea of opening our meetings to all interested scientists, regardless of the political systems in their respective countries. He was very conscious of the needs of young scientists, and it was he who proposed the creation of a special fund designed to facilitate their participation in our General Assemblies. He was also an outstanding professor and, as such, he stressed the importance of the rôle that a Union such as ours ought to play in the field of education. He was aware, too, of the need to bridge the gaps between theory and applications, and between the physicist and the engineer. Last but not least, his modesty and tolerance, and his eagerness to promote science and the great principles that he defended, never failed to merit our admiration and respect.

Another of the great figures in URSI, Charles Manneback, is also no longer with us. He died at the end of 1975 after having been an active participant at our Assemblies since 1928. Following his retirement, after having served for many years as Treasurer, Prof. Manneback was elected Honorary President in 1969. In this capacity, he felt that he still had a personal responsibility towards the Union; as a result, he frequently visited the URSI Secretariat in Brussels and he continued to attend meetings of the Board of Officers.

But, sadly, it is not only the loss of Prof. Silver and Prof. Manneback that we have to record since the last Assembly. I must also refer, if only briefly, to others: Herbert Daene, Hidetsugu Yagi, Jean Lugeon, Richard Rettie, Robert Barfield, Sir David Martin, Edward Pierce, George Schaffer, Curtis Johnson, Wolfgang Pfister and Georges Bouchard.

May I ask you to stand for a few moments in silent tribute to them ...

I would like now to say something about the reorganization of URSI; this is a subject which returns like a *leitmotiv* in the reports of almost all my predecessors during the past 20 years. I recall participating in a working group on this question in Tokyo in 1963. Thanks to Prof. Koga, Dr. Smith-Rose, Professors Silver and Dieminger, Sir Granville Beynon, Prof. Booker and many others who have offered their advice, the foundations of our reorganization have now been firmly established.

In this connection, it is important to recall two recent key events : at Warsaw in 1972, it was decided to maintain URSI as an independent Union, and in Lima in 1975, it was agreed that our main objective was to study "the scientific aspects of telecommunications using electromagnetic waves, guided and unguided". These two decisions have given us clear indications about the direction in which our future efforts should be directed.

We are, essentially, the Union that is concerned with the science of Telecommunications. At the same time, we offer the benefits of our unrivalled experience to scientists in other fields : astronomers, geophysicists and, perhaps in the future, biologists. It is this experience which has led to the development of modern radio sounding devices of many kinds : these include ionospheric and tropospheric sounders, the great radio-astronomical installations, and devices for detecting terrestrial and celestial radiation.

Another important aspect of the decisions taken in Lima was our desire to open our meetings to the scientific community in general. Symposia and colloquia organised by URSI are now accessible to all scientists and research workers, young and old, including those who work in countries that do not adhere to URSI.

Since we have already defined our principles, our present duty is, in my opinion, to decide how best to put them into practice. I must remind you that, in Lima, the Council recommended, but unfortunately too late for immediate action to be taken, that every Commission should be asked to propose to the Council a Symposium to be organised during the three years following each Assembly. It was intended that the Board of Officers should select, from these proposals, a few subjects appropriate for inclusion in the programme of the next Assembly.

This Council recommendation seems to imply not only a significant level of activity in the Commissions between Assemblies, but also some dissociation of the aim of the Assembly and of the symposia. The Assembly should give, I think, priority to the study of the results obtained, to the achievements in the various Commissions, and to the planning of their future programmes of activity. At the same time, the Assembly was intended to include scientific sessions of more general interest designed to assist the Council in reaching decisions on the creation of new Commissions or on the modifications of the terms of reference of existing Commissions.

Returning now to the question of the broadening of our external contacts, I am particularly glad to see that our long-standing and friendly relationship with the International Telecommunication Union has been strengthened by the creation of a Liaison Committee, under the chairmanship of Dr. Saxton, which links together URSI, CCIR and CCITT. One of the beneficial results of the cooperation between these bodies was, for example, the URSI Symposium on Measurements in Telecommunications, held in Lannion in 1977. Its success exceeded the expectations of the organisers, as well as those of the scientists and telecommunication engineers who participated in it.

I believe that it is through ITU that URSI will best be able to make many of its most useful contacts, not only with the engineers and others who are responsible for operational systems of communication, but also with the developing countries. The ITU has about 150 members, as compared with only 37 in URSI. Probably for a long time to come, the tribune that will provide our most direct and effective meeting ground with many countries of the world will be the ITU. There, URSI can play many different rôles. For example, the World Administrative Radio Conference in 1979 will give to our Inter-Union Commission on the Allocation of Frequencies, and also to URSI Commission E, which deals with the interference environment, an opportunity to demonstrate to the whole world our contribution to the problem of how to make the most effective use of the radio spectrum.

Recently I have had the opportunity of meeting the new Director of the UNESCO Division for the Development of Systems of Communication, and of discussing with him the important programmes envisaged by UNESCO on world communications. The collaboration of URSI would certainly be very warmly welcomed here.

Finally, I believe that the Member Committees of URSI ought to develop and strengthen their links with the national societies and professional institutions concerned with communications : such as the IEEE in the United States, the Popov Society in the Soviet Union, and the engineering societies in Europe grouped together under the title EUREL. To quote an example, the joint participation of URSI, IEEE and EUREL in the organisation of the European Electrotechnical Conference in Venice last year was certainly very valuable for URSI. For a Commission such as our Commission D, which is concerned with physical electronics, its most practical and useful activity would probably be its regular, but active, participation in the major symposia organised by various national bodies on such subjects as quantum electronics, semi-conductors, optical electronics and microwave systems.

But I must not forget those organisations whose activities, like those of URSI, place them at the centre of current scientific research. I am thinking, in particular, of our sister Unions, concerned with astronomy and geophysics, with whom we have collaborated closely for many years, both directly and also through Inter-Union Commissions and Working Groups.

The new orientation of the objectives of URSI places the emphasis on areas in which the competence of the radio scientist is universally recognised: instrumentation, methods of measurement, the gathering, processing and transmission of data. Our skills in such fields must make our collaboration more and more valuable to other research organisations, provided always that we are kept fully informed about the problems with which they are faced. A critical discussion of the nature of our cooperative programmes could well be one of the major responsibilities of our General Assemblies. These programmes cover questions which seem likely to affect, in depth, our own activities and even our finances.

I believe that we cannot fully appreciate the importance of our contacts with other scientific organisations unless we recall the outstanding contributions that radio scientists have made in other branches of science : for example, the discovery of the ionosphere and magnetosphere; the development of radar, radioastronomy and radiometeorology and, more recently, the exploration of earth resources. I am particularly glad to see that our investigations of the characteristics of natural media have now led us towards the study of living media and I welcome the initiative of Commission A, which has organised a Symposium here in Helsinki on the biological effects of electromagnetic waves. I could mention other subjects to which radio scientists are making contributions : such as artificial intelligence, pattern recognition, the study of biological communication systems, and even the search for extra-terrestrial intelligence.

I even wonder whether the time will not come when URSI will take an interest in certain interdisciplinary aspects of science : such as the social, economic and political sciences. I could mention, as examples, research on the optimal management of the radio spectrum, one of our most valuable but limited natural resources, or the study of optimal structures of information and communications in our societies.

There is a close relation, in agreement with the title of our Commission C, between the social aspects of signals and the structure of communication systems. I do not want to say anything more about the future perspectives of URSI because I wish to avoid giving you the impression that I am discussing "radio-science fiction".

The Secretary General has already given us a very full summary of our administrative and financial situation and he has drawn several conclusions which I support fully. As he has indicated, our finances are still a subject of some concern. On the other hand, since 1975 we have not been obliged to draw on our reserves, as we had to do between the Warsaw and the Lima Assemblies, and we have avoided the need to ask our Member Committees for unexpected supplementary contributions. These facts seem to justify the step-by-step increase in the unit contribution, from \$ 250 to \$ 400, to which the Council agreed in Lima. It seems possible that the Council may decide on another increase to take effect before the 1981 Assembly, but it will probably be much less than in 1975.

The change in the régime of the Secretary General from full-time to half-time after the Lima Assembly has resulted in the expected reduction of our administrative expenditure but, I fear, in a much smaller reduction in the effort required of the Secretary General. Since his arrival in Brussels in January 1968, Dr. Minnis has been the king-pin of URSI and the loyal supporter of its successive Presidents. He has proved also to be a remarkable financial manager, since he has had to deal with such problems as the optimum distribution of our assets between currencies of constantly changing values. The scientific, administrative and human qualities of Dr. Minnis, and his untiring devotion to the interests of the Union and its members, deserve our admiration and our thanks.

Dr. Minnis will give up the office of Secretary General after this Assembly but, since we can not replace him, we have decided to transfer a part of his responsibilities to each member of the incoming Board of Officers : namely the President, the four Vice-Presidents, and the new Secretary General who will make his services available to URSI on a part-time basis while, at the same time, continuing his normal career. Such an arrangement would of course not be practicable if we were not able to count on the invaluable services of our charming Administrative Secretary, Mme Stevanovitch.

This morning I have the privilege of addressing you, the members of this very large and distinguished gathering, and my attention has been attracted particularly by two components of the audience : these are the young people and the ladies, which together form a coherent group for we know that the ladies possess the gift of perennial youth. I think we can say that, since 1969, the number of young scientists at our Assemblies has continued to grow. We welcome this trend because, if we are to revise our future objectives and make rapid progress towards them, we must profit from the vigour and the idealism of the younger generation.

I believe it is important that the Committees responsible for the selection of papers for presentation at future Symposia should give special and sympathetic attention to the contributions submitted by young workers, and also by scientists from the younger nations of the world. There can be little doubt that we ought to give to the younger members of our Union a task that is appropriate to their dynamic outlook and their aspirations : for example, that of encouraging the teaching of our science and promoting the creation of laboratories in the new countries.

I come now to one of my most agreeable responsibilities—that of addressing the ladies. I have no doubt that I speak for all of the delegates when I say how much we appreciate the ray of sunlight, the charm and the sense of calm which they bring to our Assemblies through their presence. On your behalf, I would like to express to all the ladies our gratitude, and our appreciation of the part they will play in ensuring the success of this Assembly.

It is a particular pleasure for me to refer especially to Mrs Tiuri and the members of the Ladies Committee who have so kindly undertaken the responsibility of entertaining our wives and of helping to make their stay in Finland an enjoyable one.

I cannot conclude without referring again to the 60th Anniversary of URSI, which we expect to celebrate next year in Brussels. It was there, in the Palace of the Academy of Arts and Sciences, that URSI was created in 1919 during the inaugural session of the International Research Council. This Session was honoured by the presence of King Albert I who became the first Honorary President of URSI. We hope that our celebrations in 1979 will be of an exceptional character and that they will be in keeping with the illustrious origins of our Union. The occasion will provide an opportunity of reviewing the progress we have made during the past 60 years

and also of looking towards the future of radio science and telecommunications.

In conclusion, Ladies and Gentlemen, it only remains for me to welcome you all once again, and to declare open the XIX General Assembly of the International Union of Radio Science.

Address by the Director of CCIR, Mr. R. C. Kirby

Mr. President, Mr. Secretary General, Mr. President of the Finnish National Committee, Ladies and Gentlemen,

Thank you for the privilege of addressing this opening session of the XIX General Assembly of the International Union of Radio Science on behalf of the International Radio Consultative Committee, the CCIR. It is for me and my family a wonderful experience to visit beautiful Finland for the first time and to share with you the warm hospitality of the Finnish National Committee. URSI and CCIR have been close friends for fifty years, and URSI faithfully invites the CCIR to be represented at its meetings and General Assembly in a spirit of collaboration which goes back to the beginning of CCIR.

The CCIR is observing its 50th Anniversary. It was in 1927 that the International Radiotelegraph Conference, in Washington, adopted the decision to establish CCIR, and the decision came into effect on 1 January 1929. The first CCIR meeting was held at The Hague in September 1929.

Your Secretary General, Dr. Minnis, in sending URSI's most cordial anniversary greetings to CCIR, pointed out that :

"By a happy coincidence, the Second General Assembly of URSI was " also held in Washington in 1927, at about the same time as the Inter-" national Radiotelegraph Conference. This ensured that, among the " members of the Conference Delegations, there were many scientists and " engineers who also had close associations with URSI. The French and " Belgian Delegations respectively included General Ferrié and Dr. Gold-" schmidt (President and Secretary General of URSI) and, in the United " States Delegation, there were two future Presidents of URSI (L. W. " Austin and A. E. Kennelly). Among the other delegates, for example, " were two future Chairmen of URSI Commissions : Balth. van der Pol, " who later became Director of CCIR, and J. H. Dellinger, who is well " remembered as Chairman of CCIR Study Group 6". Dr. Minnis concluded : "I think it is quite clear that the origins of the " informal but effective cooperation between URSI and CCIR can be " traced back to the Washington event of half a century ago".

Not the least of URSI's contributions has been that of your Secretary General, Dr. Minnis, who has visited Geneva and ITU Headquarters on several occasions in URSI-ITU liaison. Active scientists and leaders in URSI today continue the tradition of contribution to, or leadership of, various CCIR activities.

There is another bond. Radiocommunication is inherently close to science; not only because many radio applications are of a scientific nature, such as radioastronomy and remote sensing in geophysics, but because it is a characteristic of radiocommunication that the time lag for the application of new scientific concepts to engineering is much shorter than for non-radio branches of telecommunications.

I must say that CCIR, at fifty years of age, shows signs of vigor, if not youth. The XIV Plenary Assembly of CCIR has just been held in June in Kyoto, Japan, with the participation of 65 countries. During it, 760 Recommendations and Reports were approved, of which more than three quarters were revised or new in the last four years. During this period more than 1,000 delegates participated in the work of the Study Groups. The volumes which will be published in early 1979 will reflect important advances in radiocommunication and in the international arrangements for their interworking. Many provisions concern spectrum utilization; others concern technical characteristics of new systems or services being introduced on an international basis. Much of the CCIR work in this period was devoted to technical preparation for international Radio Conferences, such as the MF/ LF Broadcasting Conference in 1975, the Satellite Broadcasting Conference in 1977, and the Aeronautical Mobile Conference in 1978. I shall say more later about preparation for the World Administrative Radio Conference to be held in 1979.

In the CCIR texts, developments in radio-wave propagation include a revision of the propagation data for evaluation of the coordination distance for earth terminals in the space service and the terrestrial radio relay service. A new atlas of ground conductivities was adopted. New texts give estimates of depolarization due to the atmosphere, and the significance of the "worst month" in propagation statistics. Improvements were made in the estimation of slant-path attenuation for Earth-space links. Of course one of the most important areas of study for international telecommunications concerns the propagation effects of rainfall. Dr. Saxton, Chairman of CCIR Study Group 5, has expressed his hope, in his Report, that URSI
will be able to assist this work by undertaking fundamental studies of precipitation so that basic physical models can be established for deriving the required radio propagation information.

In the area of ionospheric propagation, a new method of computing sky-wave field strength and transmission loss was developed. It is presently being programmed for testing with the objective of replacing the long standing CCIR Report 252. It is well known that ionospheric scintillation effects can be important for satellite communications, so propagation through the ionosphere for Earth-space paths remains an important study. A report has been adopted on the modification of the ionosphere caused by high-power radio transmitters. As there are many transmitters now whose power exceeds 500 kW and extends up to 1 or 2 MW, and many more in the planning stage, the communication effects of ionospheric modification by high-power emissions seems an important question. Other highlights in the area of spectrum utilization include a new system of classification and designation of emissions which allows useful specification of the complex emission characteristics of modern systems. New definitions of terms relating to interference were adopted, as well as new Reports on spread-spectrum techniques and on band utilization of frequencies from about 40 to 3,000 GHz. The CCIR is proposing to the World Administrative Radio Conference that the present international definition of radio waves, limited to frequencies below 3,000 GHz, should be reconsidered with a view to increasing or removing the upper limit. The Plenary Assembly also adopted a Recommendation that Universal Coordinated Time (UTC), should replace Greenwich Mean Time in the Radio Regulations and in international telecommunications usage.

At the present time, of course, more than half of CCIR's work concerns space systems. A most difficult and important question concerns the efficient utilization of the geostationary satellite orbit. An interim working party deals with this subject as regards fixed service satellite systems; appreciable progress has been made lately, and it is hoped that further proposals can come out of the CCIR Special Preparatory Meeting for the WARC-79. Certainly the most important technical issue of the WARC-79 will concern future utilization of the geostationary satellite orbit.

During the recent study period, much was accomplished toward future satellite systems. The technical characteristics for satellite television broadcasting systems were developed to an extent that permitted a World Radio Conference to adopt a detailed plan for the use in the 12 GHz satellite broadcasting band for Europe, Africa, Asia and Australasia. Since in the Region of the Americas, the band is shared also with fixed service satellites, a separate conference will be held for that Region. The technical and operating characteristics for maritime mobile satellite communications were developed in this period and are being taken account of in the planning of the International Maritime Mobile Satellite System.

In the field of space research and radioastronomy, some 18 new Recommendations and 29 new Reports have more than doubled the content of the CCIR texts on these topics. Some of these concern space systems technology for telecommunications, such as spacecraft attitude control, electrical power systems, spacecraft charging, and antenna technology. The problem of energy transmission from a collecting platform in space, using a highly collimated microwave beam to Earth is also studied. Techniques for data relay satellite systems are outlined; that is, the use of radio links between the Earth's surface and research spacecraft via space stations, including band-sharing arrangements near 15 GHz. A substantial first Report was adopted on radiocommunication requirements for space research devoted to the search for extraterrestrial life. Preferred frequency bands were recommended for Earth exploration satellites. Concerning radioastronomy, CCIR has long given careful attention to the needs of this science for protection from other sources of interference, and has noted the important input from URSI and IUCAF. The Plenary Assembly adopted revised and updated texts concerning frequency sharing, interference from transmitters in other bands, and the CCIR's list of line frequencies of natural origin of interest to radioastronomy. This list has come to be an international master list of such frequencies and will certainly be an essential contribution to the WARC-79. A revised Report on radar astronomy frequency sharing was also approved.

I have mentioned a few CCIR results related to spectrum utilization and radio science, but it is impossible in such a short time even to mention the highlights of 760 texts. There are nevertheless certain additional developments among the operating services which are of interest to URSI. For example, the development of digital radio systems for all services is reflected in the Recommendations and Reports. Especially, the expanding usage of digital transmission for microwave radio relay and satellite services compels further development of standards for compatible interworking, new guides for system planning and new methods of measurement. Digital television transmission is in growing use in local links, and is in the planning stage for international relay of programmes by microwave radio, satellites, and cables. Digital selective calling, introduced in the maritime mobile service according to a CCIR Recommendation, reflects the increasing automation of all communication services. Agreed methods of automatic measurement of video transmissions, such as those using the vertical interval test signal, are of increasing importance for satisfactory international relay of programmes. Also, new stillimage or teletext services are being introduced into television broadcasting by means of multiplex transmission along with regular services. An interim working party is considering the various technical methods for use in such services, and any desirable compatibility of terminals for broadcasting services with those for data services via the land network.

I mentioned that much of CCIR's work in the last couple of years has concerned technical preparation for the World Administrative Radio Conference in 1979, and the general revision of the Radio Regulations. This includes revision of the Table of Frequency Allocations. The CCIR is charged by the ITU with carrying out the technical preparation for this Conference, the first of its kind for 20 years. A Special Preparatory Meeting (SPM) of the CCIR will be held in October-November of this year. The Chairman, appointed by the Plenary Assembly, is to be Dr. John Saxton, who is as well known in URSI as he is in CCIR. CCIR Study Groups have already referred some 260 documents to this SPM, and in addition over 300 original document contributions from various countries will be considered. The challenge to CCIR is to provide a technical base which can guide the development of the radio regulatory framework and serve for perhaps the next 20 years.

One more action taken by the recent Plenary Assembly was to set up an Interim Working Party of the Plenary Assembly to review the CCIR organization, its Study Group structure and methods of working, and to make recommendations to the next Plenary Assembly, which are intended to assure that CCIR continues to adapt to changing technology and the needs of international telecommunication.

Mr. President, in closing my remarks on CCIR, I would certainly like to note the very promising developments in URSI, relative to telecommunications, following URSI's important decision in this regard in 1975. A real follow-through, especially at the international level, is evident from the recent URSI symposia and the programme of this General Assembly. The Symposium on Measurements in Telecommunications at Lannion was excellent; its level was genuinely scientific and its scope reflected many real measurements needs in telecommunication, especially with respect to digital transmission and techniques for electromagnetic fields. The Symposium at La Baule on Wave Propagation was also a significant contribution, with many fundamental papers which reflected an understanding of the needs for planning of telecommunications. The cosponsorship by URSI of electromagnetic compatibility symposia also serves to strengthen the scientific level of these activities.

It is obvious that there is an important rôle for radio science, and for URSI, in the future development of international telecommunications. I could mention just a few important topics. The first is communication theory for spectrum utilization. Classical communication theory considers mostly optimization of a single system, with coding and signal design for immunity to noise and interference. There is need for more emphasis on communication theory which examines aggregate information transfer among a number of systems sharing the same space-time-frequency domain. What kinds of optimization may be sought for the ensemble ?

There remain important questions in propagation : certainly the aspects relating to rainfall, and all the other parameters needed for good prediction and design. Also, the factors affecting scintillation in Earth-space propagation, and propagation at frequencies well above 100 GHz are important areas. The question of the effects of very high power in the ionosphere and troposphere are also of fundamental importance.

There are important questions of hardware science, such as the technology feasible in orbit, and superconductivity. One of the main features of development of radio systems will, of course, continue to be the continued integration of computer science into radio systems.

Mr. President, I thank you again for this opportunity to speak about CCIR and radio engineering at the most important international meeting on radio science. I shall continue, for my part, to welcome and strengthen the long and fruitful collaboration between CCIR and URSI. I wish you a most successful XIX General Assembly.

CLOSING MEETING

Tuesday afternoon, 8 August 1978

The Closing Meeting of the Assembly was held at the Helsinki University of Technology at Otaniemi on the afternoon of 8 August 1978.

Announcements

At the request of the President, the Secretary General announced :

- (a) the results of the elections for the Board of Officers, and Chairmen and Vice-Chairmen of Commissions for the period 1978-81 (see pages 7-8);
- (b) the decision of the Council to confer the title of Honorary President on Professors H. G. Booker and W. Dieminger (see page 47);
- (c) the admission of Ireland as a member of URSI, and confirmation of the admission of Egypt;
- (d) the decision to hold the XX General Assembly in Washington, D. C. in 1981 at the invitation of the United States Committee for URSI.

Closing Remarks of the President

Before I pass on the torch of URSI to my successor, I have a debt of gratitude to repay to all the people who have contributed to the success of this General Assembly. We have worked hard while we have been here, as you can see from the recommendations and resolutions that we have adopted; now our main objective must be to maintain the same enthusiasm and the same spirit of cooperation that we have experienced here in planning the activities of URSI during the next three years.

First of all, I would like to thank all my colleagues of the Board of Officers for their help and advice : our Past President, Sir Granville Beynon, Professor Migulin, Professor Gordon and Professor Stumpers, and of course my successor Professor Christiansen, for the responsibilities they have carried since 1975, in the Membership Committee, in managing the finances of URSI, and in the preparation of the scientific programme of this Assembly.

I would like to thank also the Chairmen and Vice-Chairmen of Commissions for their devotion and their efficiency, both during this Assembly and over the past three years. Thanks to them, we have been able to organise here a very full programme indeed of symposia, scientific sessions and working groups, which provides striking evidence of the potential of our Union. We must learn the lessons of this Assembly and apply them in the planning of the XX Assembly in 1981.

Because of lack of time, it will be quite impossible for me to express, in the way that I would wish, the debt that URSI, and especially its President, owe to the two members of our Secretariat : Dr. Minnis and Mme Stevanovitch. Dr. Minnis, who gives up the post of Secretary General after eleven years of loyal service to the Union, has been a central figure during one of the most positive periods in the history of URSI : a period during which we have been able to reorganise our structure and adapt ourselves better to the rapidly evolving world of telecommunication science. Without you, Dr. Minnis, we would have had the greatest difficulty in passing through this critical period in the evolution of our Union. None of us will ever forget what you have done and I hope that the new Board of Officers, and your successor Professor Hontoy, will continue to have the benefit of your advice and your help.

On behalf of you all, I must also express our gratitude to the many individuals and the scientific institutes that have welcomed us during this Assembly : in particular, the Geophysical Observatory at Nurmijärvi, the Research Stations at Metsähovi, the Research Laboratory of the University of Helsinki and, finally, the Research Centre of the University of Technology here in Otaniemi.

But there is something else that we have been able to appreciate every day, not only on technical and cultural visits, but also during our sightseeing tours into the heart of this beautiful country : this is the natural charm of a carefully protected countryside, and also the Finnish hospitality, and the kindness and courtesy that have been shown to us by everybody we have met.

But of course we must express our appreciation particularly to Professor Tiuri and Professor Halme, who have been responsible for the work of the Finnish National Committee for URSI and the Organizing Committee during the planning of the Assembly. I would like to mention also the quiet and efficient way in which Dr. Löfgren has contributed to the smooth running of the Assembly. There must be many others behind the scenes who have helped to make this event a success and to all of them we are most grateful.

I can not conclude without referring again to the very warm and friendly welcome that our wives have received from the members of the Finnish Ladies' Committee. I know that they have greatly appreciated your hospitality and I am sure they will look forward with pleasure to coming back to Finland in the future.

Now the time has come to leave your beautiful city of Helsinki and your marvellous country. But we shall do this with many regrets and you can be assured that we will take home with us wonderful memories of our all too short stay in Finland.

In a few minutes I shall leave this chair, but first of all I want to introduce the new Secretary General, Professor Hontoy. It gives me particular pleasure to welcome him because our collaboration and our personal friendship have extended over many years, and I would like to offer him my warmest wishes for the success of his period of office as Secretary General.

After the transfer of the office of Secretary General from Dr. Minnis to Prof. Hontoy, M. Voge continued :

Now it only remains for me to hand over my responsibilities as President to Professor Christiansen, and I know that I speak for all of you in expressing my confidence that, under his guidance, URSI will continue to make progress and to play its rôle in the world of science.

Closure of the Assembly by Prof. Christiansen

Following the transfer of the office of President, Prof. Christiansen expressed his appreciation of the honour which his election as President of URSI represented. He would undertake his responsibilities to the best of his ability and with the collaboration of his colleagues in the Board of Officers. He looked forward with pleasure to meeting the delegates again during the next Assembly in Washington, D.C. in 1981.

After wishing *bon voyage* to the delegates for their return journeys, Prof. Christiansen declared the XIX General Assembly of URSI closed.

REPORTS OF MEETINGS

URSI Board of Officers

The incoming Board of Officers met in Helsinki on 4 August 1978. Those present were Prof. W. N. Christiansen (President), M. J. Voge (Past President), Prof. W. E. Gordon, Dr. A. P. Mitra, Prof. A. Smolinski and Prof. F. L. Stumpers (Vice-Presidents), Prof. P. Hontoy (Secretary General) and Mme Y. Stevanovitch (Administrative Secretary). Sir Granville Beynon, Prof. V. V. Migulin and Dr. C. M. Minnis also attended.

1. — Appointment of Treasurer

In accordance with Art. 36 of the Statutes, Prof. Gordon was designated as Treasurer of URSI for the period up to the end of the XX General Assembly in 1981.

2. — DIVISION OF RESPONSIBILITIES WITHIN THE BOARD

Since Prof. Hontoy can devote only part of his time to the activities of URSI, it was agreed that the responsibilities formerly carried by the Secretary General alone should be transferred to the individual members of the Board as follows :

- 1. Relations with ICSU : The President.
- 2. Scientific Programme for the period 1979-1981, including the XX General Assembly : Prof. Gordon, in consultation with Prof. Stumpers, Sir Granville Beynon and Prof. Van Bladel.
- 3. Financial matters : Prof. Gordon.
- 4. Publications, excluding *Review of Radio Science* : Prof. Hontoy and Mme Stevanovitch.
- 5. Advisory Committee on URSI Awards : Prof. Stumpers.
- 6. Relations with ITU, CCIR and CCITT : Prof. Stumpers.
- 7. Liaison with Member Committees of URSI and national engineering societies : Profs Stumpers and Smolinski in consultation.
- 8. Standing Committee on Future URSI Assemblies : Prof. Smolinski.

- 9. Standing Committee on Membership of URSI : Dr. Mitra.
- 10. Liaison with COSTED : Dr. Mitra.
- 11. UNESCO and relations with developing countries : M. Voge and later Dr. Mitra.
- 12. 60th Anniversary of URSI : M. Voge in consultation with the Belgian Committee of URSI.

Dr. Minnis agreed to assist Prof. Hontoy in any way possible during the overlap period envisaged in the Statutes.

3. — VICE-CHAIRMEN OF COMMISSIONS

Prof. Gordon will be responsible for initiating consultations designed to ensure a standard method for selecting candidates for election as Vice-Chairmen of Commissions.

Summary Report on Meetings of the URSI Council

The Resolutions and Recommendations adopted by the Council are reproduced at the end of this volume.

MEMBERSHIP OF THE URSI COUNCIL, JULY-AUGUST 1978

President : M. J. Voge.

Representatives of Member Committees :

Argentina	Ing. A. M. Andreu
Australia	Dr. B. J. Robinson
Austria	Prof. W. Riedler
Belgium	Prof. P. Hontoy (alternate : Prof. L. Bossy)
Brazil	Dr. I. Jelinek-Kantor
Bulgaria	Prof. B. H. Borovski (alternate : Dr. A. Y. Spasov)
Canada	Dr. J. Y. Wong
Czechoslovakia	Prof. V. Zima
Denmark	Dr. E. Ungstrup
Finland	Prof. M. Tiuri (alternate : Prof. S. Halme)
France	Prof. MY. Bernard

German Dem. Rep.	Dr. V. Kempe (alternate : Dr. A. Iwainsky)
Germany, Fed. Rep.	Dr. W. Becker
Hungary	Dr. G. Bognar (alternate : Prof. K. Géher)
India	Dr. A. P. Mitra
Israel	Prof. I. Cederbaum
Italy	Prof. G. Barzilai
Japan	Prof. A. Kimpara
Netherlands	Prof. F. L. Stumpers
New Zealand	Prof. R. H. T. Bates
Nigeria	Dr. I. E. Owolabi
Norway	Dr. T. Hagfors
Peru	Dr. R. Woodman
Poland	Prof. A. Smolinski (alternate : Prof. S. Hahn)
South Africa	Mr. R. W. Vice
Spain	Dr. E. Galdon
Sweden	Prof. S. Lundquist
Switzerland	Prof. W. Gerber
Taiwan	Mr. Ting-I Ho
United Kingdom	Dr. J. A. Saxton
USA	Dr. J. V. Evans
USSR	Prof. M. E. Zhabotinskij
Yugoslavia	Prof. R. Horvat

Secretary : Dr. C. M. Minnis.

The following Committees were not represented : Egypt, Mexico, Portugal.

The members of the Board of Officers attended in an advisory capacity.

FORMATION OF TEMPORARY COMMITTEES

Finance : J. A. Saxton (Chairman), R. H. T. Bates, M.-Y. Bernard and A. P. Mitra. The Treasurer and Secretary General were available in an advisory capacity.

Publications : Sir Granville Beynon (Chairman), K. Géher, P. Hontoy, M. Thué and S. Hahn. Prof. Bowhill (Editor, *Review of Radio Science*) attended in an advisory capacity.

Drafting Committee : F. Horner, M. Thué, C. M. Minnis and Mme Y. Stevanovitch.

60th Anniversary of URSI: J. Voge (Chairman), W. N. Christiansen, J. V. Evans, P. Hontoy, S. Lundquist, V. V. Migulin and F. L. Stumpers.

Revision of Statutes : W. N. Christiansen, M.-Y. Bernard, J. V. Evans, J. A. Saxton and M. E. Zhabotinskij.

ELECTION OF BOARD OF OFFICERS 1978-81

The results of the elections were as follows :

President :	Prof. W. N. Christiansen (Australia).
Vice-Presidents :	Prof. W. E. Gordon (USA),
	Dr. A. P. Mitra (India),
	Prof. A. Smolinski (Poland),
	Prof. F. L. Stumpers (Netherlands).

Secretary General : Prof. P. Hontoy (Belgium).

M. Voge (Past President) remains a member of the Board. The Board later designated Prof. Gordon as Treasurer.

The Council decided to confer the title of Honorary President on :

 Prof. H. G. Booker (USA) : Vice-President 1969-1975; Chairman of Commission IV 1966-1969;

and

 Prof. Dr. W. Dieminger (FR Germany) : Vice-President 1963-1969; President 1969-1972.

ELECTION OF CHAIRMEN AND VICE-CHAIRMEN OF COMMISSIONS

The names of candidates for election were submitted by the respective Commissions and the elected officers are listed on pages 7-8. It was agreed to ask the Board to investigate the possibility of having a standardised procedure for selecting the candidates for Vice-Chairmen. The procedure should be used in preparing for the Assembly in 1981.

REVISION OF STATUTES

The revisions of Arts 53-56 arise out of the decisions already made at the XIX Assembly in 1975. The change in Art. 4 is designed to permit URSI to accept applications for membership from territories which do not adhere to ICSU.

Admission of Member Committees

ARAB REPUBLIC OF EGYPT.

The Council endorsed the action taken by the Board in 1975 to admit the Academy of Scientific and Industrial Research in Cairo. The Board had been authorised to do so by the Assembly in 1979. The Egyptian Committee is in Membership Category 1.

REPUBLIC OF IRELAND.

The Council agreed to accept the application for membership received from the Royal Irish Academy. The Irish Committee is in Membership Category 1.

INDONESIA.

A provisional application for membership was received from the Indonesian Institute for Space Research in Bandung. The body which adheres to ICSU and other Unions is the Institute of Sciences in Jakarta and the relation between these two organisations is not clear. The situation is being investigated and the Board was authorised to consider the second application, which will probably be received from one of these Institutes, and to admit Indonesia if the application is considered satisfactory.

MEMBERS' CONTRIBUTIONS

The Treasurer expressed his appreciation of the prompt payment of their annual contributions by most Committees. This greatly facilitated the management of URSI finances.

It was noted that the Committee in Mexico had not paid its contributions since 1973, and that Art. 9 of the Statutes states that, in such circumstances, a Committee is considered to have resigned unless the Council decides otherwise.

It was agreed that a member of the Board should make contact with the Committee in Mexico but that, if no satisfactory reply was received by the end of 1978, then the Committee would be informed that Art. 9 of the Statutes would be applied.

FUTURE MEMBERS

Following the removal of the restriction formerly included in Art. 4 of the Statutes, it was agreed that contacts should be established with scientific bodies in territories which do not adhere to ICSU. The ITU was considered to be a useful meeting point where the needs of the developing countries for communications and the relevant educational facilities could be discussed. The possibility of visits by members of the Board to several countries will be considered since personal contacts are considered to be valuable.

FINANCING OF INTER-UNION COMMISSIONS AND FAGS SERVICES

It was noted that the Unions (URSI, IAU and IUGG) were entirely responsible for the provision of funds required for the support of the activities of IUCAF and IUCRM. This responsibility was recognised and it created no serious problem for the Unions.

The FAGS Services were supported mainly by funds provided by ICSU from the annual UNESCO grant. The future of these grants is in doubt at present and other sources may have to be found. Although the funds required by IUWDS could conceivably be provided by the interested Unions (IAU, IUGG and URSI) those required by BIH were much greater and would be beyond the resources of the Unions.

The Council appreciated the difficulties which would arise if the FAGS Services were obliged to obtain financial support from the organisations which made use of the services provided. It was agreed nevertheless that, in principle, the users should make some contribution towards the financing of the Services and that this view should be submitted to FAGS for comment.

SCIENTIFIC PROGRAMME : HELSINKI

It was noted that the scientific programme for the present Assembly included about 100 sessions and 500 speakers, in addition to the meetings of the Council and business meetings of the Commissions. In consequence, there were necessarily many simultaneous sessions dealing with related topics, and delegates were embarrassed by the difficulty in deciding which sessions to attend. Prof. Stumpers referred to the attempt which the Board had made to coordinate the programme but it seemed that, on the whole, each Commission preferred to arrange its programme on its own. The inclusion of Open Symposia in the programme implied that time had to be made available for many more speakers than usual.

The general opinion was that review papers, carefully prepared but restricted in coverage, were very important in the Commissions and that they ought not to be neglected. There was also a need for joint sessions which would permit several Commissions to study topics of common interest.

It was agreed that, for the 1981 Assembly, the Board should appoint a small group empowered to consult the Chairmen of Commissions and to plan a coherent scientific programme to which all the Commissions would adhere. This group would also decide which topics would be suitable for Open Symposia to be held in association with the 1981 Assembly.

Relations with ITU

The importance of maintaining relations between URSI and ITU, and especially CCIR, were stressed. The URSI-CCIR-CCITT Liaison Committee ought to meet from time to time but, in addition, it was considered important to consider the inclusion of a CCIR representative in the Programme Committees for Symposia which dealt with topics of direct interest to CCIR.

FINANCES

The Council received a detailed report on finances prepared by the Secretary General. This included the audited accounts for the years 1975-77 and draft budgets for the years 1979-81. It was noted that the accounts for the past three years had been published in the URSI Information Bulletin in accordance with the recommendation made in Lima in 1975.

These documents were examined by the Finance Committee which submitted its Report and Recommendations dated 3 August 1978. This Report was accepted and it was agreed (a) that the audited accounts for the years 1975-77 be approved and (b) that income and expenditure for the period 1979-81 should be based on the budget referred to as "Model E" in the Report.

STANDING FINANCE COMMITTEE

It was noted that the Board had recommended the creation of a Standing Finance Committee which could be consulted by the Treasurer between Assemblies. In the present unsettled world economic situation, it was felt that the advice of an outside body would be helpful to the Board.

The Council accepted the view of the Board, but insisted that the Treasurer must retain full responsibility for financial matters as directed in Art 36 of the Statutes. The Committee would act in an advisory capacity only.

The following were designated as members of the Standing Finance Committee for the period 1978-81 : Dr. J. A. Saxton (Chairman), Prof. M.-Y. Bernard (France), Dr. A. P. Mitra (India) and Prof. R. H. T. Bates (New Zealand).

60th ANNIVERSARY OF URSI

URSI was established, in July 1919, in the Palace of the Academy of Sciences and Arts in Brussels during the constitutive Assembly of the International Research Council. At the request of the Board, Prof. Hontoy (President of the URSI Committee in Belgium) had examined the possibility of marking the 60th anniversary of the creation of the Union in 1979 in Brussels. The Permanent Secretary of the Academy had welcomed the idea and it was proposed to hold a 2-day meeting at which several distinguished speakers would present their views on the achievements of radio scientists during the past 60 years and on the prospects for future developments in telecommunications science and related topics. Attendance will be limited to 150-300 persons including the representatives of the Member Committees of the Union. A registration fee will be charged and the cost to URSI is to be limited to \$4,340.

STANDING COMMITTEE ON MEMBERSHIP

The membership for the period 1978-81 will include : Dr. A. P. Mitra (Chairman) and Prof. V. V. Migulin (formerly the Board's representative); the regional representative are :

Asia : Prof. S. Okamura (Japan) Africa : Prof. O. Awe (Nigeria) EUROPE : Prof. K. Géher (Hungary) LATIN AMERICA : Dr. A. A. Giesecke (Peru).

REMOTE SENSING

The UK Committee proposed that URSI should consider the creation of a new Commission to deal with the broad range of topics covered by the term "remote sensing". The applications of such techniques were becoming more and more important and there was a need for an appropriate scientific foundation for future developments in the field.

It was noted that several Commissions were already concerned with specific aspects of remote sensing and that they had some reservations about the need for a single broadly-based Commission. The Council did not have sufficient time to discuss the question in detail and it was considered undesirable to make an immediate decision to form a Commission without having given serious thought to the implications of such action.

It was agreed, however, that representatives of the interested Commissions should be designated as a Working Group on Remote Sensing and that this group should examine the possibility of organising an URSI Symposium on some aspect of the subject.

RELATIONS WITH ICSU

The Council had discussed the relationship between the Unions and ICSU in Lima in 1975 and had asked the Board to consider it and to report back in 1978. A factual statement on the subject had appeared in URSI Information Bulletin No. 200 but the Board did not wish to make any specific proposals at present.

It was agred to ask the incoming Board to keep the question in mind especially in the light of any developments during the ICSU General Assembly in September 1978.

SCOSTEP

It was noted that the ICSU Special Committee on Solar-Terrestrial Physics had proposed to ICSU that its future status should be that of a Scientific Committee of ICSU, that is a Committee with no specified termination date. The Committee had proposed the Middle Atmosphere Programme of observations and several other international cooperative programmes of astronomical and geophysical observations.

It was emphasised that the decision to extend the life of SCOSTEP indefinitely must be taken by the Academies of Science which intended to participate actively in the observational programmes, and which would be required to provide the necessary funds for the operation and administration of the Committee. If adequate support was forthcoming from the Academies at the ICSU General Assembly, it was agreed that URSI should vote in favour of the acceptance of the MAP and of the new status of SCOSTEP.

LOCATION OF URSI GENERAL ASSEMBLIES IN 1981 AND 1984

Invitations had been received from the URSI Committees in India and the USA to hold the 1981 Assembly in New Delhi and Washington D.C. respectively. The results of the vote were Washington D.C. : 104 votes, New Delhi : 67 votes, with two abstentions. Hence the XX Assembly will be held in Washington D.C.

For the 1984 Assembly, Dr. Mitra (Chairman, Standing Committee on Future Assemblies) reported that no formal invitations had yet been received. However, he thought it was possible that some of the European Committees that had issued invitations for the 1978 event might wish to renew their invitations for 1984.

Dr. Spasov (Bulgaria) stated that his Committee would be glad to welcome the XXI Assembly in 1984 and that a formal invitation with further information would be issued later.

VOTES OF THANKS

At the final meeting, the President, on behalf of the Council and all the participants, expressed his complete satisfaction with the local arrangements made by the Finnish URSI Committee. These had been sufficiently flexible and well planned to adapt to the actual circumstances and the larger than expected participation.

The President offered his warm thanks especially to Prof. Tiuri, Prof. Halme and Dr. Löfgren and to their many helpers. He also asked that the warm thanks of the ladies who accompanied participants should be conveyed to Mrs Tiuri, Mrs Halme and the other members of the Ladies Committee for their kindness and hospitality during the Assembly, and for the interesting visits and other activities which they had organised.

In conclusion, the President thanked the members of the Council for their participation and looked forward to meeting many of them in Washington in 1981.

Report of the Finance Committee

1. — Accounts for the years 1975-1977

The Finance Committee has examined the full accounts of URSI for the years 1975-1977, audited by Gimson and Co., London. The summarised accounts, as presented to the Council, are consistent with the annual audited accounts. It is recommended that the latter be published in the *Proceedings of the Assembly*.

The Committee notes that the actual excess of expenditure over income was 3,300, as compared with the estimated budget deficit of 2,400. The difference (3,4900) represents only 2 % of the total expenditure and is not significant in view of the unstable international economic situation.

The Committee recommends the approval of the audited accounts for 1975, 1976 and 1977 and wishes to place on record its appreciation of the careful way in which the Treasurer and the Board of Officers have managed the finances of the Union during these three years.

2. — BUDGET FOR THE YEARS 1979-1981

2.1. — In framing the budget for the next three years, the Committee considers that it will be necessary to assume a continuation in the depreciation of the value of the US dollar. A rate of 7 % per year is consistent with the trend during the past 3 years and has been used in framing the budget.

2.2. — Rates of inflation are generally lower than in 1975, when a rate of 15 % per year was assumed for budgetary purposes. The rate assumed for the years 1979-81 is 6 % per year.

2.3. — In Tables 1 and 2, administrative expenditure has been based on the assumption that the Secretariat will remain in its present office in Brussels and that Mme Stevanovitch will remain as Administrative Secretary. It is expected that the annual dues payable to ICSU will remain at 2.5 % of our Members' Contributions. Expenditure on the 1981 Assembly (\$ 32,700) is equivalent to the allocation made in Lima for the present Assembly (\$ 18,800) after allowing for the depreciation of the dollar, and also inflation, over the period 1975-1981.

2.4. — Estimates made by the Secretary General show that the level of scientific activity since the Lima Assembly was about 89 % of its level in the reference year, 1969. If Income Model D were adopted (Table 3), the potential level of activity during the years 1979-81 would be about 84 %; the two small steps in Model D (revised) are preferred to the one large step in Model D.

2.5. — If scientific activity is to be restored to the level envisaged in the post-Lima period, a modest increase in income over that implied by Model D would be required. This end could be achieved by using Model E, which would permit an increase of about 6 % per year in the funds available for scientific activities.

2.6. — The budget for 1976-78 contained no provision for a meeting of the Coordinating Committee. If it is decided to convene this Committee before the 1981 Assembly, the cost must be covered from the funds allocated to Scientific Activities.

2.7. — It was noted that the Reserve Fund for the closure of Secretariat could be released only if it were decided to close the URSI Secretariat after an interval of 3 years and to give due notice of the termination of Mme Stevanovitch's Contract of Employment. The Committee considered that it was premature to consider such an eventuality at present in view of the difficulty of establishing alternative secretarial facilities, and in the absence of any steps having being taken so far to investigate this possibility.

3. — PUBLICATION OF ACCOUNTS

Finally the Committee recommended that the practice, initiated in Lima, concerning the annual publication of the audited accounts be continued.

The Finance Committee :Assisted by :J. A. Saxton (Chairman)W. E. Gordon (Treasurer)R. H. T. BatesC. M. Minnis (Secretary General)M.-Y. BernardC. M. Minnis (Secretary General)

Helsinki, 3 August 1978.

A. P. Mitra

			and the second	
	1979	1980	1981	Total
Income		\$ (0)00)	
Members' Contributions ICSU Grant Interest Sales	86.8 8.0 6.4 0.5	97.7 8.0 6.8 0.5	108.5 8.0 7.2 0.5	293.0 24.0 20.4 1.5
Total income \$ (000)	101.7	113.0	124.2	338.9
Expenditure :		\$ (00)0) I	r
Annual Scientific Activities Assembly 1981 Administration Loss on exchange ICSU Dues	40.9 44.7 0.7 2.2	46.5 50.7 0.7 2.4	53.1 32.7 57.9 0.7 2.7	140.5 32.7 153.3 2.1 7.3
Total expenditure Surplus (+), Deficit (-)	88.5 +13.2	100.3 +12.7	147.1 	335.9 + 3.0
\$ (000)	101.7	113.0	124.2	338.9

TABLE 1. Draft URSI Budget 1979-81. Income Model D (revised).

TABLE 2. Draft URSI Budget 1979-81. Income Model E.

			and the second se	the second s
	1979	1980	1981	Total
Income :		\$ (0)00) I	1
Members' Contributions ICSU Grant Interest Sales	86.8 8.0 6.4 0.5	99.8 8.0 6.8 0.5	112.9 8.0 7.2 0.5	299.5 24.0 20.4 1.5
Total income \$ (000)	101.7	115.1	128.6	345.4
Expenditure :		\$ (0)00) I	1
Annual Scientific Activities Assembly 1981 Administration Loss on exchange ICSU Dues	43.4 	49.3 50.7 0.7 2.5	56.3 32.7 57.9 0.7 2.8	149.0 32.7 153.3 2.1 7.8
Total expenditure Surplus (+), Deficit (-)	91.3 +10.4	103.2 + 11.9	150.4 	344.9 +0.5
\$ (000)	101.7	115.1	128.6	345.4

TABLE 3. Income Models.

	Unit Contribution (\$)					
Model	1978	1979	1980	1981	Total 1979-81	
D	400	400	470	470	290,780	
D (revised)	400	400	450	500	292,950	
Е	400	400	460	520	299,460	

URSI ACCOUNTS FOR THE YEARS 1975, 1976 AND 1977

The Finance Committee formed by the URSI Council in Helsinki examined the audited Accounts of Income and Expenditure for the calendar years 1975, 1976 and 1977. In its Report, reproduced elsewhere, the Committee recommended the approval of the accounts and their publication in the *Proceedings*.

The URSI account books are kept in Belgian francs but, at the request of UNESCO, the accounts are presented in US dollars using the UN rate of exchange in force at 31 December each year :

Value of US\$ 1 on 31 December

Year	Belgian francs
1974	37.50
1975	39.—
1976	37.—
1977	35.—

The increase or decrease in the value of the dollar (when expressed in francs) during a given year gives rise respectively to an increase or a decrease in the value of the balance carried forward at the end of that year. The resulting loss or gain is indicated in the accounts.

INTERNATIONAL UNION OF RADIO SCIENCE

Income and Expenditure Accounts for the years ended 31 December 1975, 1976, 1977

Year ended 31 December 1975

	\$	\$	\$
Income			
Subscriptions : Member Committees Special contribution		53,506 142	
Interest (less tax \$ 1,349) Profit on sale of investment		6,145 8	53,648
Less interest attributable to Pension and Balth. van der		6,153	
Pol Gold Medal Funds			5,376
Sale of publications			2,058 11,500
Total income			\$ 72,582
Expenditure			
Scientific Activities			
Meetings XVIII General Assembly Board of Officers Miscellaneous	17,814 2,533 67		
	100 (1001110-100)	20,414	
Publications URSI Bulletin Nos 193-195 INAG Bulletin (grant) Review of Radio Science 1975	4,307 650 4,006		
0		8,963	
Four symposia and scientific sessions, Lima 1975 Ionosphere, London Atmospheric probing, Bournemouth	21,711 432 500		
Grants		22,643	
IUCAF IUCRM	1,000 150		
		1,150	
TOTAL : SCIENTIFIC ACTIVITIES (carried forward)			53,170

	\$	\$	\$
(brought forward)			53,170
Administration Salaries (including social security and supplementary pension provisions)		44,593	
Office and General Expenses			
Office rent, heat, repairs, etc. Stationery and office supplies Insurance Telephone Postage Bank charges Entertainment Audit and accountancy Miscellaneous	5,855 262 617 517 572 218 105 1,346 65		
		9,557	
TOTAL : ADMINISTRATION		and vocane formula	54,150
ICSU dues Losses on exchange (net)			1,338 173
TOTAL EXPENDITURE			108,831
Excess of expenditure over income for the year			36,249
			\$ 72,582
	\$		
Balance in hand on 1 January 1975	93,212		

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Balance : Manneback presentation Fund	48
Loss on appreciation of US dollar during 1975	93,260 3,587
Revised balance in hand on 1 January 1975 Excess of expenditure over income 1975	89,673 36,249
Balance in hand at 31 December 1975	\$ 53,424

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Year ended 31 December 1976

	\$ \$	\$
Income		
Subscriptions : Member Committees	62,855	
Special contribution	800	
		63 655
Interest (less tax \$ 1,304)	5,600	05,055
Less interest attributable to Pension and Balth. van der Pol Gold Medal Funds	1,153	
		4,447
Sale of publications		571
Allocation from UNESCO Grant to ICSU		8,000
TOTAL INCOME		\$ 76,673

Expenditure

Scientific Activities

Meetings Board of Officers Representation of URSI Miscellaneous	4,533 699 389	5,621	
Publications Proceedings of URSI Assembly 1975 URSI Bulletin Nos 196-200 INAG Bulletin (grant) Register of Standards Laboratories URSI Brochure (French/English)	4,386 5,064 500 164 931	11.045	
Symposia Radio oceanography, Hamburg Call for papers	400 51	451	
Grants IUCAF IUCRM	1,250	1,550	
TOTAL : SCIENTIFIC ACTIVITIES (carried forward)			18,667

(brought forward)	\$	\$	\$ 18,667
Administration			
Salaries (including social security and supplementary pension provisions)		39,463	
Office and General Expenses			
Office rent, heat, repairs, etc. Stationery and office supplies. Insurance Telephone Postage Bank charges Entertainment Audit and accountancy Transfer of office Miscellaneous	2,815 371 1,107 462 708 242 189 1,351 444 53		
		7,742	
TOTAL : ADMINISTRATION			47,205
ICSU dues Loss on exchange (net)			1,571 468
Total Expenditure			67,911
Excess of income over expenditure for the year			8,762
			\$ 76,673
	\$		
Balance in hand on 1 January 1976 Gain on depreciation of US dollar during 1976	53,424 2,888		

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Revised balance on 1 January 1976	56,312
Excess of income over expenditure 1976	8,762
Balance in hand at 31 December 1976	\$ 65,074

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Year ended 31 December 1977

	\$ \$	\$
Income		
Subscriptions : Member Committees		77,309
Interest (less tax \$ 1,705)	6,955	
Less interest attributable to Pension and Balth. van der Pol Gold Medal Funds	1,291	
		5,664
Sale of publications		488
Allocation from UNESCO Grant to ICSU		11,000
Surplus on Symposium		3,535
Total Income		\$ 97,996

Expenditure

Scientific Activities

Meetings Board of Officers URSI-CCIR-CCITT Liaison Committee Miscellaneous	3,896 1,706 649		
		6,251	
Publications	4 724		
INAG Bulletin (grant)	250		
		4,984	
Symposia			
Wave propagation, La Baule Eurocon, Venice EMC, Montreux Bioeffects, Airlie Measurements, Lannion Information theory, Ithaca Optical communications, Tokyo Calls for papers, Helsinki 1978	2,351 2,643 1,229 1,057 507 507 246 1,122	0.000	
-		9,662	
Grants IUCAF IUCRM	1,250 300	1,550	
TOTAL : SCIENTIFIC ACTIVITIES (carried forward)			22,447

(brought forward)	\$	\$	\$ 22,447
Administration Salaries (including social security and supplementary pension provisions)		45,666	
Office and General Expenses Office rent, heat, repairs, etc. Stationery and office supplies. Insurance Telephone Postage Bank charges Entertainment Audit and accountancy Miscellaneous	2,460 590 690 680 765 285 42 1,571 40		
T		7,123	62 700
IOTAL : ADMINISTRATION ICSU dues Loss on exchange (net) TOTAL EXPENDITURE			1,933 697 77,866
Excess of income over expenditure for the year			20,130 \$ 97,996
Balance in hand on 1 January 1977 Gain on depreciation of US dollar during 1977	\$ 65,074 3,718		
Revised balance on 1 January 1977	68,792 20,130		

Balance in hand at 31 December 1977 \$ 88,922

Balance Sheet

	31 Dec.	1975	31 Dec	. 1976	31 Dec	. 1977
	\$		\$		\$	
Assets						
Belgian francs	20,703		24,857		34,742	
US dollars	3,131		19,824		36,218	
-		23,834		44,681		70,960
Belgian Government Securities		60,784		64,069		70,909
Petty cash and stamps		105		141		202
Sundry debtors		933		1,629		751
Less		85,656		110,520	-	142,822
Creditors	17 507		27 872		33,159	
Balth, van der Pol Fund	3.939		4,441		4.859	
Pension Fund	10,786		13,133		15,882	
-		32,232		45,446		53,900
TOTAL : URSI Funds	÷	53,424	:	\$ 65,074	ŝ	\$ 88,922

The distribution of the funds shown above was as shown below :

	1 Jan. \$	1976	l Jan. \$	1977	1 Jan. \$	1978
Reserve Fund						
General Closure of Secretariat	 36,923		 43,919		 49,643	
-		36,923		43,919	- <u></u>	49,643
Funds for Scientific Activities						
XVIII General Assembly	4,487					
XIX General Assembly Other meetings and symposia in	_		8,700		18,800	
1976, 1977 and 1978	11,667		12,162		16,857	
Special Symposium Fund	_		-		3,535	
-		16,154		20,862		39,192
Unallocated		347		293		87
TOTAL : URSI Balances	e e	\$ 53,424	ç	65,074	\$	88,922

The conversion from Belgian francs to US dollars was made using the UN rates of exchange on 31 December : \$1 = 39 BFr in 1975, 37 BFr in 1976, 35 BFr in 1977.

Report of Meeting of Publications Committee

Membership : Sir Granville Beynon (Chairman), Prof. K. Géher, Prof. S. Hahn, M. M. Thué, Prof. P. Hontoy.

Also attended : Prof. S. A. Bowhill (Editor, *Review of Radio Science*), Dr. C. M. Minnis (Secretary General), Mme Y. Stevanovitch (Administrative Secretary).

1. — URSI INFORMATION BULLETIN

The change in the format and method of printing since 1975 is satisfactory and the cost is now \$ 1,100 (approx.) per issue of 1,300 copies. The present format and contents are satisfactory and publication should be maintained.

The practice of including names and addresses in the December issue each year should be continued. In future this issue should include also members of Working Groups set up during the preceding Assembly.

In order to make the *Bulletin* more widely known, a copy of the September 1978 issue should be sent, preferably with the *Review of Radio Science*, to all registered participants at the Helsinki Assembly.

2. — URSI BROCHURE

Following the change in Art. 4 of the Statutes, the URSI Brochure should be brought up to date and sent to Academies and other organisations which do not adhere to ICSU.

3. — INAG BULLETIN

The *INAG Bulletin* serves a useful purpose and its publication should be continued. In view of the increasing cost of printing, the Treasurer should be invited to consider an increase in the annual grant paid to NOAA (at present \$ 500).

4. — INTERNATIONAL REFERENCE IONOSPHERE 1978 (IRI 78)

It was noted that IRI 78 would be published soon and would include appropriate computer programmes, but that it would not contain printouts of typical profiles. It would be helpful to small organisations, having no access to a computer, if a supplement to *IRI 78* could be prepared, containing a selection of representative profiles. Prof. Rawer should be consulted about the possibility of doing so before any decision is taken.

5. — PROCEEDINGS OF THE 1978 ASSEMBLY

Vol. XVII of the *Proceedings* should be published using a format and style similar to that adopted in the past. Since the number of papers presented in Helsinki is very much greater than usual, it will probably be impracticable to include the titles and names of authors. It is proposed that only the titles of the sessions be published, but the Secretariat should keep copies of the abstract booklets for future reference.

6. — A POSSIBLE URSI JOURNAL

It is understood that arrangements have been made to continue publication of the American journal *Radio Science*. In view of this, the URSI Board agreed that it would be inappropriate for URSI to sponsor the publication of a commercial journal covering the same field, as had been suggested at the Assembly in 1975. The Publications Committee accepted the opinion of the Board and noted that there had been no negotiations with any of the publishers which had expressed an interest in an URSI journal.

7. — REVIEW OF RADIO SCIENCE 1978-80

It was noted that there would be a delay in publishing the *Review* because of the late arrival of the text for certain Commissions, but that it would be circulated later to all participants at the General Assembly. It was understood that the cost of printing and the subsequent postal charges, would be covered by part of the Registration Fee which had been earlier allocated for this purpose.

The Committee notes that doubts have been expressed as to whether the great effort devoted to the preparation of the text by the Commissions and the General Editor can be justified by the use that is made of the *Review*. Although there are differences of opinion about the audience to which the *Review* is directed, it is recommended that another issue of the *Review* should be prepared for the 1981 Assembly and that Prof. Bowhill be invited to act as General Editor of the *Review* as for the 1975 and 1978 editions. A more uniform allocation of pages to the Commissions should be made in consultation with the Chairmen. As for the 1978 edition, a publicity campaign should be undertaken in order to increase the number of copies sold.

Report on the Work of the Drafting Committee

The Drafting Committee was established by the URSI Council in Helsinki with the following membership :

Designated by URSI Council :	URSI Secretariat :
Dr. F. Horner (UK),	Dr. C. M. Minnis,
M. M. Thué (France).	Mme Y. Stevanovitch.

It was not possible for the Drafting Committee to meet or to complete its work in Helsinki, because many of the administrative meetings were held at the end of the Assembly. In consequence, secretaries often had no opportunity to prepare texts, suitable for submission to the Drafting Committee, recording decisions taken or recommendations made during their meetings. Such decisions and recommendations were later extracted, in the URSI Secretariat, from reports or minutes of meetings, and submitted to the Drafting Committee.

Following consultations between the members of the Drafting Committee in September 1978, the French and English texts of the resolutions, etc. which emerged from the Assembly were agreed and have been published in URSI Information Bulletin No. 206 (September 1978).

The present timing of the administrative meetings (for example : URSI Council and Business Meetings of Commissions) follows a recommendation made by a Working Group on the reorganisation of URSI in Ottawa in 1969 : namely, that the programme of URSI Assemblies should be arranged so as severely to restrict the administrative meetings to the beginning and end of the Assembly.

In view of the difficulties created as a result of the rigid application of this recommendation, it would appear to be desirable for the Board of Officers to consider arranging the programme for the 1981 Assembly in such a way that adequate time will be made available for holding important administrative meetings well before the end of the Assembly.

22 September 1978

C. M. Minnis, Secretary General, XIX General Assembly of URSI.

BUSINESS TRANSACTED BY COMMISSIONS

The following summary of the activities of the URSI Commissions during the General Assembly has been prepared by the Secretary General using various documents submitted by the officers of the Commissions or by those who acted as reporters.

Commission A. — Electromagnetic Metrology

Chairman : Dr. H. M. Altschuler (USA). Vice-Chairman : Prof. S. Okamura (Japan).

ACTIVITIES 1975-1978

The Chairman referred to the main activities of Commission A during the last three years :

(a) Co-sponsorship of Symposium of Time and Frequency held at Copper Mountain (Col.) in 1976;

(b) Symposium on Biological Effects of EM Waves held at Airlie (Va.) in 1977 in cooperation with Commission B;

(c) Symposium on Measurements in Telecommunications hosted by CNET at Lannion (France) in 1977 in cooperation with Commissions C and E;

(d) Participation in the CPEM in Ottawa in 1978;

(e) Preparation of a Chapter on biological effects, with cooperation from Commission B, for inclusion in *Review of Radio Science 1975-77*;

(f) Symposium on Biological Effects, co-sponsored by Commission B being held during the Helsinki Assembly;

(g) Symposium on Time and Frequency being held during the Helsinki Assembly.

THE 1981 ASSEMBLY

It was noted that the coordination of the programme for the next Assembly would be the responsibility of a small group of Board members. It was considered that it would be best for the Commission to submit its comments and proposals after making an assessment of the success achieved by the programme for the Helsinki Assembly (see Council Res. UC.4).

REMOTE SENSING

It was noted that a proposal had been made for the creation of an URSI Commission on Remote Sensing using radio waves. It was felt that Commissions ought not to be formed to deal with applications, and that it would be more appropriate to form an inter-Commission Working Group to handle the subject. It was agreed to oppose the formation of the Commission, but to recommend the creation of such a Working Group (see Council Res. UC.18).

URSI REGISTER OF NATIONAL STANDARDS LABORATORIES

Mr. Steele reported on the progress of the Working Group which had prepared the URSI Register of National Standards Laboratories (July 1978). It was evident that the first edition (1975) had served a useful purpose and it was agreed to recommend the continuation of the Working Group until 1981 (See Res. A.5).

TIME AND FREQUENCY

It was agreed to recommend a reduction in the number of meetings relating to time and frequency and the more effective coordination of their topics (see Res. A.3).

BIOLOGICAL EFFECTS

Prof. Rosenthal reported that his Working Group had 12 members, had participated in the organization of symposia, and was actively cooperating with other international groups. A Newsletter had been circulated and a preliminary dictionary of terms in use had been compiled. It was agreed to maintain the Working Group until 1981 (See Res. A.6).

SI UNITS

The Chairman emphasized the need to encourage support for the general use of SI units; this had already been referred to in a Resolution at the URSI Assembly in 1966. It was agreed to reaffirm the earlier Resolution (See Res. A.4).

NOMINATION OF VICE-CHAIRMAN

After two ballots, the candidates for election as Vice-Chairman of Commission A were as follows, in order of preference :

- 1. V. Kose (FR Germany).
- 2. S. Leschiutta (Italy).
- 3. S. Hahn (Poland).

There was some discussion about the present procedure used for the election of Commission Vice-Chairman. Suggestions for a change were made (See Res. A.8 and Council Res. UC.12).

TITLES OF SCIENTIFIC SESSIONS

- Circuit measurements.
- Laser measurements.
- Electromagnetic field measurements.
- Signal and noise measurements (with Commission E).
- Cryogenic measurements (with Commission D).

OPEN SYMPOSIUM ON TIME AND FREQUENCY (with Commission D).

- Standards and measurements.
- Applications in science and technology.
- Relativity.
- National time and frequency services.
- Precise time coordination.
- Coordination and dissemination via satellites.

SYMPOSIUM ON BIOLOGICAL EFFECTS OF ELECTROMAGNETIC WAVES (with Commission B).

- State-of-the-Art Review.
- Dosimetry.
- Medical studies.
- ELF effects.
- Nervous system effects.
- Behavioral effects.
- Special topics.

Commission B. — Fields and Waves

Chairman : Prof. J. Van Bladel (Belgium). Vice-Chairman : Prof. L. B. Felsen (USA).

CHAIRMAN AND VICE-CHAIRMAN: 1978-81

It was agreed unanimously that Prof. L. B. Felsen (USA) should succeed as Chairman for the next three years.

The result of the vote for the Vice-Chairman was a follows, in order of preference : H. G. Unger (FR Germany), V. A. Borovikov (USSR), G. Gerosa (Italy).

The Commission is aware of the concern of URSI for a suitable geographical distribution of the officers of the Commissions. However, the Commission would be quite unhappy if its first choice among the candidates for Vice-Chairman, arrived at by a suitable process of consultation, were not respected by the Council (See Council Res. UC.12).

SYMPOSIUM ON EM THEORY

The symposia on Electromagnetic Wave Theory have been held every three years since 1953. They are now major events and represent the main effort in Commission B between Assemblies. The result of the vote on the invitations for the next Symposium in the series was, in order of preference : FR Germany, France, Australia (See Res. B.1).

Remote Sensing

In view of the proposal for the creation of an URSI Commission on Remote Sensing, the Commission was of the opinion that it would be preferable first to form a working group on the subject, and to consider the eventual need for a fully-fledged commission later on (See Council Res. UC.18).

COMMISSION B WORKING GROUPS

It was agreed to create two Working Groups on millimetre wave and optical techniques, and on unified techniques for electromagnetism (including optics) and for acoustics, but only after prudent preparation and an exploration of the actual interest in these topics and the human resources available.

1981 Assembly

Complaints were made about the overabundance of subject matter in the Helsinki programme and the organisation of poster sessions. It was agreed that a serious evaluation of the programme should be made after the end of the Assembly before any new recommendations are made relating to the 1981 Assembly (See Council Res. UC.4).

REVIEW OF RADIO SCIENCE

The Commission recognised the great effort that had been expended by those who had prepared the Commission B Chapter in the 1978 edition of the *Review* : Prof. Senior (Editor) and the Associate Editors : Messrs Deschamps, Hurd, Lee, Tesche, Bolomey, Cullen, Rumsey and Mailloux, and expressed its thanks to them for their good will and readiness to serve.

Given the limited number of pages available, it is not possible to give an adequate reflexion of the progress made in the field of Commission B during a period of three years. Doubts were expressed as to whether the results achieved could justify the considerable effort devoted to the preparation of the Chapter. No review of a comparable nature should be compiled for the 1981 edition.

If, however, the Council should decide to publish the *Review* in 1981, the allocation of pages to Commission B ought to be increased by a factor of about 2.5 so as to make the Chapter more valuable to Commission B and to other Commissions.

BIOLOGICAL EFFECTS

It was agreed that Commission B would be a joint sponsor, with Commission A, of the proposed URSI Symposium on Biological Effects of EM Waves which is expected to be held in France in 1980.

TITLES OF SCIENTIFIC SESSIONS

- Antennas for satellite communication.
- Recent developments in electromagnetic theory : Numerical techniques.
- Recent developments in electromagnetic theory : Analytical techniques.
- Electromagnetic waves and the gravitational field.
- Special discussion on techniques for combining high frequency asymptotic and numerical methods.
- Nonlinear electromagnetics.
- Electromagnetics in the USSR.
- Applications of electromagnetics to transportation problems (with Commission C).
- Antennas as signal processors (with Commission C).
- Leaky feeder and open cable communications (with Commission C).
- Electromagnetic theory in geophysical exploration (with Commission F).
- Antennas in plasmas (with Commission H).
- Recent developments in radio-astronomical antennas (with Commission J).
- OPEN SYMPOSIUM ON OPTICAL COMMUNICATION (with Commissions A, D and F).
- Field theory of optical waveguides.
- Optical communications devices and systems.
- Measurements in optical communications.
- Integrated optics.
- Optical propagation in the earth's atmosphere.

Commission C. — Signals and Systems

Chairman : Prof. B. Picinbono (France). Vice-Chairman : Prof. V. Zima (Czechoslovakia).

ACTIVITIES DURING THE PAST THREE YEARS

INTERNATIONAL.

A short review was presented, by the Chairman, of the main activities of the past three years, including the enquiry designed to define the objectives of the Commission and to prepare the programme for the present Assembly. Other actions were the preparation of the Commission C Chapter in *Review of Radio Science 1975-77*, and of the list of important international conferences or symposia of interest to the Commission.

NATIONAL.

Short reports were presented by the representatives of France, Hungary, Italy, Japan, Switzerland, UK, USA and Yugoslavia. The most important problem seems to be the establishment of closer connexions between local engineering and scientific societies, and the national representatives of URSI Commission C.

Recommendations for the Future

URSI Commission C cannot be expected to play the leading rôle in the organisation of all symposia in the broad field of communication science. However, it can contribute by helping to emphasise the international character of appropriate events organised by national bodies (See Res. C.2).

For the next URSI Assembly, most of those present would prefer to have a programme of invited survey papers, rather than short and highly specialised contributions. Some ideas were presented concerning topics of particular interest for submission to the Programme Committee (See Res. C.1).

ELECTION OF VICE-CHAIRMAN

There were three candidates for the position of Vice-Chairman of the Commission, and the result of the vote was as follows, in order of preference : J. K. Wolf (USA), Y. Taki (Japan), K. Géher (Hungary).

TITLES OF SCIENTIFIC SESSIONS

- Advances in network analysis.
- Satellite communications.
- New approaches in broadcasting.
- Adaptive systems in communications.
- Advances in information theory.
- Digital and data communications.
- Computer communications.
- Effects of non-gaussian noise on system performance (with Commission E).
- Speech processing.
- Advances in optical communication systems.

Commission D. — Physical Electronics

Chairman : Prof. A. Smolinski (Poland). Vice-Chairman : Prof. W. G. Farnell (Canada).

Report of the Chairman : 1975-1978

URSI Commission D (Physical electronics and devices) was formed in Lima at the XVIII General Assembly in 1975. Its predecessor was Commission VII on Radio Electronics.

It was agreed in Lima that Commission D should deal with physical phenomena and devices for applications in radio science.

It was recommended that the programme for the XIX Assembly should be decided jointly by the Vice-Chairman and myself, and that we should designate organisers to take responsibility for each session. We agreed that Commission D should not try to arrange symposia which compete with the many specialist events already being organised in various parts of the world. However, it was recommended that a one-day symposium on optical devices for telecommunication systems and for frequency mixing or multiplication should be organised jointly with Commissions A, B and C.

Following consultations with Prof. Cullen, Prof. Farnell and some Member Committees, we decided to organise the following sessions :

- Submicron fabrication technology.
- Charge coupled devices.
- Plasma devices.
- Microwave acoustics; bubble memories.
- Millimetre-wave devices.
- Submillimetre and infrared wave devices.
- High-power devices.
- Acoustic imaging.

Besides this we agreed on a joint session with Commission A on Cryogenic measurements, and a session on optical devices in the Open Symposium on Optical Communication.

Unfortunately, as a result of various organisational difficulties, we were obliged to cancel three sessions :

- Plasma devices.
- High-power devices.
- Acoustic imaging.

During the Business Session of Commission D, the programme of the XIX General Assembly was criticized as being too dense, and no enthusiasm was shown for holding open symposia during the Assembly. The Commission recommends that the number of sessions at future General Assemblies should be limited to such an extent as not to discourage cross-fertilization of disciplines (See Rec. D.1).

The following sessions were arranged by Commission D, and are summarised at the end of this Report :

- D1 Submicron fabrication technology (5 papers); Chairman and organizer : Dr. G. Pircher (France).
- D2 Charge coupled devices (4 papers); Chairman : Prof. A. Smolinski (Poland), Organizer : Dr. E. Buss (USA).
- D4 Microwave acoustics and bubble memories (4 papers); Chairman and Organizer : Prof. W. G. Farnell (Canada).

D5/6 Millimetre, submillimetre and infrared devices (7 papers); Chairman and Organizer : M. J. Le Mézec (France).

Beside this there was a joint session with Commission A :

 AD1 Cryogenic measurements (4 papers); Chairman and Organizer : Dr. V. Kose (FRG).

On behalf of Commission D, M. J. Le Mézec took part in the Working Group for the Open Symposium on Optical Communication. Two sessions of that Symposium were in the programme of Commission D :

OS3-3 Optical communications devices and systems (4 papers); Chairman : Dr. T. Nakahara (Japan).

- OS3-5 Integrated optics (7 papers); Chairman : Dr. E. Spitz (France).

It should be mentioned that more than 60 participants at the Assembly showed their interest in the Commission D programme.

During the first Business Meeting the Commission suggested the following new topics for the XX General Assembly (see Rec. D1) :

- Low-noise solid-state detectors and amplifiers.

— Devices for fast signal processing.

Concerning activities of the Commission between the Assemblies, it was agreed to choose a few international conferences of interest to Commission D, which URSI should sponsor and take part in the establishment of the scientific programmes (see Rec. D2) :

- Fourth International Conference on Infrared and Submillimetre Waves, Florida, USA, 1979.
- Second International Conference on Integrated Optics and Optical Fibre Communication, The Netherlands, 1979 (the first took place in 1977 in Tokyo and was sponsored by URSI which was represented in the Scientific Programme Committee).

Coming finally to Commission D elections, I have pleasure in announcing that Prof. W. G. Farnell (Canada), the present Vice-Chairman, agreed to be Chairman for the next 3-year period.

Two candidates for the position of Vice-Chairman were proposed, and after a ballot, they received the following votes :

M. J. Le Mézec (France) - 7.

Prof. M. E. Zhabotinskij (USSR) - 6.

The results of the ballot were submitted to the URSI Council which elected Prof. Farnell as Chairman and M. Le Mézec as Vice-Chairman for the period 1978-81.

A. Smolinski Chairman, Commission D.

SUMMARY OF SESSIONS

(1) SUBMICRON TECHNOLOGY (Organizer, Chairman and Reviewer : G. Pircher, Thomson-CSF, France).

This session was devoted to modern technology for submicron circuits. Submicron means that the drawings of the planar process masks have some line-width of the order of one micrometre or less. Line-width reduction imposes a change of the conventional process.

Microlithography, etching, oxidation-epitaxy, etc.

In Microlithography, ordinary UV light limits the line-width to about 0.7 μ m, but it is well adapted for development and production. Replacing full wafer replication by step and repeat replication seems necessary for fine lines on large wafers. Optical composition is challenged by electron beam composition for reticle and masks with advantage for resolution and yield. Direct electron beam writing on wafer is still too slow for large production. Very fine lines below 0.5 μ m require the use of thin substrate; if this is not possible, it is necessary to use a thin membrane with special gold mask and X-ray replication, which is very promising for very small structures.

Etching has long used wet medium. Submicron technology needs to have very sharp edges for line-width; this is difficult to achieve with wet etching. Dry etching by plasma or in active ion is widely studied and used. Precise control of oxide thickness with very good quality becomes more and more important, especially in MOS structure. Refined methods of dry and steam oxidation are necessary. Epitaxy must give thin homogeneous layers of good crystalline properties : low-pressure chemical vapor deposition replaces the old method of epitaxy. Limitation of decreasing line-width comes from the physics of the device and the processing. With silicon substrate and doped regions, it seems that 0.2 μ m is a minimum for many aspects.

Influences of submicron technology are numerous : (a) for the devices - larger complexity, higher frequencies and speed, cost decreasing; and (b) for the equipment - cost and size reduction, high modularity, new areas of applications, change of worker specialization.

The occurring of very large-scale integration based on submicron technology may have a deep influence on the electronic industry.

Papers were presented by : G. Pircher, Thomson CSF, France; G. Trotel and B. Fay, Thomson CSF, France; M. Doering, Siemens, FRG; and J. Piquendar, Thomson CSF, France. (2) CHARGE COUPLED DEVICES (Organizer : D. D. Buss, Texas Instruments, USA; Chairman and Reviewer : L. J. M. Esser, Philips Research Labs, Netherlands).

L. J. M. Esser of Philips Res. Labs., Netherlands, presented an *overview* of charge transfer devices (CTDs). The main types of CTDs viz. bucket brigade devices (BBDs), surface charge coupled devices (SCCDs), buried channel CCDs (BCCDs), peristaltic CCDs (PCCDs) and profiled PCCDs (P²CCDs) were discussed in terms of structure, charge transfer process, transfer efficiency, speed, charge handling capacity, limiting factors and the state of the art. Some relevant input and output structures and their impact on signal processing were discussed. It has been demonstrated that, for a sampling pulse with a 2 nsec fall time, the sampling window function is smaller than 1 nsec.

Impressive was the demonstrated 100 MHz clockrate of a four-phase P^2CCD , which corresponds to a 720 MHz transfer rate. It is expected that the clockrate will go up into the GHz region.

D. F. Barbe, Naval Research Lab., USA, presented a paper on *visible* and infrared imaging with CCDs and CIDs (charge injection devices). The different systems such as crossbar, interline and frame transfer imagers were reviewed. The main problem in visible imaging is the low yield on defect-free devices. A large effort is being put into the determination of the origin and the reduction of defects.

The time delay and integration mode (TDI) was shown to be a very powerful technique in both visible and infrared imaging. The use of mechanical scanning and TDI increases the signal-to-noise ratio and reduces the effects of response nonuniformity of the elements.

Of special interest were CCD infrared images made on HgCdTe. This material has an adjustable bandgap.

Furthermore, the read-out of one integrated image for tenths of hours at a normal frame rate for a cooled CID imager was quite impressive.

H. J. Hartoff, Siemens AG, Germany, presented a paper on *CCD memo*ries and systems. State-of-the-art devices produced by several firms show capacities of 65 kbit, access time of 0.1-1 msec, and a data rate of 1-5 Mbit/ sec. Devices of 262 kbit capacity are expected within 2 years. CCD memories bridge the gaps, in both capacity and speed, between main memory systems of computers and mass memories (e.g. disks). Other applications are as buffer or back-up memory in peripheral computer equipment or computerlike systems of communication equipment.

C. R. Hewes of Control Research Labs, Texas Instruments, USA,

discussed a paper on *CCD signal processing*. He showed that CCDs are capable of a wide range of complex signal processing functions and are very cost effective compared to digital implementations.

Very impressive were the implementations of devices which performed the discrete Fourier transform by means of the chirp Z-transform (CZT) algorithm, a channel vocoder built up with two integrated circuits as well as the use of the CCD CZT to perform the holomorphic deconvolution of the pitch excitation and vocal tract impulse response. These functions will be applied among others in a "speaking" pocket calculator.

(3) MICROWAVE ACOUSTICS AND BUBBLE MEMORIES (Organizer, Chairman and Reviewer : Prof. W. G. Farnell, McGill University, Canada).

The field of linear surface-wave devices is now a mature one, and linear transfer functions with a wide range of characteristics can be produced for the frequency range from 30 to 1000 MHz using conventional planar technology. The paper on Linear surface-wave devices, presented by W. G. Farnell, after introducing the methods of tailoring the transducers to produce the appropriate frequency or impulse response, demonstrated several examples of band-pass filters fabricated to meet different and exacting specifications. The examples included one with over 50 % bandwith, one with low spurious response, one with long and precise delay, and two with special shapes for the pass band. Several second-order effects, such as tripletransit echo, which must be understood and accounted for in the design were outlined. The original dispersive surface-wave delay lines were developed for pulse compression applications for radar, but the accuracy and bandwidth of these lines, time bandwidth products up to 104, and phase errors of a few degrees over bandwidths greater than 100 MHz, have led to their use in the implementation of the chirp Z-transform and hence to a variety of Fourier-transform-type applications, spectral analysis, variable delay and variable bandwidth filters. The paper concluded with a discussion of the reflection of surface waves from periodic arrays and the resulting ability to produce resonators with Q values in the range of 10,000 in the frequency range up to a Gigahertz : resonators which can be used for the control of stable oscillators or coupled to form narrow-band filters.

The paper on *Nonlinear surface-wave devices*, presented by C. Maerfeld, Thomson CSF, France, discussed the common nonlinear interactions encountered with surface waves and the application of these interactions to signal processing functions. Two surface waves can interact through the elastic non-linearity of the medium, but it is difficult to obtain displacement amplitudes large enough to produce efficient coupling through forms of

focusing or beam compression to improve this efficiency. The non-linear coupling can be greatly increased either by using the transverse current in a slab of semiconductor near the waves on a piezoelectric, or by coupling many diodes to the electric field of the waves. The most common application of this concept involves two counter-propagating waves passing under the non-linear region producing in the current integrated over the region a signal which is the convolution of the envelopes of the two input signals. The device is useful because the convolutions provided are equivalent to some 2000 multiplications produced in about 10 nsec. Here the reference signal for matched filtering applications of this device must be generated for each separate pulse of the other incoming signal. In an extension of this device the reference signal is stored by a read operation in the charge profile of either the surface states of the semiconductor slab, or the transition capacity of the diode array, and the convolution can take place at a later time and repetitively. The memory correlator thus has applications in the matched filtering of radar pulses. Considerable research is now being done on image scanners for visible and infrared images. Here it is the incident light which establishes the charge distribution which is then scanned by the non-linear interaction with a surface wave. Different one-dimensional scanning methods using chirped waveforms have been demonstrated including techniques which produce Fourier transforms of the scanned line. The paper concluded with preliminary results of a method for twodimensional scanning.

There is growing interest in the field of acoustical microscopy because, while the wavelengths are of the same order of magnitude as in the optical case, the measured properties are elastic, the lenses are simple, and the output signal is electrical and thus convenient for signal processing.

The paper on *Ultrasonic microscopy*, presented by M. Luukkala, University of Helsinki, Finland, described two different types of acoustical microscope, demonstrated results and discussed probable fields of application. In one type the object is illuminated by an acoustic wave and scanned by a laser spot, the reflected laser spot is thus modulated by the acoustic transmission through the object. Demodulated by a knife-edge detector, the signal can produce on a synchronized TV raster an image of either the amplitude or the phase of the acoustic transmission. This system produces scans of relatively large objects with moderate resolution and magnification. The second type of miscroscope uses confocal wide-angle lenses produced by concave spherical interfaces between a solid and the liquid in which the object is immersed. The interface is illuminated from the solid side. The resolution is thus of the order of the wavelength of 1 GHz acoustic

waves in water : that is, less than a micron. The object is mechanically scanned and the transmitted, or reflected, signal produces amplitude or phase images on a TV raster. The simple spherical lenses are free of all aberrations except spherical, and that is extremely small because of the large difference in acoustic refractive index between the solid and the water. The exact fields of application of acoustic microscopy have not yet been established, though uses have been demonstrated in the sub-surface examination of small-scale joining processes and of microelectronic devices, in microstress analysis, and in images of biological specimens complementary to optical images but made without staining.

The paper on Magnetic bubble memories was presented by Mrs S. C. M. Backera, Philips Research Labs., Netherlands, and dealt with bubble memories, their principles, practical realization and potential application. It was shown that in certain thin films of magnetic material, small independent cylindrical domains across the films provide a stable configuration in a d.c. bias field. A domain which can be of the order of a micron in diameter can be moved laterally along an array of shaped permalloy electrodes by a rotating magnetic field in the plane of the film, or by current flowing in the array. Similarly, these domains or magnetic bubbles can be created, eliminated or divided in an extremely controlled manner. The paper described different techniques for manipulating the bubbles and included a moving picture which showed the translation, generation, and destruction of bubbles in an actual device. The micron size of the bubbles allows the realization of memories with various access configurations and clock rates for computer applications. In particular, the bubble memories, in competition with CCD memories, fill the gap in the memory hierarchy between the fast, but high cost per bit, MOS memories and the slow, but low cost, tapes and disks. A further great advantage to the bubble memory is that its storage of information is non-volatile and remains when the power supply is turned off.

(4) MILLIMETRE, SUBMILLIMETRE AND INFRARED DEVICES (Organizers : K. Button, MIT, Boston, USA and J. Le Mézec, CNET, Lannion, France; Chairman and Reviewer : J. Le Mézec).

This subject is of interest to almost all the Commissions of URSI. For instance, radioastronomy is interested in progress at millimetre and submillimetre wavelengths, especially in very low-noise receivers. We may also quote remote sensing, space research, material science, and so on. Special devices are developed for time and frequency standards. For application in the field of telecommunication, the future of this frequency band does not seem very bright. However, with the experience of the progress obtained in optical fibres, where many orders of magnitude in attenuation have been gained in ten years, we must be attentive to any possible progress in the huge gap extending between the two regions of the spectrum which are now used for telecommunications : the near infrared and the microwave region.

The papers in this session covered two aspects of the subject : transmission lines and circuits for millimetre and submillimetre waves, and generators and receivers for the submillimetre, far and medium infrared waves. Some of the highlights of these papers are as follows :

- Waveguides for millimetre and submillimetre waves (A. A. Oliner, Polytechnic Institute of New York, Brooklyn, USA).

The author first reviewed various structures which could be suitable for long runs of guides, including the O-guide, beam guide, H-guide and groove guide. Then, he discussed some new types of wave-guide for component construction and integrated circuit configuration; among them, the inverted strip dielectric waveguide which offers interesting electromagnetic properties.

 Investigations on low-loss materials for dielectric waveguides at the millimetre and submillimetre wavelengths (P. Kupecek, University of Paris, and CNET, Bagneux, France).

The different physical mechanisms for attenuation in polyolefins for 50 $\mu < \lambda < 3$ mm were discussed and typical figures were given : residual effects of near infrared intramolecular vibration bands, one-phonon absorption, multiphonon absorption, residual effects of the microwave relaxation band, scattering losses. At the present time the best values obtained are of the order of 10⁴ dB/km at $\lambda = 1$ mm.

- Active integrated devices on dielectric substrates for millimetre-wave application (R. Mittra, University of Illinois, USA).

Various integrated devices on dielectric substrates, including oscillators, mixers and receivers for the 30-80 GHz range were presented.

 Submillimetre wave technology advances and applications (T. S. Hartwick, The Aerospace Corp., El Segundo, Calif., USA).

A short review of the present state of submillimetre wave technology, which concentrated on the progress of optically pumped far-infrared lasers.

Various wavelengths up to $\lambda = 1$ mm are obtained, with power outputs of 0.5 W CW or 0.5 MW pulsed. Different applications were described including Tokamak plasma diagnosis (sensitivity has been increased by two orders of magnitude with the use of Schottky diodes), far infrared imaging, and remote sensing (sounding ionosphere chemical constituents from above).

- Submillimetre-wave receiver for measurement of the cosmic background radiation (P. L. Richards, University of California, Berkeley, USA).

Comparison was made between heterodyne and square-law detection. The author described an apparatus featuring a ³He cooled bolometric detector, a Fourier transform spectrometer, a cooled antenna and several black-body sources for absolute calibration. For the experiment, an equivalent antenna temperature of 0.03° K in the submillimetre region was needed and obtained.

- A new submillimetre wave source of radiation : the gyrotron (J. L. Hirschfield, Yale University, New Haven, Conn., USA).

This paper described the principle of operation of the gyrotron, using the radiation of free electrons rotating in a magnetic field. Research and development work are in progress at different laboratories in USSR and USA. One of the main applications is plasma heating for the Tokamak. High efficiencies can be obtained, since up to 98 % of the rotating energy of the electrons can be transferred to the electromagnetic field. Wavelengths from 10 mm down to 0.1 mm can be obtained. Some typical figures of CW power radiated are 12 kW at $\lambda = 8.8$ mm ($\gamma = 31$ %); 1.5 kW at $\lambda = 0.9$ mm ($\gamma = 6.2$ %). Pulsed power larger than 1 MW can be obtained in the millimetre region (pulse duration — 50 ns).

- Quantum tunable sources for medium and far infrared (R. C. Smith, University of Southampton, UK).

The author reviewed the present state of the art for two types of tunable sources in the medium and far infrared : down-converters, and parametric amplifiers and oscillators. Peak powers of the order of 10 MW have been obtained at $\lambda = 1.5 \mu$ with parametric oscillators; 5 kW at $\lambda = 3 \mu$ and 0.2 W at $\lambda = 200 \mu$ with down converters. Some applications to infrared spectroscopy and to remote pollution detection in the atmosphere were illustrated.

Commission E. — Electromagnetic Noise and Interference

Chairman : Dr. Ya. I. Likhter (USSR). Vice-Chairman : Mr. G. Hagn (USA).

> JOINT CHAIRMAN'S AND VICE-CHAIRMAN'S REPORT (Summary)

1. — ORIGIN OF COMMISSION E.

The present Commission was formed during the Assembly in 1975. It succeeds the former Commissions IV, IVA and VIII, which included studies of radio noise in their terms of reference (see Res. E1 for the terms of reference of the present Commission).

2. — Activities of Commission E since 1975.

The Commission has been active in several ways :

- (a) co-sponsorship of various international meetings;
- (b) the provision of responses to requests for information or comment from CCIR;
- (c) the preparation of the Commission E Chapter in *Review of Radio* Science;
- (d) the organisation of its sessions at the Helsinki Assembly. At present, national meetings of Commission E are held only in the USA;

for example during the Annual Meetings of the URSI National Committee. The Commission has co-sponsored or cooperated in the following events :

- IEEE International Symposium on Electromagnetic Compatibility (EMC), (Washington DC, 1976);
- EMC Symposia at Wroclaw (1976) and Montreux (1977);
- Symposium on Measurements in Telecommunications (Lannion, France 1977).

3. — WORKING GROUP ON MAN-MADE NOISE.

Since 1976 the Group has been chaired by Dr. A. D. Spaulding (USA) and it has worked by correspondence. The Group provided an URSI input to CCIR Question 46/1 on Radio Noise, and also Doc. 1/148 for a meeting of Study Group 1 in 1978. In Helsinki, the Group will consider several other requests from CCIR relating to man-made noise.

4. — STATUS OF LIMA RESOLUTIONS 1975.

At the Helsinki Assembly, there will be a session on Global Location of Atmospherics, and Lightning Instrumentation organised by Prof. H. Ishikawa (Japan). Dr. Likhter has arranged a session on Natural Noise in Space at the Helsinki Assembly as part of the Symposium on Wave Instabilities in Plasmas.

Commission E did not actively participate in the meeting on Lightning Instrumentation held in Uppsala in 1975, since the planning was already well advanced at the time of the URSI Assembly in 1975.

There was not enough research in progress on Solar-cycle Variations in Noise and Interference to justify holding a meeting on this subject.

5. — Plans for 1978-81.

URSI Commission E is interested in the following symposia :

(a) Electromagnetic Compatibility, Wroclaw 1978,

Since this event follows almost immediately after the URSI Assembly, no URSI sessions have been arranged on this occasion.

(b) Solar-Terrestrial Predictions, Boulder (Col.), 1979.

The primary interest of Commission E is in the study of sudden enhancements of atmospherics, and possibly also in solar radio noise as a source of interference.

(c) Electromagnetic Compatibility, Rotterdam 1979.

Mr. Hagn is a member of the Organising Committee and it is intended that Commission E should organise one or more sessions. This event is being coordinated with the CISPR Meeting in The Hague.

(d) Electromagnetic Compatibility, Baltimore (Md), 1980.

Commission E has made contact with the responsible IEEE Technical Programme Committee with a view to cooperating in the planning.

(e) Measurements in Telecommunications.

Commission E has expressed its willingness to cooperate with Commissions A and C in planning the Second Symposium on this subject, which will follow the successful Lannion event in 1977.

SCIENTIFIC PROGRAMME

During the XIXth URSI General Assembly, Commission E held seven sessions (including about 50 presentations); three sessions were joint with Commissions A, C and H. Attendance was typically 35-45 (except for the sessions on CCIR topics and the natural noise in space which were attended by about 80-90), and the discussions were lively. The traditional noise topics were addressed, as well as those included in the terms of reference in Lima. At least one session dealt with each of the topics in the terms of

reference. The joint sessions are worthy of special notice : Natural Noise in Space (joint with Commission H), Signal and Noise Measurements (joint with Commission A), and Effects of Non-Gaussian Noise on System Performance (joint with Commission C). The titles of the scientific sessions of Commission E are given below.

- Global Location of Atmospherics and Lightning Instrumentation; Organizer and Chairman : Dr. H. Ishikawa (Japan).
- Natural Noise in Space; Organizer : Dr. Ya. I. Likhter (USSR); Chairman : Dr. F. Horner (UK).
- Man-Made Noise and Interference (Sources); Organizer and Chairman : Mr. G. H. Hagn (USA).
- Radio Noise and Interference (Environment); Organizer : Mr. G. H. Hagn (USA); Chairman : R. Lindquist (Sweden).
- Signal and Noise Measurements : Organizers : Mr. P. I. Somlo (Australia) and Mr. G. H. Hagn (USA); Chairman : Mr. P. I. Somlo.
- Effects of Non-Gaussian Noise on System Performance; Organizers and Chairmen : Dr. A. D. Spaulding (USA) and Dr. J. K. Skwirzynski (UK).
- CCIR Topics; Organizer : Mr. G. H. Hagn (USA); Chairman : M. M. Thué (France).

Summary of Minutes of Business Meetings on 31 July and 7 August

There were three candidates for the position of Vice-Chairman, and the result of the voting was as follows, in order of preference : 1. S. Lundquist (Sweden); 2. E. Nano (Italy); 3. A. Iwai (Japan).

Dr. Likhter (Chairman) referred to the growing interest of Commission E in noise in space, and suggested that the measurement of noise in space would become increasingly important in future.

A Working Group recommended that the title of the Commission be changed to Electromagnetic Noise and Interference, but that the terms of reference should remain unchanged (see Council Res. UC11 and Res. E1). It was noted that the new title was consistent with the CCIR definition of interference, where noise is considered as a potential source (or cause) of system performance degradation, and interference is considered to be the effect (that is, the degradation produced).

The cooperation between Commission E and the organizers of several future symposia was discussed (see para. 5 of the Chairman's Report and Res. E2).

Dr. Likhter reported on the concern expressed in COSPAR about pollution of the environment and, in particular, electromagnetic pollution (solar-power satellite transmissions, high-power radars, high-voltage power lines, ionospheric heating experiments, etc.). It was agreed to designate Dr. H. Kikuchi as the Commission E representative in the URSI Working Group on the Influence of Man's Activities on Telecommunications.

Dr. Spaulding (Editor, Commission E) referred to the arrangements made for the preparation of the material for *Review of Radio Science* 1978-1980 which would be published in 1981. Contributions to the next Commission E Chapter in the *Review* should be sent to Dr. Spaulding as soon as they become available; the final text must be submitted to Prof. Bowhill by 31 December 1980.

It was agreed that the Commission E programme at Helsinki represented a good balance between Commission E's own sessions, and those held jointly with Commissions A, C and H.

The following topics were suggested as potential subjects for a Commission E Symposium, to be held in cooperation with Commission C during the Assembly in 1981 :

- (a) How to predict the performance of telecommunication systems from various noise models and measurements;
- (b) The impact of the new broad-band modulation systems on existing systems and vice-versa.

The Chairman will coordinate with Commission C.

It was agreed to form a Working Group on Natural Noise which will study lightning, lightning-flash counters, and related subjects. The Chairman will be Prof. S. Lundquist, and it was suggested that he should keep in touch with the CIGRE Working Group on Lightning Flash Counters. Dr. Spaulding agreed to continue to chair the Working Group on Manmade Noise.

At the conclusion of the second Meeting, Mr. Hagn, speaking on behalf of the members of Commission E, thanked Dr. Likhter for his services to the Commission during the past three years. Chairman : Mr. F. Eklund (Sweden). Vice-Chairman : Prof. A. T. Waterman Jr. (USA).

CHAIRMAN'S REPORT

Guidelines for the work of the Commission were given by the URSI Council in Lima in 1975, and I want to emphasise two of these :

- (a) the importance placed on the need to stimulate and coordinate studies of telecommunications using electromagnetic waves, and
- (b) the recommendation that a major part of the scientific activities of URSI should be the organisation of open symposia.

Commission F responded to the directives of the Council by recommending the organisation of two symposia :

- 1. Remote sensing of the lower atmosphere and of the Earth's surface and sub-surface,
- 2. Limitations on the performance of telecommunication systems due to propagation effects in the lower atmosphere,

and by recommending a number of topics for future IUCRM colloquia.

Since 1975, the outstanding event among the various activities of Commission F was the Open Symposium held in La Baule, France, in April-May 1977 on the invitation of the French URSI Committee. It was the ambition of the Programme Committee to put special emphasis on :

- (1) limitations to the performance of telecommunication systems due to propagation effects;
- (2) methods of using such effects for the remote sensing of the lower atmosphere and of the Earth's surface and sub-surface.

A large number of the participants expressed the opinion that the Symposium was highly successful as a forum for the exchange of scientific information. The conclusion drawn by M. Pierre Misme (Chairman of the French Organizing Committee) and myself is that the Symposium showed that URSI could bring together a majority of the scientists and specialists interested in the topics covered by Commission F. As Chairman of Commission F and of the Programme Committee, I want, on this occasion, to express my thanks to the members of this Committee for their contribution to the success of the event, and to M. Misme and the Organizing Committee for dealing with all the problems of arranging the Symposium.

The activities of IUCRM are of great interest to Commission F. Since

the addition of radio-oceanography to its terms of reference in 1975, IUCRM has organised two colloquia : namely, on Radio-oceanography (Hamburg 1976) and Passive radiometry of the ocean (Patricia Bay, Canada 1978). We shall hear reports on these two events in our scientific sessions.

CCIR Study Group 5 is concerned with a number of questions which are closely related to the terms of reference of Commission F. Dr. Saxton, Chairman of the Study Group, and also a former Chairman of our Commission, has asked for our assistance in solving some problems concerning precipitation attenuation, and we shall discuss possible action in our Business Sessions.

URSI and Commission F were represented at the Meeting of the WMO Commission for Instrumentation and Methods of Observation, in August 1977, by Dr. Olsson (Sweden) and Dr. Jeske (FR Germany). Of particular interest were the discussions on measurements of precipitation, evaporation and soil moisture with the aid of satellites and radar techniques.

I must now turn to some problems encountered when planning the Commission F programme for this Assembly. In addition to the Scientific Sessions of all the Commissions, there will be five Open Symposia and two Open Workshops; in consequence, the programme is more extensive than ever before at an URSI Assembly.

Even though the Programme Coordinator (Prof. Stumpers), the Secretary General and the Commission Chairmen have tried, mainly by correspondence, to avoid collisions of interest between the various activities, it was inevitable that such conflicts would occur. After the general structure of the programme had been decided early in 1977, proposals for additions to the Commission F sessions were received. It was my ambition not to overload the already quite extensive Commission F programme in order to facilitate some participation in the Open Symposia, etc. The result is that some subjects will be very briefly treated in the Commission F programme here, and some will be omitted.

In conclusion, may I make some comments, which may be of general interest, on my experience as Chairman during the past three years. The responsibility has been a stimulating one because of the many contacts I have made with colleagues at conferences and meetings, and through correspondence. In my opinion, Commission F can best contribute to the attainment of the objectives of URSI by continuing and increasing its efforts to stimulate international discussion, and exchanges of ideas on the scientific and technical problems in our field. We must also try to improve still further the flow of knowledge from basic research to applications, particularly through continued and improved contacts with CCIR and CCITT. We can do this by allowing time, during our future symposia, for giving particular attention to selected questions and study programmes submitted by these organisations. Also, when we try to define the high-priority research areas in our field, it will be more than ever necessary to find out what are the important trends in the development of telecommunication needs and techniques. This may call for closer cooperation and joint activities, primarily with Commissions B, C and D.

In the remote-sensing area, we can foresee a tremendous increase in the amount of data produced, and a breakthrough in the use of microwave techniques for civil purposes; I need only mention SEASAT 1 and NIM-BUS G as examples. Many organisations arrange conferences, etc. on "remote sensing", but it will be important for Commission F to be careful in defining its rôle in this field. Radio science and geophysics overlap, and it may be necessary for us to engage in joint activities with other organisations.

During the past three years, my task as Chairman has been lightened through contacts with people in the surrounding world. Within URSI, I want to mention the Secretary General of URSI, the members of Commission F, and the representatives of other Commissions. I took over a vigorous Commission from my predecessor, M. Misme, and I hope that, at this Assembly, we shall lay the foundations of a Commission F programme with "go" in it, to be handed over to the incoming Chairman who, according to established practice, will be the present Vice-Chairman, Prof. Alan Waterman from the USA.

SCIENTIFIC ACTIVITIES AT THE XIXTH GENERAL ASSEMBLY

Commission F held five scientific sessions on the following topics :

- Session 1. Characteristics of radio transmission channels affecting high-capacity communication and precision navigation systems (Organizer : Dr. D. Crombie, USA).
- Session 2. Electromagnetic wave propagation and remote sensing (Organizer : Dr. D. Gjessing, Norway).
- Session 3. Review of major scientific accomplishments of the Commission F Open International Symposium in La Baule, France 1977, and of IUCRM Colloquia in the period 1975-78 (Organizer : Dr. I. Katz, USA; Mr. P. Misme, France and Dr. B. R. Bean, USA (IUCRM)).
- Session 4. Precipitation effects on propagation at frequencies above 10 GHz (Organizer : Dr. F. Fedi, Italy).

Session 5. - New topics (Organizer : Dr. A. T. Waterman, Jr., USA).

SESSION 1.

In this session, papers were presented dealing with the limitation to performance arising from causes other than additive noise or interference from other users. The session was primarily concerned with the distortion effects which limit the coherent bandwidth and which give rise to what is often called multiplicative noise, intersymbol interference (in digital systems) or interchannel interference in FDM/FM analog systems. The primary cause of distortion in the papers discussed is multipath. Distortion is, in many practical respects, often a worse limitation than additive noise since it cannot be reduced by raising the transmitter power. The deleterious effects of multipath are most significant when the multipath contains signals of appreciable magnitude having delays comparable with the bit length in digital systems or the reciprocal of the bandwidth in analog systems.

The session was organised in two parts. The first dealt with distortion arising from atmospheric effects, while the second contained the papers dealing with multipath arising from scattering by the terrain or buildings.

The papers raise the need for further data beyond simple measurements of attenuation, and its variability on a single link at a single frequency, if the propagation studies are to be of serious value to designers of modern systems. Data which reveal the dispersion, distortion or angular distribution of received signals are badly needed if high capacity and high precision systems are to be effectively designed. A related issue, that of identifying the best way of presenting such data, has not been resolved, URSI scientists could play an important rôle here as well as in the collection of appropriate data.

The following papers were presented :

- R. W. Hubbard : Multiplicative disturbances in microwave communication channels.
- S. G. Häggman : Time domain observation on microwave multipath propagation and estimation of channel parameters.
- G. Hyde and F. Tseng : Comstar 29/19 beacon measurements at Comstar Labs.
- G. L. Turin : Simulation of urban radio propagation and of urban communication systems.
- L. Ladell : Identification of urban and rural multipath objects by means of a new measuring technique.
- B. Wieder : Application of holographic principles to locating multipath scatterers at L.F.

SESSION 2.

This session contained some papers discussing basic signature problems relating to remote sensing of physical properties of the surface of the earth, water bodies and atmospheric gases using radio and/or optical waves. Some papers were concerned more with applications oriented research such as remote sensing of wind on different scales and of sea-surface structure.

A review was also given in this session on remote sensing of particulate matter in air and on clear-air studies of the neutral atmosphere. The increase in doppler radar sensitivity has made it possible to gain a new insight into wind field and refractive index structures in different altitude regimes of the neutral atmosphere.

Finally a review was presented of recent results of remote sensing of planetary atmospheres.

The following papers were presented :

- D. T. Gjessing : General introduction to remote sensing. Remote sensing of earth's surface.
- T. Lund : Remote sensing of organic compounds in water. Remote sensing of atmospheric gases.
- A. T. Waterman : Wind measurements in transhorizon propagation using antenna-array beams.
- G. R. Valenzuela : Remote sensing of sea-surface structure.
- U. Kravtsov, Etkin *et al.* : Resonance phenomena in thermal microwave radiation from sinusoidal water surfaces.
- R. K. Moore : SEASAT An application to wind measurements.
- E. E. Gossard : (Review) Remote sensing of particulate matter in air. Clear-air studies of the neutral atmosphere.
- V. Eshelman : Remote sensing of planetary atmospheres.

SESSION 3a.

The major scientific results described in papers presented in 1977 at the Commission F Symposium on Propagation in Non-ionized Media in La Baule, France, were reviewed in two contributions.

The first review and evaluation of progress was concerned with papers in the subject areas : propagation in the clear atmosphere; propagation influenced by the earth's surface and subsurface; remote sensing. It was presented by I. Katz, USA and J. R. Wait, USA. Some of the papers presented in these subject areas have been published in a Special Issue of *Radio Science*, Vol. 13, No. 2, March-April 1978.

The second review and evaluation dealt with the subject areas : radio-

wave propagation : properties of precipitation; ATS-6 and other earthsatellite radio propagation investigations; transmission channel characteristics : performance of telecommunication systems, and was presented by P. Misme, France. The papers presented in these three subject areas have been published in a Special Issue of *Annales des Télécommunications*, Vol. 32, No. 11-12, Nov.-Dec. 1977.

Abstracts of all papers presented at the La Baule Symposium were published in *Proceedings of the URSI Commission F Open Symposium*, La Baul², 1977.

Significant scientific progress was reported in all the subject areas treated.

SESSION 3b.

The review of IUCRM's scientific achievements in the period 1975-78 contained accounts of the IUCRM Colloquium on Radio Oceanography held in Hamburg, FR Germany in 1976, and the Colloquium on Passive radiometry of the ocean, held in Patricia Bay, Canada in 1978.

The Colloquium in Hamburg was reported on by G. Valenzuela, USA. It was successful in helping to bring into the international limelight this new area of research, and in encouraging oceanographers and radio scientists to exchange scientific information.

The Colloquium on Passive radiometry of the ocean was reported on by J. F. R. Gower, Canada.

Important recommendations for further research were worked out at both these colloquia.

The collection of papers, workshop summaries and recommendations from the Hamburg colloquium appears in the January 1978 issue of *Boundary-Layer Meteorology*, Vol. 13. Similarly the material from the Patricia Bay Colloquium will be published in a future issue of the same journal.

SESSION 4.

This scientific session was concerned with precipitation effects on propagation at frequencies above 10 GHz.

Papers were presented by :

- F. Fedi : Radio propagation data for terrestrial communications.

 L. S. Ippolito, G. Hyde, G. Brussard, D. C. Cox and F. Carassa : Radio propagation data for satellite communications.

SESSION 5.

In the final scientific session, results of some research projects were presented in short contributed papers. The report on the first results obtained from the synthetic aperture radar (SAR) on the SEASAT A Satellite were easily the most striking. The application of this technique, well developed for aircraft, to a satellite configuration was of the utmost interest. It will doubtless see much further use and development in the future study of the land and ocean surface from space. The following papers were presented in the session :

- C. Ellyett, D. Pratt and P. McNabb : Airborne infra-red studies of the earth's surface.
- M. P. M. Hall : Dual polarization radar measurements on rainfall.
- J. F. R. Gower : SEASAT radar images, a brief presentation of the first SEASAT SAR results.
- G. R. Valenzuela : Future work in radar oceanography.

Commission G. — Ionospheric Radio and Propagation

Chairman : Dr. J. W. King (UK). Vice-Chairman : Dr. A. P. Mitra (India).

TITLES OF SCIENTIFIC SESSIONS

The scientific programme of Commission G was made up of the 17 sessions of the Open Symposium on Radio Waves and the Ionosphere. In view of the large number of papers for presentation (about 175) it was necessary to present nearly all the papers in parallel sessions.

The topics of the sessions and their Conveners were as follows :

- Propagation of the whistler-mode signals, K. Tsuruda and A. D. M. Walker.
- The need for improved ionospheric knowledge for communication purposes, C. Rush.
- High-power radar studies of the region below 100 km, S. A. Bowhill.
- Ionospheric propagation at high latitudes, R. D. Hunsucker.
- Remote sensing of the sea surface by HF backscatter, J. W. King.
- Modern developments in ionospheric sounding, J. W. Wright.
- Ionospheric structure and dynamics, J. V. Evans.
- Long-range HF ionospheric ducting, K. Toman.
- Ionospheric effects on earth-space propagation, J. A. Klobuchar.
- Ionospheric irregularities, P. Dyson and J. W. King.
- Non-linear effects excited in the ionosphere by radio waves, W. E. Gordon.

Ionospheric modelling and mapping and their applications, K. Rawer.
 Future directions for ionospheric research, J. W. King and H. Rishbeth.

BUSINESS MEETINGS

The principal decisions reached during discussions in Commission G are recorded in Resolutions G1-G9. The opinions expressed by the Commission on several administrative matters were referred to the URSI Council which adopted Council Resolutions UC18 (Remote Sensing using Radio Waves), UC19 (Middle Atmosphere Programme and status of SCOSTEP), and UC21 (Location of XX URSJ Assembly).

The result of the voting for the position of Vice-Chairman of the Commission was as follows, in order of preference : 1. B. Hultqvist (Sweden), 2. M. Petit (France), 3. P. Bauer (France).

The Vice-Chairman (Dr. A. P. Mitra) would normally have succeeded as Chairman but, since he had been elected to the Board of Officers, he could not also serve as Chairman of a Commission. Given these circumstances, Dr. Hultqvist agreed to serve as Chairman for the next three years.

Dr. Petit had been the first preference candidate for Vice-Chairman of Commission H, and had expressed his preference to be associated with this Commission. After considering the situation, the URSI Council later elected Dr. Hultqvist and Dr. Bauer as Chairman and Vice-Chairman respectively of Commission G. Dr. Petit was elected Vice-Chairman of Commission H.

WORKING GROUPS

The following Working Groups will be active during the period 1978-81 :

- G.1. Ionospheric Network Advisory Group (INAG). Chairman : W. R. Piggott; Vice-Chairman : J. V. Lincoln.
- G.2. Software Exchange in Ionospheric Research. Chairman : J. W. Wright.
- G.3. Southern Hemisphere Atmospheric Studies Group (SHASG). Co-Chairmen : J. A. Gledhill and S. Radicella.
- G.4. International Reference Ionosphere (IRI). Chairman : K. Rawer.
- G.5. Evaluation of analysis techniques in ionospheric research. Chairman : L. F. McNamara.
- G.6. Ionospheric knowledge needed to improve radio propagation systems. Chairman: C. M. Rush.

- G.7. *F2 layer mapping*. Chairman : E. Neske.
- G.8. Incoherent scatter. Chairman : M. Baron; Vice-Chairman : M. Blanc.
- G.9. Abnormal ionospheric propagation.

Chairman : D. G. Cole.

- G.10. International Digital Ionosonde Group (IDIG). Chairman : J. R. Dudeney; Vice-Chairmen : K. Bibl and J. W. Wright.
- G.11. Panel on Southern Hemisphere Incoherent Scatter Facility. Chairman : J. A. Gledhill.

INTER-UNION WORKING GROUPS

URSI Commission G (See Res. G.9) will continue to participate in the work of two URSI-IUGG (IAGA) Inter-Union Working Groups :

- 1. Structure and dynamics of the thermosphere, ionosphere and exosphere, Chairman : J. V. Evans.
- 2. Neutral and ion chemistry and solar fluxes, Chairman : L. Thomas; Vice-Chairman : A. D. Danilov.

Commission H. — Waves in Plasmas

Chairman : Dr. R. Gendrin (France). Vice-Chairman : Dr. F. W. Crawford (USA).

BUSINESS MEETINGS

TERMS OF REFERENCE.

It was agreed that the terms of reference of the Commission, as defined in 1975 at the previous Assembly, seemed to represent well the fields of interest of Commission H.

INTERNAL WORKING GROUPS.

It was decided to maintain only the following two Working Groups (See Res. H.1):

- Wave analysis (Co-Chairmen : D. Jones and J. L. Lacoume);

- Active experiments (Chairman : C. T. Russell).

These Groups should work closely with Commissions C and G respectively. INTER-UNION WORKING GROUPS.

It was decided to recommend the maintenance of the URSI/IUGG (IAGA) Working Groups on :

Passive Electromagnetic Probing of the Magnetosphere (Chairman : D. Carpenter);

Wave Instabilities in Space Plasmas (Co-Chairmen to be designated later by correspondence).

(See Res. H.2).

Symposia 1979-80.

Commission H is interested in the subjects of the following symposia, and it is recommended that they should be co-sponsored by URSI :

- 1. 4th International Conference on Phenomena in Ionized Gases, Grenoble, France, 1979;
- 2. Joint Conference including 4th Kiev Conference on Plasma Theory and 4th International Congress on Waves and Instabilities in Plasmas, Nagoya, Japan, June 1980;
- 3. URSI/IAGA Session on Non-linear Waves in Geophysical Plasmas, Canberra, December 1979 (during IUGG Assembly).

Prof. Crawford is already a member of the Programme Committee for Symposia 1. and 2. and he was designated to represent URSI. The URSI representative in the Programme Committee for Symposium 3. will be designated later (See Res. H.3).

URSI GENERAL ASSEMBLY, 1981.

The following topics are recommended as possible subjects for inclusion in the scientific programme for the General Assembly of URSI in 1981 (See Res. H.4) :

(a) Non-linear electromagnetic theory. This is of fundamental interest and it seems likely to concern also Commissions B, D, F and G. A Symposium on this topic should be seriously considered by the Programme Committee.

(b) Active wave experiments. This subject will be of special interest in view of the launch of the space shuttle in 1980.

(c) First results from EISCAT. Since EISCAT will become operational in early 1980, this is an appropriate topic. The Symposium should be organised in cooperation with Commission G.

REMOTE SENSING.

After a thorough discussion of the United Kingdom proposal for the creation of an URSI Commission on Remote Sensing, Commission H recognized the timeliness of defining URSI's interests in remote sensing and made the following recommendations :

- 1. that, before the end of the Assembly, a Working Group be set up by the Council containing representatives of all Commissions with relevant interest;
- that this Working Group should define the terms of reference of a future URSI Commission on Remote Sensing, and the relations of the Commission with other scientific organisations, and submit these to the XX URSI General Assembly in 1981;
- 3. that the Working Group should consider organising a Symposium on those aspects of remote sensing that are relevant to radio science, to be held before or at the XX Assembly. (See Council Res. UC18).

ELECTION OF VICE-CHAIRMAN.

The following candidates for election as Vice-Chairman for the period 1978-81 were selected by the Official Members of the Commission in order of preference :

1. M. Petit (France); 2. R. L. Dowden (New Zealand).

ENVIRONMENTAL ASPECTS OF ACTIVE EXPERIMENTS IN SPACE

A Meeting was held on 3 August 1978 to discuss the organisation of an URSI Working Group on the possible effects of active experiments in space.

The Chairman (Dr. Gendrin) explained that the URSI Board of Officers had asked him to form a small group, within URSI, to study particularly those changes in the atmosphere that were likely to affect the propagation of radio waves or to interfere with systems of communication.

Prof. K. Rawer summarised the activities of the COSPAR Panel (of which he is Chairman) on Potentially Environmentally Detrimental Activities in Space (PEDAS), and Dr. J. Rutkowski expressed the concern of CCIR about these matters.

It was noted that the possible consequences of active experiments must first be scientifically assessed before any recommendation concerning them can be issued. In consequence, such effects cannot be qualified in advance and it will be desirable to avoid the use of pejorative terms to describe them, such as "harmful", "detrimental", etc. The term "active experiments" was considered to be too restrictive since it excludes, for example, radiation from power lines.

The consensus of opinion was that the following title was suitable for the Working Group : Influence of Man's Activities on Telecommunications.

It was agreed that the Group should consider the following topics :

(1) solar power transmission;

- (2) active remote sensing (in particular using high-power radars);
- (3) power-line emissions;
- (4) active experiments using electron and ion guns, ionospheric heating, or chemical releases (including the exhaust products from large rockets);
- (5) non-linear wave-wave coupling;
- (6) ELF, VLF and HF transmitters (on the ground and in spacecraft).

The following persons have agreed to participate actively in the Working Group :

Prof. K. Rawer (Chairman of the COSPAR PEDAS Panel);
Dr. J. Rutkowski (CCIR);
Mr. G. H. Hagn (Commission E);
Dr. L. M. Duncan (Commission G);
Prof. W. E. Gordon;
Dr. E. K. Smith;
Dr. W. Utlaut;
Dr. R. A. Helliwell (Commission H);
Dr. C. T. Russell;
Dr. Tsuritani;
Dr. R. Wielebinski (Commission J).

The Chairman of the Group has not yet been designated and a precise timetable for its future activities has not so far been established.

Helsinki, 5 August 1978.

R. Gendrin.

TITLES OF SCIENTIFIC SESSIONS

- Propagation of whistler mode signals. Convenors : K. Tsuruda and A. D. M. Walker.
- Antennas in plasmas, Convenors : L. R. O. Storey and M. P. E. Weenink.

SYMPOSIUM ON WAVE INSTABILITIES.

- Natural noise in space, Convenor : Ya. J. Likhter.
- Plasma turbulence, Convenor : P. J. Palmadesso.

- Non-linear effects, Convenor : D. A. Gurnett.
- Ionospheric irregularities, Convenor : P. L. Dyson.

WORKSHOP ON WAVE ANALYSIS.

- Convenors : D. Jones, J. L. Lacoume and R. G. McPherron.
- Spectral analysis.
- Polarization measurements.
- Time delays.

Commission J. — Radio Astronomy

Chairman : Prof. G. Westerhout (USA). Vice-Chairman : Prof. H. Tanaka (Japan).

BUSINESS MEETING

About 60 people were present at the only business meeting held, on July 31. The Commission Chairman, G. Westerhout, chaired the meeting, while J. W. Findlay acted as Secretary.

COMMISSION J : CIRCULAR LETTER.

The Chairman asked that, in the future, the Circular Letters from the Chairman to Official Members should be given wide publicity among scientists, so as to facilitate the collection of more representative opinions before the next Assembly.

COMMISSION J PROGRAMME, HELSINKI.

The programme for the present Assembly was almost completely made up of invited papers, and the Chairman asked whether this was a good idea. After discussion, it was agreed that the all-day session on New Developments gave plenty of opportunity for contributed papers, but that in the future there should be somewhat fewer Commission J Sessions. It was also agreed that about one day of the 1981 Assembly could usefully be devoted to survey papers from some or all Commissions, and that Commission J should propose a survey paper if requested to do so.

SYMPOSIA BETWEEN ASSEMBLIES.

J. C. Ribes (France), R. Wielebinski (FRG) and F. D. Drake (USA) were invited to make proposals for future symposia which should be

recommended for support by URSI. On the advice of this Group, it was agreed to propose a Symposium on Millimetre-wave technology, especially as applied to radio astronomy, to be arranged preferably in collaboration with Commission D. The Group made other recommendations relating to the procedure for the approval of symposia by the Board of Officers and the provision of financial support (See Res. J.2).

THE URSI COMMISSIONS AND THE COUNCIL.

The Commission would like to see the establishment of closer contacts between, on the one hand, the Council and the Board of Officers and, on the other, the Commissions. At present, the Chairmen of Commissions are sometimes asked to discuss organisational matters without being fully aware of the background. Also the Business Meetings of the Commissions ought to provide a channel for keeping the URSI Council fully informed about the opinions of the radio-science community.

Recommendations for action were included in Res. J.1.

COORDINATING COMMITTEE ON MOON AND PLANETS.

Following a discussion on the recent activities of this Committee, the general view was that URSI might well withdraw from it, and that consideration should be given to the need for the continuation of the Committee.

DETRIMENTAL ACTIVITIES IN SPACE.

Prof. Wielebinski reported that he had prepared a report for the COSPAR Panel on Potentially Environmentally Detrimental Activities in Space, in which he had described the dangers to radioastronomy of radio transmissions in space and the work of IUCAF in trying to improve protection.

REVIEW OF RADIO SCIENCE.

Although a great deal of work went into the preparation of successive editions of *Review of Radio Science*, it appeared that very few scientists in Commission J made any use of it. It was agreed that the volumes should be given a much wider circulation than in the past, or that publication should be discontinued (See Council Res. UC.7).

COMMISSION J REPORT.

The Chairman took the view that the reports he had received from Member Committees in support of his preparation of the Commission J Chapter in the *Review of Radio Science* were very valuable. He considered that they ought to be reproduced in full for the use of Commission J, even though no formal procedure for achieving this was available in URSI.

Accordingly he had reproduced the reports received from 22 Committees in a 170-page booklet for distribution during the Assembly. The cost was being covered partly by the purchasers and partly by a grant from URSI.

The action taken by the Chairman was approved and a vote of thanks to him for his initiative was adopted.

IUCAF.

It was agreed to recommend that Prof. J. P. Hagen and Dr. J. W. Findlay should remain the URSI representatives in IUCAF, since continuity in the work of the Commission was essential in the period leading up to the World Administrative Radio Conference in 1979.

ELECTION OF VICE-CHAIRMAN.

The results of the voting were as follows, in order of preference : 1. V. Radhakrishnan (India), 2. R. Wielebinski (FRG), 3. G. G. Getmantsev (USSR).

REPORTS OF MEETINGS.

Prof. Hagen reported on the work going on in CCIR that was of particular interest to Commission J, and on the results of the recent Plenary Assembly in Kyoto.

Dr. Findlay and Prof. Hagen described the work of IUCAF during the last three years in preparation for the WARC in 1979. The Commission will meet its Correspondents in Helsinki and also hold a closed meeting.

TITLES OF SCIENTIFIC SESSIONS

- J.1, J.2. New developments in observatories and laboratories; Organizer :G. Westerhout, USA; Chairman : G. Westerhout (USA) and H. Tanaka (Japan).
- J.3. Very-long baseline interferometry; Organizer and Chairman : T. A. Clark (USA).
- J.4. Search for extraterrestrial intelligence; Organizers : K. I. Kellermann (FRG) and N. S. Kardashev (USSR), Chairman : K. I. Kellermann (FRG).
- J.5. Millimetre wave electronics; Organizers : S. Weinreb (USA),M. Morimoto (Japan) and J. W. M. Baars (FRG), Chairman :J. W. M. Baars (FRG).

- J.6. Physics of nonthermal radio sources; Organizer : R. G. Strom (Netherlands).
- J.7. Recent developments in antennas for radio astronomy; Organizers : J. W. Findlay (USA) and J. W. M. Baars (FRG), Chairman J. W. M. Baars (FRG).
- J.8. Solar and planetary radio and radar astronomy; Organizers : D. B. Campbell (USA) and M. Pick (France), Chairman : D. B. Campbell.
- J.9. Spectral line research; Organizer and Chairman : B. E. Turner (USA).
- BJ.1. Recent developments in radio astronomical antennas; Organizers :J. W. M. Baars (FRG) and J. W. Findlay (USA), Chairman :J. W. Findlay (USA).

CHAIRMAN'S REPORT ON THE ACTIVITIES OF COMMISSION J

A very full programme of scientific sessions was presented. Nine halfdays were organised by Commission J alone, and one half-day jointly by Commissions B and J. In general about 100 people attended each session.

Sessions J.1 and J.2 occupied the first day and were devoted to the traditional reports on new developments in observatories and laboratories. In these Sessions, which are open (time permitting) to short papers describing new antenna or receiving systems and current observing programmes, 31 papers were presented by scientists from 12 different countries. Putting this Session at the start of the Assembly allowed participants to have further discussions, about the topics presented, during the whole period of the Assembly. The Session was considered to be very successful and it should be continued at future Assemblies.

Session J.3 was a review of the status of very long base-line interferometry. A decade has elapsed since the first successful demonstrations of vlbi techniques, which have been applied in a number of very different scientific fields. Some extra-galactic radio sources have shown variations in their nuclear regions at apparent velocities in excess of the velocity of light, while others show collimated jets a few parsecs in length, colinear with double structures of hundreds of kilo parsecs in length. OH and H_2O maser sources have been mapped and show the collapsing shells surrounding stars in their earliest stages. The vlbi technique has shown that it now rivals centuries of optical astrometry, and is capable of positional determinations at the 0.01 arc second level. Geodetic observations on baselines of thousands of kilometres are already at the sub-decimetre level necessary to

measurements of continental drift, crustal deformation, polar motion and UT1. Transportable vlbi terminals now permit field "surveying" at accuracy levels superior to those obtained using classical techniques. New vlbi hardware has been demonstrated which will permit an order-of-magnitude increase in sensitivity. "Real-time" vlbi using satellite data links has been demonstrated.

Ten papers were presented in Session J.4 on the search for extraterrestrial intelligence (SETI). Following a review of the problem and relevant technology by B. M. Oliver (USA), Oliver and S. Gulkis (USA) reviewed the plans for the NASA-Ames targeted search, and the NASA-JPL cell sky search respectively. J. Tarter (USA), F. Drake (USA) and R. Wielebinski (F. R. Germany) then described their observations of nearby stars and galaxies using several novel techniques. In other papers the problems of optimum frequencies and signal signatures were discussed. The Session was one of the two most widely attended sessions of Commission J (over 150 participants); this reflects the growing world-wide interest in SETI and the rapidly improving technology which now makes meaningful searches possible.

All the speakers in Session J.5, on millimetric-wave electronics, had been invited and all the papers were surveys. The attendance was good, with a noticeable proportion from outside the direct radioastronomy circle. The well-presented papers provoked numerous questions and considerable discussion. The main points of the day were :

- (1) the need for flexible multifrequency operation, together with easy access to the front-ends (Morimoto);
- the routine use in actual observations of wide-band (100 MHz) acoustooptic spectrometers (Robinson);
- (3) the achievement of a cooled-mixer receiver at 80 GHz with an almost theoretical noise temperature of 320K (Schneider);
- (4) difficulties in obtaining the desired performance of parametric down converters, coinciding with growing insight into the characteristics of the device (Weinreb);
- (5) optimistic prospects for Josephson-junction mixers with noise temperatures between 50K and 200K in the frequency range 30-300 GHz (Migulin);
- (6) promising developments in BWO and Impatt oscillators for frequencies above 100 GHz; the main problems at present are harmonic radiation of BWO and high noise of Impatt devices (Lacroix).

In Session J.6, on the physics of non-thermal radio sources, J. A. Högbom reviewed the status of observations of strong extragalactic radio sources,

and presented examples of projected magnetic field distributions and spectral index variations. Magnetic fields generally run parallel to the total intensity contours but, in the narrow jet-like features emanating from some galactic nuclei, there are also examples of fields perpendicular to the direction of extension. C. A. Norman discussed theoretical aspects of the stability of beams, and the likely relationship of fine scale structure to particle acceleration in extragalactic sources and supernova remnants. In a review of low-frequency variability of quasars and radio galaxies, R. Fanti presented recent results which underline the ever present problem of variations that are both too rapid and too large in magnitude to be explained by existing models. V. Radhakrishnan discussed the status of pulsar observations and recent theoretical advances. Recent polarisation measurements on the Crab nebula, presented by A. S. Wilson, place stringent limits on the circularly polarised emission, and have important implications for the object's magnetic field structure. In short communications, very large galaxies were discussed by R. Wielebinski, R. G. Strom and E. B. Fomalont, while W. van Breugel and W. M. Goss presented observations of several double radio sources.

On August 3, an open workshop on large digital correlators was convened by P. Dewdney (Canada). About 25 people attended and each participant was asked to summarise the activities in this field in his institution. B. Clark (NRAO, USA) outlined the operation of the VLA correlator system and reviewed progress to date. R. Frater (CSIRO, Australia) explained the design principles of the asynchronous correlator system being developed in Australia by J. Ables with a view to using it in the planned Australian Synthesis Telescope. J. O'Sullivan (Netherlands) reviewed the design of the extension to the Dwingeloo Spectral Line Correlator, and outlined progress. B. Oliver (USA) explained the operation of the "Million-channel Spectrometer" being developed in the USA at Stanford. F. Biraud (Meudon, France) reported on the eight-level correlator system being constructed for the Nançay radio telescope. P. Dewdney (Canada) presented some ideas on the configuration of cross-correlator systems, in aperture synthesis telescopes, leading to simplified design and sampling rates slower than the Nyquist rate.

Discussion also took place on the following topics :

- Progress which other institutions have made using the VLA correlator integrated circuits. Apparently they have not been available long enough for anyone to finish building a complete system with them.
- (2) Calibration of correlators; elimination of bad channels and interference.

- (3) Possible dynamic range problems in the pre-filtering part of the Millionchannel Spectrometer.
- (4) Bandwith limits to digital correlator systems were discussed, especially in relation to the acousto-optical system.

Session BJ.1 was organised jointly by Commissions B and J, and dealt with recent developments of new antennas. The first few speakers reviewed progress in the last three years in the design or building of large new antennas and systems. The VLA in New Mexico is more than half-completed. The use of antennas separated by distances of several thousand kilometres as interferometer pairs has developed to the point where source structure in the milli-arcsecond range can be mapped. At millimetre wavelengths several antennas have operated for some years, some as interferometer pairs and some as single dishes. Plans are being made for future antennas and arrays at these wavelengths. The final paper described the measurement of the shape of a 25 metre antenna by a radio-holographic method; a technique which shows considerable promise for the future. The Session was a very successful one and about 150 persons attended.

Session J.7 dealt with recent developments in antennas for radioastronomy. The papers had been chosen by the session organisers from the contributions offered. Several antenna experts from outside Commission J attended the Session. The main topics were millimetre-wave telescopes and synthesis interferometers. Most impressive was the achievement of a 25 μ m accuracy for a 10 m antenna by CalTech. Japan has just started the construction of a national facility comprising a 45 m dish for use from 1 to 100 GHz, and a two-dimensional synthesis array with five 10 m antennas for the range 22-150 GHz.

The new Onsala 20 m mm-telescope operates beyond specifications, while the improved inner 17 m section of the Parkes telescope makes it the most powerful mm-telescope in the southern hemisphere; it is useful up to 90 GHz. The Jodrell Bank 4-element (to be extended to 6-element) radio link interferometer will close the gap in resolution between VLA and VLBI systems. The Ooty Synthesis Telescope at 327 MHz and the modified fan-beam synthesis Molonglo instrument (843 MHz) will add powerful mapping capabilities for galaxies, especially in the southern hemisphere. There is still progress, albeit slow, in feeds and, in particular, in their polarisation characteristics. At Bonn, powerful methods and software packages have been developed to improve the mapping capabilities of a single dish in the presence of atmospheric disturbances and/or antenna side-lobes.

Session J.8 was devoted to radio and radar observations of the sun and planets. M. Pick (Observatoire de Paris) reviewed (a) the effects of coronal holes and arches on our understanding of the radio emission from the sun; (b) the recent high resolution observations which have been made with the Westerbork synthesis array, and (c) the uses to which bursts are being put in probing the corona and interplanetary medium. M. Kundu (Univ. of Maryland) and K. Kawabata (Univ. of Nagoya) elaborated on the high resolution work, while K. Sheridan (CSIRO) discussed recent work being done at Culgoora. The current state of our knowledge of the inner and outer planets obtained from radio observations was reviewed by D. Muhleman (CalTech) and S. Gulkis (JPL), while I. de Pater (Leiden Observatory) discussed her very nice observations of the radiation belts of Jupiter using the Westerbork array. D. Campbell (NAIC) and R. Jurgens (JPL) described the recent observations of the rings of Saturn, the Galilean satellites of Jupiter, and Venus. E. Gerard (Observatoire de Paris) gave a brief description of recent measurements of OH in comets.

Session J.9 was devoted to spectral line investigations. Apart from the traditional HI (21 cm) and HIT recombination lines, in the last 10 years molecular line studies have revolutionised our understanding of the interstellar medium, because of their unique ability (in the microwave spectral region) to probe the previously unknown dense component. Molecular line studies have inspired three main areas of research : (a) galactic structure, (b) the physical properties and evolution of dense interstellar clouds, (c) the "new" subject of astrochemistry. These areas were addressed by review speakers.

W. B. Burton (USA) summarised the galactic distribution of HI and CO showing, in particular, how the molecular species are found predominantly in a "ring" between galactocentric radii 4 and 8 kpc : very different from the flatter HI distribution. The galactic centre is now believed to contain a rotating, expanding, tilted disk, as revealed in a complementary way by CO and HI together.

The physics of interstellar clouds was reviewed by P. J. Encrenaz (France). Such clouds range from small ones ($\sim 100 \text{ M}_0$) to "giant" clouds ($\sim 10^6 \text{ M}_0$), and may or may not contain hot regions which signal the existence of embedded young stars or protostars. Temperatures range from 10K to 100K (hot spots) and densities from $\sim 10^2$ to $10^9/\text{cm}^3$. Clouds do not generally rotate perceptibly, nor collapse at anything approaching free-fall rates, despite greatly exceeding the Jeans gravitational instability criterion. Magnetic fields are generally believed, in some way, to prevent rapid collapse.

The specific study of condensed regions in interstellar clouds which are forming stars was reviewed by B. Zuckerman (USA) who traced the evolution of such regions from the starting point where, for massive stars, collapse is triggered by external pressures from other hot nearby stars, supernova remnants, gravitational density waves, etc. The relation of molecular masers, compact IR and HII sources in relation to the protostellar objects, was discussed. At the opposite end of the stellar evolutionary pattern, molecular studies of carbon stars, planetary nebulae, and intermediate types of object, have revealed a possible evolutionary path for evolved N-type super-giants, on the giant branch of the Hertzsprung-Russell diagram, to planetary nebulae. It appears that the carbon-rich evolved stars which have been studied via CO and other molecular species, do indeed evolve to planetary nebulae, leaving other types of evolved stars (O-rich Miras?) to evolve via the supernova route.

These major areas of research were complemented by short papers on various other topics. The local HI distribution is becoming better understood as a result of the study of several hundred absorption line sources by the Nançay telescope. M31 has been newly studied in both HI (synthesis studies in Penticton) and CO. H109 α recombination line studies by the Westerbork Synthesis Telescope appear to reveal pressure-broadening in the lines more convincingly than before. Various specific observations of HCN and HCO⁺ both at Onsala and in Japan have shown new details in sources as wide ranging as Sgr A in the galactic centre, and Orion A locally. Finally, studies of the time variability of both OH (Illinois) and SiO (Japan) masers in Mira-type stars are providing new insights into the dynamics of the circumstellar dust shells of these stars.
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RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

UC.1. — MODIFICATIONS TO STATUTES (GENERAL ASSEMBLY)

The URSI Council,

considering Res. C.1 (Item 10) adopted at the XVIIth General Assembly of URSI;

resolves to make the following modifications to the Statutes :

Art. 53(b) : Delete "and Scientific";

Art. 53 : Add "(e) Scientific Meetings of the Commissions, and Symposia";

Art. 54(f): *Delete* existing text, and substitute the following "Repre-"sentatives invited in accordance with Art. 56";

Art. 55 : *Delete* existing text and substitute the following "Scientific "Meetings of Commissions, and Symposia, are open to all scientists "(including students) who have registered as participants at the beginning "of the General Assembly. The total number of registrants may be restric-"ted by the host Committee so that the meeting can be accommodated "within the facilities available";

Art. 56 : *Delete* existing text and substitute the following "The President "of the Union can invite representatives nominated by international orga-"nisations to attend the General Assembly as observers".

UC.2. — MODIFICATIONS TO STATUTES (MEMBERSHIP)

The URSI Council,

considering

(a) that membership of URSI is at present restricted to Committees formed in territories that already adhere to the International Council of Scientific Unions;

(b) that the Board of Officers has proposed the removal of this restriction; resolves to amend Art. 4 of the Statutes to read as follows :

"Art. 4. — The Union can admit to membership a Committee in any "territory in which there is an interest in radio science".

UC.3. — STANDING FINANCE COMMITTEE

The URSI Council,

considering that it would be helpful to the Treasurer if he could consult a Standing Finance Committee when it seemed desirable to do so;

resolves to amend Art. 62(g) of the Statutes to read as follows :

"Art. 62(g) to appoint a Standing Finance Committee charged with

- "(i) the preparation of a report on the accounts for the period since the last Ordinary General Assembly and the budget for the period until the next Ordinary General Assembly,
- "(ii) the submission of recommendations concerning the finances of the Union,
- "(iii) the provision of assistance to the Treasurer, when so requested "by him, to review the financial affairs of the Union during the
- " period until the next Ordinary General Assembly".

UC.4. — COORDINATION OF THE SCIENTIFIC PROGRAMME OF URSI

The URSI Council,

considering the desirability of effecting some measure of coordination between scientific meetings and symposia organised by URSI Commissions;

recommends

1. that a group of Board members, acting in full consultation with Commission Chairmen, be given responsibility for the overall coordination of the scientific programme at General Assemblies, and for the oversight of proposals made by Commissions for symposia to be held between Assemblies;

2. that, at the present Assembly, the nominated group of Board members shall meet with the Commission Chairmen and Vice-Chairmen

(i) to work out an agreed framework for the overall scientific programme at the next General Assembly, (ii) to discuss and agree upon a timetable, extending from now until 3 months before the next General Assembly, for the preparation and issue of the scientific programme for the next General Assembly;

3. that each Commission be invited to propose one topic, in its field, which it considered would be of especial interest to the Assembly as a whole;

4. that, during the Assembly, one day at most be set aside for the presentation of some or all of the proposed topics.

UC.5. — APPROVAL OF AUDITED ACCOUNTS 1975-1977

The URSI Council,

noting the Report of the Finance Committee dated 3 August 1978;

resolves to approve the audited accounts of URSI for the years ended 31 December 1975, 1976 and 1977.

UC.6. — UNIT ANNUAL CONTRIBUTIONS AND BUDGET 1979-1981

The URSI Council,

considering

(a) that the Finance Committee has reported that the level of activity of URSI has fallen by about 10 % since 1969;

(b) that it is desirable that this level be restored;

(c) that it will be desirable to convene the Coordinating Committee before the Assembly in 1981;

resolves

1. to approve the Income and Expenditure Budgets contained in Table 2 of the Finance Committee Report;

2. to adopt the unit contributions referred to as Income Model E in Table 2, namely :

1979	US\$400
1980	US\$460
1981	US\$520.

UC.7. — URSI PUBLICATIONS

The URSI Council,

noting the recommendations made by the Publications Committee;

recommends

1. that the URSI Information Bulletin continue to be published in its present form, that the December issue in each year should take the form of an URSI Yearbook, and that a copy of the September 1978 issue be sent to all registered participants at the XIXth General Assembly;

2. that a new edition of the URSI Brochure be prepared and widely circulated;

3. that the *INAG Bulletin* (fonospheric Network Advisory Group) be continued and that the Treasurer be invited to consider an increase in the annual grant to the National Oceanic and Atmospheric Administration (NOAA);

4. that consideration be given to the possible need for a Supplement to the *International Reference Ionosphere 1978* containing a set of typical profiles;

5. that the *Proceedings of URSI General Assemblies*, Vol. XVIII be published in the same format as Vol. XVII;

6. that, in accordance with the views expressed by the Board of Officers, URSI should not consider launching an URSI journal covering the same ground as *Radio Science*;

7. that *Review of Radio Science 1978-80* be published in 1981, with Prof. Bowhill as General Editor, and that the efforts be followed up and expanded to increase the number of copies sold in 1980-81.

UC.8. — Admission of Ireland

The URSI Council,

considering

(a) that the Royal Irish Academy in the Republic of Ireland has applied for membership of URSI in Category 1;

(b) that the clause in the Statutes of URSI which restricted membership to territories that already adhere to the International Council of Scientific Unions has been deleted; *resolves* to admit to membership of URSI, in Category 1, the Committee which will be formed under the auspices of the Royal Irish Academy.

UC.9. — Admission of Egypt

The URSI Council,

considering that in 1975 the Board of Officers admitted, to membership of URSI in Category 1, the Academy of Scientific Research and Technology in Cairo, Arab Republic of Egypt, under the authority given to it by the XVIth General Assembly in 1969 (Ottawa, Resolution 4);

resolves to give its formal approval to the action of the Board of Officers.

UC.10. — Application for Membership from Indonesia

The URSI Council,

considering

(a) that a provisional application for membership has been received from the Indonesian Institute for Space Research in Bandung;

(b) that the body which coordinates scientific research in Indonesia is the Institute of Sciences in Jakarta;

(c) that the Secretary General has invited the Institute for Space Research to consult the Institute of Sciences;

resolves to authorise the Board of Officers

1. to consider the second application for membership which, it is expected, will be received from one of these Institutes;

2. to admit Indonesia to membership if the application is satisfactory.

UC.11. — TITLE OF COMMISSION E

The URSI Council,

considering that Commission E has recommended a change in its title;

resolves to change the title of Commission E to :

Electromagnetic Noise and Interference.

UC.12. — Election of Vice-Chairmen of Commissions

The URSI Council,

considering

(a) that there is no statutory procedure for the selection of candidates for election as Vice-Chairmen of Commissions;

(b) that it would be preferable if the names of the candidates were known some time before the beginning of each Assembly (See Rec. A.8);

resolves to ask the Board of Officers

1. to investigate the possibility of introducing a standardised procedure for the selection of candidates;

2. to notify the Chairmen of Commissions, in good time, of the procedure to be adopted in preparing for the Assembly in 1981.

UC.13. — DESIGNATION OF HONORARY PRESIDENTS

The URSI Council,

considering that it is authorised to confer the title of Honorary President on former members of the Board of Officers and Chairmen of Commissions who have made notable contributions to the achievement of the objects of the Union;

resolves to confer the title of Honorary President on :

Prof. H. G. Booker (Chairman Commission IV 1966-1969, Vice-President of URSI 1969-1975), and

Prof. W. Dieminger (Vice-President of URSI 1963-1969, President 1969-1972)

in view of the valuable services they have given to the Union.

UC.14. — Standing Committee on URSI General Assemblies

The URSI Council,

considering

(a) that an invitation to hold the XXIth URSI Assembly in Bulgaria in 1984 has been received;

(b) that it is desirable to investigate other possible invitations for the URSI Assemblies in 1984 and 1987;

resolves

1. to maintain the Standing Committee on Future Assemblies with the following members :

Prof. A. Smolinski (Chairman, Poland),Dr. J. L. Locke (Canada),Prof. S. Lundquist (Sweden),Prof. V. A. Padula-Pintos (Argentina);

2. to ask the Committee to continue its work and to present a report, in time for consideration at the XX Assembly in 1981, on invitations received for the Assemblies in 1984 and 1987;

3. to thank the Bulgarian URSI Committee for its invitation.

UC.15. — STANDING COMMITTEE ON URSI MEMBERSHIP

The URSI Council,

considering that it is desirable to encourage the adherence of new Member Committees to URSI;

resolves

1. to maintain the Standing Committee on Membership with the following members :

Dr. A. P. Mitra (Chairman, representing the Board of Officers),
Prof. V. V. Migulin (USSR, Past Chairman),
Prof. O. Awe (Nigeria) : Africa,
Prof. K. Géher (Hungary) : Europe,
Dr. A. A. Giesecke (Peru) : Latin America,
Prof. S. Okamura (Japan) : Asia;

2. to confirm the terms of reference of the Committee, namely : to propose ways of bringing URSI to the attention of radio scientists in territories which have not yet decided to adhere to URSI and to send its recommendations to the URSI Board of Officers.

UC.16. — URSI-CCIR-CCITT LIAISON COMMITTEE

The URSI Council,

considering

(a) that, in response to Lima Resolution C.8, the URSI-CCIR-CCITT Liaison Committee was formed in 1977;

(b) that it is desirable to maintain and strengthen the links between URSI and the Consultative Committees of the ITU;

recommends

1. that the Liaison Committee be maintained;

2. that it submit recommendations for further improving cooperation between URSI and ITU to the Board of Officers.

UC.17. — 60th Anniversary of URSI

The URSI Council,

considering

(a) the preliminary steps taken by Prof. Hontoy, at the request of the Board of Officers, to arrange a meeting of about 2 days in Brussels in 1979 to mark the 60th Anniversary of the creation of URSI;

(b) the support given to the proposed meeting by the Belgian URSI Committee, and by a small working group which met in Helsinki;

recommends

1. that the planning of the Anniversary Meeting should be continued in consultation with the Board of Officers and a Programme Committee to be appointed by the Board;

2. that the cost to URSI of the event should be limited to 10% of the budget allocation for scientific activities in 1979;

3. that the Member Committees of URSI be invited

- (i) to submit the names of distinguished radio scientists who might agree to be speakers at the meeting;
- (ii) to send representatives to the meeting.

UC.18. — REMOTE SENSING USING RADIO WAVES

The URSI Council,

considering

(a) that remote sensing of the Earth includes the use of earth-pointing sensors (for example, in satellites and aircraft) designed to receive radiation emitted, reflected or scattered by the land and water surfaces of the Earth;

(b) that remote sensing techniques are of increasing importance in studies of Earth resources and their conservation, environmental pollution, etc.;

(c) that the basic physics of remote sensing, and the applications of information theory and mathematical techniques to image processing are appropriate topics for study in URSI;

(d) that the URSI Committee in the United Kingdom has proposed the formation of an URSI Commission on Remote Sensing using Radio Waves;

(e) that several URSI Commissions are already interested in particular aspects of remote sensing and are, at present, opposed to the formation of a single Commission to deal with this subject;

resolves

1. to defer any decision on the formation of an URSI Commission on Remote Sensing;

2. to ask the Board of Officers to establish, as quickly as possible, a Working Group, consisting of representatives of the interested Commissions, which should consider the possibility of organising an URSI Symposium on some aspect of remote sensing.

UC.19. — MIDDLE ATMOSPHERE PROGRAMME AND STATUS OF SCOSTEP

The URSI Council,

considering

(a) that the ICSU Special Committee for Solar Terrestrial Physics (SCOSTEP) has proposed the Middle Atmosphere Programme (MAP) as an international cooperative enterprise during the period 1982-1985;

(b) that the planning and coordination of the MAP would require a central organising committee consisting of specialists in middle atmosphere physics;

(c) that if the MAP is accepted as an ICSU enterprise, it would be administratively simpler to modify the terms of reference and the structure of SCOSTEP, rather than to create a new ICSU Committee for MAP;

(d) that solar-terrestrial physics is widely regarded as a field in which it is desirable to ensure the long-term international coordination of routine observations and of inter-disciplinary projects, such as the MAP and those already coordinated by SCOSTEP;

(e) that SCOSTEP will terminate in December 1980 unless ICSU decides otherwise;

recommends

1. the recognition of MAP as an ICSU enterprise provided that a sufficient number of Academies of Science agree to participate actively in the scientific programme and to provide the funds that would be necessary for the support of the central organising committee, at least until 1985;

2. that the status of SCOSTEP be changed from that of a Special to that of a Scientific Committee of ICSU, provided that a sufficient number of Academies of Science agree to provide the funds required for the support of the Committee over a possible period of several decades;

3. that the membership of SCOSTEP be revised as and when required in the light of the needs of the MAP and subsequent projects.

UC.20. — URSI AND THE DEVELOPING COUNTRIES

The URSI Council,

considering

(a) that it is desirable to inform scientists and governmental bodies in developing countries about the activities of URSI, and to encourage their participation in these;

(b) that an attempt should be made to assess the difficulties affecting radio science in developing countries and to recommend appropriate solutions;

recommends

1. that URSI should consider sending suitable scientists on visits to developing countries in order to attain the above objectives;

2. that financial support from UNESCO should be sought for such visits;

3. that the Treasurer should consider the re-establishment of the URSI Young Scientists Scheme so as to permit young research scientists from developing countries to attend URSI meetings.

UC.21. — XX GENERAL ASSEMBLY OF URSI

The URSI Council,

considering

(a) the invitations received from the Member Committees in India and the USA for the XXth General Assembly of the Union;

(b) the results of the ballot;

resolves

1. to accept the invitation of the URSI Committee in the USA to hold the XX General Assembly in Washington D.C. in 1981;

2. to express to these two Committees its appreciation of their kind invitations.

UC.22. — UNESCO (VOTE OF THANKS)

The URSI Council,

considering that the annual subvention received from UNESCO, through ICSU, represents a valuable addition to the support provided by Member Committees for the scientific activities of URSI, in particular for the organisation of international scientific symposia and other meetings of scientists, and for the issue of URSI publications;

resolves to convey to UNESCO the thanks and appreciation of the Union for these subventions.

UC.23. — URSI COMMITTEE IN FINLAND (VOTE OF THANKS)

The URSI Council,

noting

(a) the excellent facilities provided in the Helsinki University of Technology at Otaniemi for the scientific and administrative sessions of the XIXth General Assembly of URSI, and the Open Symposia associated with it;

(b) the hospitality shown to the participants and their families during the Assembly;

resolves to offer its warmest thanks

1. to the URSI Committee for the invitation to hold the Assembly in Helsinki and to the Organising Committee for its detailed preparatory work which ensured the success of the Assembly;

2. to the members of the Finnish Ladies' Committee whose welcome was greatly appreciated by those who accompanied the participants.

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RESOLUTIONS AND RECOMMENDATIONS OF COMMISSIONS

COMMISSION A ELECTROMAGNETIC METROLOGY

A.1. — FREQUENCY STANDARDS

Commission A,

considering

(a) the need to measure frequencies, including optical frequencies, with reference to the second, the unit of time in the SI;

(b) the necessity for a new definition of the metre, the unit of length in the SI;

(c) the feasibility of a "unified standard of length and time" based on a fixed value for the speed of light (see URSI Rec. I/VII.1, Warsaw, 1972);

recommends

1. that the study and the development of frequency standards in all frequency ranges be encouraged;

2. that the necessary support be given to the development of methods permitting the measurement of all relevant frequencies with an accuracy which primary time and frequency standards are capable of attaining.

A.2. — PRIMARY CAESIUM FREQUENCY STANDARDS

Commission A,

considering

(a) that the second, a base unit of the International System of Units (SI), is realized by primary caesium frequency standards;

(b) that the scale unit of TAI (International Atomic Time) needs to be determined regularly with primary caesium frequency standards, and that it must be kept as closely as possible in agreement with the second;

(c) that the accuracy of both the TAI scale unit and the second, as realized, needs further improvement;

(d) that the definition of the second in terms of caesium is likely to continue in the foreseeable future;

(e) that only a very small number of primary frequency standards exists;

recommends

1. that work on primary caesium frequency standards continue as an important metrological effort including studies on fundamental improvements and continuous clock operation;

2. that such efforts be taken up by more laboratories.

A.3. — CONFERENCES ON TIME AND FREQUENCY

Commission A,

considering

(a) that the main concern in establishing the Working Group on Frequency and Time Metrology at the XVIIIth General Assembly was the great number of conferences dealing with Time and Frequency (T & F), and that this concern still exists;

(b) that these conferences appear to lack coordination in programme and/or scheduling;

(c) that URSI itself has been a sponsor and co-sponsor of two such conferences in 1978 (CPEM in June and the Open Symposium on T & F in August);

(d) that some such conferences have T & F as their sole subject and purpose (e.g. the International Conference on Chronometry, Symposia organized by IAU Commission 31, the Annual Symposium on Frequency Control, the Annual Strategic Planning Meeting on Precise Time and Time Interval (PTTI), and some special purpose meetings such as symposia on frequency standards and metrology) and that other conferences have T & F as part of a wider programme (e.g. CPEM, IEEE meeting on navigation, etc.);

(e) that the metrological aspects of (atomic) time and frequency are an important concern of URSI Commission A;

recognizing

(f) that there exist distinctly different needs in the T & F community for tutorial, engineering and advanced scientific papers to serve applica-

tions, engineering and specific metrological and fundamental physics interests;

(g) that while most existing conferences appear to be aimed at different needs, their declared goals and purposes are often not sufficiently articulated;

recommends

1. that conferences dealing with T & F clarify their goals as much as possible to avoid unnecessary overlap in their programmes and conflicting schedules;

2. that URSI co-sponsorship be offered to some such conferences as a valuable aid in attracting international visitors so as to make the attendance complete and to achieve comprehensive T & F meetings;

3. that the level and quality of these conferences be improved and their frequency decreased, whenever possible, so as to avoid the proliferation of largely repetitive papers;

4. that URSI officials and URSI Member Committees connected with the above named conferences make continuing efforts to bring this recommendation to the attention of the organizers of T & F meetings.

A.4. — Use of the International System of Units

Commission A,

considering

(a) that the International System of Units (SI) is not always used in all branches of radio science (for example in those that deal with the upper atmosphere, magnetic materials, and radio oceanography);

(b) that interdisciplinary communication could be considerably improved by the general use of SI units;

reaffirms Recommendation 1.1 of the XVth General Assembly of URSI (Munich, 1966);

recommends

1. the broadest acceptance and use of SI as adopted by the General Conference of Weights and Measures (CGPM) and as most recently published in 1977 by the Bureau International des Poids et Mesures (BIPM) in the third edition of "Le Système International d'Unités";

2. that, at all levels of the educational systems, the necessary education be provided to make the SI units generally known.

A.5. — NATIONAL STANDARDS LABORATORIES

Commission A,

considering

(a) that a revised edition of the URSI Register of National Standards Laboratories, compiled by Mr. A. E. Bailey's Working Group on National Standards Laboratories, was issued in July 1978;

(b) that the Register is considered to be a useful document and that it is of special value in the developing countries;

(c) that the data contained in the Register have been transferred to a computer for retrieval and updating as required;

recommends

1. that the Working Group on National Standards Laboratories be reconstituted under the chairmanship of Mr. Bailey;

2. that a further revised edition of the Register should be issued by URSI in due course.

A.6. — Working Group on Measurements relating to the Interaction of Electromagnetic Fields with Biological Systems

Commission A,

considering

(a) the general interest in the biological effects of electromagnetic radiation, and URSI's interest in this interdisciplinary topic;

(b) the prior URSI efforts in this area, especially within the US National Committee of URSI, and the recent international symposia;

(c) the need for the cooperation of physical scientists with biomedical organisations and scientists;

resolves

1. to maintain the Working Group on Measurements relating to the Interaction of Electromagnetic Fields with Biological Systems (Chairman : Prof. S. Rosenthal);

2. to ask the Working Group to continue its efforts towards

 (i) exploring and planning possible symposia that stress the measurement aspects of the interaction between electromagnetic radiation and biological systems;

- (ii) interfacing with other interested organisations in the development of such symposia;
- (iii) giving its active support to international organisations concerned with the health and safety aspects of the electromagnetic radiation environment.

A.7. — Symposium on Measurements in Telecommunications

Commission A,

considering

(a) the great success of the URSI Symposium on Measurements in Telecommunications (Lannion, France, 3-7 October 1977), organised by CNET in cooperation with the French URSI Committee, and sponsored by URSI Commissions A, C and E;

(b) the discussions in Lannion in 1977, and during the URSI Assembly in 1978, which led to the conclusion that a similar symposium should be held in the foreseeable future;

recommends

1. that Commissions A, C, D and E sponsor a Second Symposium on Measurements in Telecommunications to be held between the XIXth and XXth General Assemblies of URSI;

2. that CCIR and CCITT be invited to cooperate in planning the Symposium;

3. that decisions on the date, location, programme committee, sponsorship, etc. be taken by a Coordinating Committee consisting of Prof. S. Okamura (Chairman), Drs H. M. Altschuler, W. G. Farnell, G. Hagn, J. Le Mézec and V. Zima and submitted to the URSI Board of Officers.

A.8. — VICE-CHAIRMEN OF URSI COMMISSIONS

Commission A,

considering

(a) that URSI Commission Chairmen play a dominant rôle in shaping the activities of their Commissions;

(b) that, in most instances, Commission Vice-Chairmen are the future Chairmen of their Commissions;

(c) the consequent importance of careful discussion by the various Member Committees of URSI of the qualifications of candidates for the Commission Vice-Chairmanships;

recommends to the URSI Council that Member Committees be informed by the URSI Secretariat, at least three months before the beginning of a General Assembly, of all candidates for Vice-Chairmen of the Commissions.

COMMISSION B FIELDS AND WAVES

B.1. — URSI Symposium on Electromagnetic Wave Theory

Commission B,

considering

(a) that URSI Symposia on Electromagnetic Wave Theory have been held at intervals of three years in a series beginning in 1953;

(b) that these Symposia are major events which represent the main effort of Commission B between Assemblies;

resolves that the invitation to hold the next Symposium in this series in Munich (Germany, Fed. Rep.) be accepted.

B.2. — WORKING GROUPS

Commission B,

considering the probable need for Working Groups on (i) mm-wave and optical techniques; (ii) unified techniques for electromagnetism (including optics) and for acoustics;

resolves that the launching of these two Groups should occur only after prudent preparation and an exploration of the degree of actual interest and the available human resources. — 127 —

COMMISSION C SIGNALS AND SYSTEMS

C.1. — PROGRAMME FOR XXth GENERAL ASSEMBLY (1981)

Commission C,

considering the structure of the scientific sessions held in association with the XIXth General Assembly of URSI in 1978;

recommends

1. that, for the 1981 Assembly, the emphasis should be on survey papers, presented by invited speakers, rather than those dealing with specialised topics of limited interest;

2. that consideration should be given to one of the following as a subject of general interest at the 1981 Assembly :

- multiple-access communication,
- signal processing,
- satellite and computer communication,
- non-linear circuits and systems.

C.2. — FUTURE Symposia

Commission C,

considering that the Commission can best contribute to international activities in its field by cooperating with those organisations which organise Symposia having an international character;

recommends

- 1. that the Commission should participate in :
 - 1.1. International Symposium on Circuits and Systems (IEEE), Tokyo, Japan, 1979;
 - 1.2. International Conference on Communications, Boston, USA, June 1979;
- 2. that URSI sponsorship of the following symposia be considered :
 - 2.1. Information Theory, Tbilisi, USSR, June 1979;
 - 2.2. Network Theory, Bled, Yugoslavia, September 1979;
 - 2.3. Digital Systems (Seminar), Zurich, Switzerland, 1980;

- 2.4. Circuit Theory, Prague, Czechoslovakia, July 1980;
- 2.5. Performance of Computer Communication and Telegraphic Systems, Paris, France, May 1980.

COMMISSION D PHYSICAL ELECTRONICS

D.1. — RÔLE OF COMMISSION D

Commission D,

considering

(a) that the URSI Assembly is not a natural forum for research workers in the field of Commission D to meet or to present new results;

(b) that the rôle of Commission D is an educational one : namely, that of providing the other Commissions with information on future electronic devices and systems that could make valuable contributions to radio science;

(c) that the Commission is unable to fulfil this rôle because the very full schedule of the Assembly prevents interested members of other Commissions from attending sessions of Commission D;

recommends

1. that the number of sessions at future URSI Assemblies should be limited to such an extent as not to discourage cross-fertilization between different disciplines;

2. that, in particular, Commission D should not be prevented from playing its educational rôle as a result of the approval of an overcrowded schedule of scientific sessions;

3. that Commission D should concentrate on the presentation of review papers at URSI Assemblies;

4. that consideration should be given to the following as topics of general interest at the 1981 Assembly :

- low-noise solid-state detectors and amplifiers;

- devices for fast signal processing.

D.2. — Optical Communications

Commission D,

considering the growing importance of optical communication systems;

recommends that URSI should cosponsor :

(1) the International Conference on Infra-red and Submillimeter Waves, Florida, USA, 1979;

(2) the International Conference on Integrated Optics and Optical Fibre Communication, Netherlands, 1979.

COMMISSION E ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1. — TITLE AND TERMS OF REFERENCE

Commission E,

recommends

1. that the URSI Council be invited to change the title of the Commission to : "Electromagnetic Noise and Interference";

2. that the subjects for study specified at the Lima Assembly in 1975 be retained :

- 2.1. natural and man-made sources of noise,
- 2.2. the composite noise environment,
- 2.3. the effects of noise on system performance,
- 2.4. the scientific basis for noise control,
- 2.5. scientific aspects of spectrum utilization;
- 3. that the Commission should continue to cooperate :
- with Commission A on noise metrology;
- with Commission C on the effects of noise on telecommunication system performance;
- with Commission J and others on the mitigation of the effects of electromagnetic interference on scientific experiments.

E.2. — FUTURE SYMPOSIA

Commission E,

recommends that contacts be established or maintained, as appropriate, with the organisers of the following symposia, with a view to offering URSI participation :

(1) Electromagnetic Compatibility, Rotterdam, 1-3 May 1979 (same sequence as Montreux 1977);

(2) Solar-terrestrial Predictions, Boulder, USA, April 1979 (primarily the sessions dealing with sudden enhancements of atmospherics);

(3) Lightning protection for electronic systems, Uppsala, Sweden, June 1979;

(4) Electromagnetic Compatibility (IEEE), Baltimore, USA, 1980;

(5) Measurements in Telecommunications (Commissions A and C).

E.3. — Working Groups on Man-made Noise and Natural Noise

Commission E,

considering

(a) that the Director of CCIR has referred various documents on manmade noise and natural noise to URSI for comment;

(b) that the Commission E Working Group on Man-made Noise, established in 1972, has been useful in the dissemination of information by correspondence and at meetings held during URSI Assemblies, and in the preparation of responses to CCIR;

resolves

1. to retain the Working Group on Man-made Noise, with Dr. A. D. Spaulding (USA) as Chairman;

2. to establish a Working Group on Natural Noise with Prof. S. Lundquist (Sweden) as Chairman.

COMMISSION F WAVE PHENOMENA IN NON-IONIZED MEDIA

F.1. — STRUCTURE OF URSI SCIENTIFIC PROGRAMME

Commission F,

recommends

1. that *at General Assemblies*, there should be one or more Open Symposia on scientific topics of major current interest, to be organised preferably in cooperation with other Commissions, and that one or more poster sessions be organised to deal with selected topics of interest to Commission F;

2. that, *between General Assemblies*, Commission F should organise one or more open international meetings on specialised topics of interest to Commission F;

3. that, for each event, the selection of papers should be the responsibility of an international programme committee.

F.2. — FUTURE SYMPOSIA

Commission F,

recommends that it should organise, or participate in, the following symposia :

(1) Satellite Sensing of the Ocean Surface (joint IUCRM/COSPAR Symposium), COSPAR Meeting, Hungary, June 1980;

(2) Effects of hydrometeors on telecommunication systems at frequencies above 1 GHz, (Commission F) Canada, June 1980 (provisional);

(3) Middle Atmosphere Programme (Commissions F and G), USA, Fall 1980;

(4) Radio science and the optimum use of the radio spectrum (Commissions B, C and F), URSI General Assembly, Washington D.C., 1981;

(5) Mathematical models of radio propagation (Commissions B and F), URSI General Assembly, Washington, D.C., 1981;

(6) Signature problems in remote sensing of the surface of the Earth and the troposphere (Commission F), Kansas, USA, 1980 or 1981.

F.3. — INTER-UNION COMMISSION ON RADIO METEOROLOGY (IUCRM)

Commission F,

expresses the opinion that the subject of radio-oceanography has obtained broad international recognition and that IUCRM covers this field sufficiently well for the present;

recommends

1. that IUCRM should organise a Symposium on Sea-air interaction and its effect on the propagation of electromagnetic radiation (in 1979);

2. that IUCRM should cooperate with COSPAR in organising the Symposium on Satellite sensing of the ocean surface, Hungary, June 1980;

3. that the URSI representatives in IUCRM for the next three years shall be as follows : J. R. Apel (USA), R. Crane (USA), P. Gudmandsen (Denmark), Ya. Melnichuk (USSR), G. Valenzuela (USA), S. Wickerts (Sweden).

F.4. — WORKING GROUPS

Commission F,

considering the request from CCIR Study Group 5 for advice on :

A. The anomalous absorption of water vapour in the windows between absorption lines in the region from 22 GHz to several hundred GHz;

B. Scattering, attenuation and cross-polarization by precipitation, particularly by rain, and the provision of information, on a world-wide basis, on basic research relating to the structure of rainstorms (drop shapes, dropsize distribution, and concentration as a function of height and lateral spread within a storm) and their radio characteristics;

resolves

1. to create two Working Groups to study the above-mentioned questions :

- A. Water Vapour (Coordinator : P. Delogne, Belgium),
- B. Precipitation (Coordinator : F. Fedi, Italy);
- 2. to request these Working Groups
 - 2.1. to prepare preliminary reports, by November 1978, including : the state of the art, the most important remaining gaps in our knowledge, suggestions for active research;

2.2. to prepare a report for submission by Commission F to CCIR Study Group 5 in 1980-1981.

FG.1. — MIDDLE ATMOSPHERE PROGRAMME (MAP)

Commissions F and G,

considering

(a) that processes occurring in the middle atmosphere strongly influence radiocommunications at frequencies from VLF to HF;

(b) that many different radio techniques are used in making *in situ* and remote observations of the middle atmosphere;

recommend

1. that URSI support the adoption by ICSU of the MAP;

2. that an URSI Coordinating Committee for MAP be formed, with representatives from Commissions F and G, to coordinate the participation of radio scientists in MAP $(^1)$;

3. that two URSI representatives be designated in the MAP Steering Committee to be formed by SCOSTEP, as in the present interim MAP Steering Committee.

COMMISSION G IONOSPHERIC RADIO AND PROPAGATION

G.1. — WORLD NETWORK OF IONOSONDES

Commission G,

considering

(a) that modern communication and navigational systems, even when using UHF, require information from ionosondes on the structure and variability of the ionosphere;

^{(&}lt;sup>1</sup>) The representatives of Commission F will be selected from the following : R. Crane (USA), I. Revah (France), L. Thomas (UK), S. Westerlund (Sweden), T. Van Zandt (USA).

(b) that the ionosondes now in operation also make important contributions to studies of upper atmospheric physics on a global scale, and to the description of the terrestrial environment now needed in multidisciplinary scientific projects;

(c) that vertical incidence ionospheric sounding stations are established and maintained mainly in support of national research programmes and radiocommunication services;

(d) that the closing of existing stations can materially affect the value of the contributions made by the network to international science and radio communications;

(e) that the advanced ionospheric sounders that have been available for a few years are enabling important advances to be made in ionospheric research;

recommends

1. that national administrations responsible for the maintenance of ionosondes be invited to bear in mind the contributions which their stations make to the advancement of science at international level, and to the needs of the International Telecommunication Union;

2. that any changes in the present world network of ionosondes should, as far as possible, take into account the basic criteria given in the Annex to this Resolution;

3. that national administrations should be invited to consult the Ionospheric Network Advisory Group (INAG) of the International Union of Radio Science before making any changes in the status of existing stations;

4. that national administrations, when considering the replacement of equipment approaching obsolescence, consider the advantages of replacing that equipment by advanced digital instrumentation.

ANNEX

Ionosonde stations that satisfy one or more of the following criteria are especially valuable :

- (a) those that have an unbroken run of good-quality data extending over some decades, particularly in view of their potential use for monitoring long-term and man-made changes;
- (b) those forming part of "chains" generally north-south, which can be used to study the propagation and development of large-scale geophysical disturbances;

- (c) those in geophysically interesting regions such as the polar cap, the auroral zone, and the vicinity of the magnetic equator;
- (d) those that are remote from other stations, are magnetically conjugate to other stations, or are in the Southern Hemisphere;
- (e) those operated in conjunction with well-instrumented geophysical observatories and special research facilities;
- (f) those forming part of a regional group of stations providing data for specific aeronomic or propagation research.

G.2. — SUPPORT FOR IUWDS

Commission G,

recognising

(a) that the International Ursigram and World Days Service (IUWDS) has rendered valuable service to the scientific community in URSI during coordinated programmes such as the IG¥, IQSY and the IMS;

(b) that the services provided by the IUWDS are relevant to the activities of at least three Commissions (F, G and J);

(c) that these services will be particularly important for imminent programmes such as MAP;

(d) that the IUWDS activities include the prompt reporting of the geophysical and solar events that will be relatively frequent during the next few years;

recommends that URSI should continue to support the activities of the IUWDS to the fullest extent possible.

G.3. — INAG BULLETIN

Commission G,

recognizing the important rôle of the *INAG Bulletin* (Ionospheric Network Advisory Group) in maintaining the world network of ionospheric stations, and the quality of the data acquired by the network;

appreciating the fact that some financial support for the Bulletin is provided by WDC-A and some national administrations; *recommends* that URSI continue to support the publication of the *Bulletin* for the next three years.

G.4. — Nomenclature for Middle Atmosphere Radars

Commission G,

noting that different names are used to describe the radar systems being developed to investigate the middle atmosphere in different parts of the world;

considering that confusion in the international scientific community would be avoided if equipments having broadly similar objectives were described by the same name;

recommends that the new radar devices for investigating the mesosphere, stratosphere and troposphere be described as "MST radars", and that radars capable of investigating only the stratosphere and troposphere be described as "ST radars".

G.5. — Importance of Mesosphere, Stratosphere, Troposphere (MST) Radars

Commission G,

considering

(a) that MST radars are yielding new and exciting results on the structure and dynamics of the mesosphere, stratosphere and troposphere;

(b) that observations made by MST radars will play a major rôle in the Middle Atmosphere Programme;

recommends that the attention of national administrations be drawn to the importance of this new technique and to the desirability of installing MST radars in different parts of the world.

G.6. — Applications of Ionospheric Research to Telecommunications

Commission G,

considering that many of the experimental and theoretical techniques used by ionospheric radio scientists are relevant to various systems of telecommunications operating over a wide frequency range and including advanced satellite communication and navigation systems;

recommends that studies of practical applications of these techniques should be encouraged when radio research programmes in universities or other institutions are being planned.

G.7. -- Incoherent Scatter System in the Southern Hemisphere

Commission G,

considering

(a) that great advances in our knowledge of the atmosphere have resulted from the use of incoherent scatter systems;

(b) that no facility of this type exists south of the magnetic equator;

resolves to create a Panel to investigate the feasibility of establishing an international incoherent scatter facility in Antarctica or at middle latitudes in the Southern Hemisphere.

G.8.— WORKING GROUPS

Commission G,

recommends that the following Working Groups be constituted or reconstituted, as appropriate, within Commission G :

- G.1. Ionospheric Network Advisory Group (INAG). Chairman : W. R. Piggott; Vice-Chairman : J. V. Lincoln.
- G.2. Software exchange in ionospheric research. Chairman : J. W. Wright.
- G.3. Southern Hemisphere Atmospheric Studies Group (SHASG). Co-Chairmen : J. A. Gledhill and S. Radicella.
- G.4. International Reference Ionosphere (IRI). Chairman : K. Rawer.
- G.5. Evaluation of analysis techniques in ionospheric research. Chairman : L. F. McNamara.
- G.6. Ionospheric knowledge needed to improve radio propagation systems. Chairman : C. M. Rush.

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- G.7. F2 layer mapping. Chairman : E. Neske.
- G.8. Incoherent scatter. Chairman : M. Baron; Vice-Chairman : M. Blanc.
- G.9. Abnormal ionospheric propagation. Chairman : D. G. Cole.
- G.10. International Digital Ionosonde Group (IDIG). Chairman : J. R. Dudeney; Vice-Chairmen : K. Bibl and J. W. Wright.
- G.11. Panel on Southern Hemisphere Incoherent Scatter Facility. Chairman : J. A. Gledhill.

G.9. — INTER-UNION WORKING GROUPS

Commission G,

recommends the continuation of the URSI-IUGG (IAGA) Inter-Union Working Groups on :

- (1) Structure and dynamics of the thermosphere, ionosphere and exosphere. Chairman : J. V. Evans;
- (2) Neutral and ion chemistry and solar fluxes. Chairman : L. Thomas; Vice-Chairman : A. D. Danilov.

COMMISSION H WAVES IN PLASMAS

H.1. — WORKING GROUPS

Commission H,

resolves to reconstitute only the following two Working Groups, which should work closely with Commissions C and G :

- Wave Analysis.
 Co-Chairmen : D. Jones and J. L. Lacoume;
- (2) Active Experiments. Chairman : C. T. Russell.

H.2. — INTER-UNION WORKING GROUPS

Commission H,

recommends the continuation of the URSI-IUGG (IAGA) Inter-Union Working Groups on :

- (1) Passive electromagnetic probing of the magnetosphere. Chairman : D. Carpenter;
- (2) *Wave instabilities in space plasmas.* Co-Chairmen to be designated later.

H.3. — FUTURE SYMPOSIA

Commission H,

recommends

- 1. that URSI should cosponsor the following events :
 - 1.1. 4th International Conference on Phenomena in Ionized Gases, Grenoble, France, July 1979;
 - 1.2. Joint Conference including : 4th Kiev International Conference on Plasma Theory and 4th International Congress on Waves and Instabilities in Plasmas, Nagoya, Japan, June 1980;
 - 1.3. URSI/IAGA Session on Non-linear Waves in Geophysical Plasmas, IUGG Assembly, Canberra, Australia, December 1979;

2. that Prof. F. W. Crawford represent URSI on the Programme Committees of 1.1 and 1.2;

3. that the URSI representative in 1.3 be designated later.

H.4. — XXth URSI Assembly : Scientific Programme

Commission H,

considering

(a) that non-linear electromagnetic theory is of fundamental scientific interest to at least Commissions B, D, F, G and H;

(b) that the launch of the space shuttle in 1980 will stimulate interest in active wave experiments in space;

(c) that EISCAT will become operational in 1980;

recommends the inclusion of symposia on the following topics in the programme for the XXth URSI General Assembly :

- Non-linear electromagnetic theory,
- Active wave experiments,
- The first results from EISCAT.

COMMISSION J RADIO ASTRONOMY

J.1. — THE URSI COMMISSIONS AND THE COUNCIL

Commission J,

considering

(a) that the contacts between the URSI Council and the Board of Officers on the one hand, and the Chairmen of Commissions on the other, are not as close as they ought to be;

(b) that it is desirable for the Commissions to be better informed about organisational and administrative matters, and for the Council to be fully informed about the opinions of the radio science community;

recommends

1. that positive steps should be taken to invite Commission Chairmen to attend meetings of the URSI Council, in accordance with Art. 21 of the Statutes;

2. that the Secretary General should ensure that all those decisions, made by the Board of Officers, that may affect the activities of the Commissions are communicated to the Chairmen and Vice-Chairmen of Commissions as quickly as possible.

J.2. — Organisation of URSI Symposia

Commission J,

considering that symposia on specialised topics should be organised preferably between General Assemblies;

recommends

1. that proposals for future Symposia be scrutinized promptly by the Board of Officers;

2. that, when a Symposium has been approved, the Commissions, through their Chairmen, be given the opportunity of co-sponsoring the event;

3. that participation by other Unions in URSI symposia be encouraged;

4. that financial support be provided by URSI (\$1,000-\$2,500) and that the host country also be invited to provide financial support;

5. that, between 1979 and 1981, a Symposium on "Millimetre-wave technology, especially as applied to radio astronomy" be organised by Commission J, preferably in collaboration with Commission D.

RÉSOLUTIONS ET RECOMMANDATIONS DU CONSEIL

UC.1. — MODIFICATIONS AUX STATUTS (ASSEMBLÉE GÉNÉRALE)

Le Conseil de l'URSI,

considérant la Résolution C.1 (Point 10) adoptée par la XVIII^e Assemblée générale de l'Union;

décide d'apporter les modifications suivantes aux Statuts :

Art. 53(b) : supprimer « et des séances scientifiques »;

Art. 53 : *ajouter* « (e) des séances scientifiques des Commissions et des colloques »;

Art. 54(f): *remplacer* le texte existant par le texte suivant : « les repré-» sentants invités en vertu de l'Art. 56 »;

Art. 55 : *remplacer* le texte existant par le texte suivant : « Les séances » scientifiques des Commissions et les colloques sont ouverts à tous les » scientifiques (y compris les étudiants) inscrits comme participants au » début de l'Assemblée générale. Le nombre total des participants pourrait » être limité par le Comité Membre qui organise l'Assemblée générale en » fonction des possibilités locales »;

Art. 56 : *remplacer* le texte existant par le texte suivant : « Le Président » de l'Union peut inviter les représentants désignés par des organisations » internationales à assister à l'Assemblée générale en qualité d'observa-» teurs ».

UC.2. — MODIFICATIONS AUX STATUTS (MEMBRES)

Le Conseil de l'URSI,

considérant

a) que l'adhésion à l'URSI est actuellement limitée aux Comités formés dans des territoires qui sont déjà affiliés au Conseil International des Unions Scientifiques;

b) que le Bureau a proposé la suppression de cette restriction;

décide de modifier comme suit l'Article 4 des Statuts :

« Art. 4. — L'Union peut admettre comme membre tout Comité qui, » dans un territoire donné, développe une activité dans le domaine de la » radioélectricité scientifique ».

UC.3. — Comité permanent des finances

Le Conseil de l'URSI,

considérant que le Trésorier trouverait avantage à pouvoir consulter un Comité permanent des finances lorsqu'il le jugerait utile;

décide de modifier l'Article 62(g) des Statuts comme suit :

« Art. 62(g) — de désigner un Comité permanent des finances chargé :
» (i) de préparer un rapport sur les comptes de l'Union depuis la dernière Assemblée générale ordinaire et sur les prévisions budgétaires

- » pour la période allant jusqu'à l'Assemblée générale ordinaire
 » suivante,
- » (ii) de présenter ses recommandations concernant les finances de
 » l'Union,
- » (iii) d'aider le Trésorier, à sa demande, à faire le point sur les affaires
- » financières de l'Union pendant la période allant jusqu'à l'Assem-
- » blée générale ordinaire suivante ».

UC.4. — COORDINATION DU PROGRAMME SCIENTIFIQUE DE L'URSI

Le Conseil de l'URSI,

considérant qu'il est souhaitable de prendre des mesures pour assurer la coordination des séances scientifiques et des colloques organisés par les Commissions de l'URSI;

recommande

1. que la responsabilité d'assurer la coordination générale du programme scientifique des Assemblées générales et la supervision des propositions émises par les Commissions pour l'organisation de colloques entre les Assemblées, soit confiée à un groupe formé de membres du Bureau et agissant en étroite consultation avec les Présidents des Commissions;

2. que le groupe en question se réunisse au cours de la présente Assemblée avec les Présidents et les Vice-Présidents des Commissions pour

- (i) élaborer le plan-cadre du programme scientifique de la prochaine Assemblée générale,
- (ii) examiner et fixer un calendrier couvrant la période allant de la présente Assemblée à 3 mois avant l'Assemblée suivante, en vue de la préparation et de la publication du programme scientifique de cette dernière;

3. que chaque Commission soit invitée à proposer un sujet ressortissant à son domaine, dont elle estime qu'il présenterait un intérêt particulier pour l'ensemble des participants à l'Assemblée;

4. qu'une journée au maximum soit réservée, pendant l'Assemblée générale, à la présentation des sujets proposés ou de certains d'entre eux.

UC.5. — Approbation des comptes 1975-1977

Le Conseil de l'URSI,

ayant pris connaissance du Rapport du Comité des finances daté du 3 août 1978;

décide d'approuver les comptes de l'Union apurés pour les années prenant fin au 31 décembre 1975, 1976 et 1977.

UC.6. — Unité de contribution annuelle et budget 1979-1981

Le Conseil de l'URSI,

considérant

a) qu'une baisse d'environ 10 % du niveau d'activité de l'URSI depuis 1969 a été signalée par le Comité des finances;

b) qu'il est souhaitable de revenir au niveau antérieur;

c) qu'il sera également souhaitable de réunir le Comité de Coordination avant l'Assemblée générale de 1981;

décide

1. d'approuver les prévisions budgétaires figurant dans la Table 2 du Rapport des finances;

2. d'adopter, pour l'unité de contribution annuelle, les montants figurant dans la Table 2 du Rapport précité sous la rubrique « Modèle E », à savoir :
1979 400 dollars des Etats-Unis
1980 460 dollars des Etats-Unis
1981 520 dollars des Etats-Unis.

UC.7. — PUBLICATIONS DE L'URSI

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées par le Comité des publications;

recommande

1. de poursuivre la publication du Bulletin d'Information de l'URSI dans sa forme présente, le numéro de décembre de chaque année prenant la forme d'un annuaire de l'URSI, et d'envoyer un exemplaire du numéro de septembre 1978 à tous les participants inscrits à la XIX^e Assemblée générale;

2. de préparer une nouvelle édition de la Brochure sur l'URSI et de lui donner une large diffusion;

3. de poursuivre la publication du « INAG Bulletin » (Groupe Conseil du Réseau Ionosphérique) et d'inviter le Trésorier à examiner la possibilité d'augmenter le subside qui est accordé à la National Oceanic and Atmospheric Administration (NOAA) pour ce Bulletin;

4. d'examiner le besoin éventuel de publier un Supplément à «International Reference Ionosphere 1978», lequel contiendrait une série de profils caractéristiques;

5. de publier le Vol. XVIII des Comptes Rendus des Assemblées générales de l'URSI dans le même format que le Vol. XVII;

6. de s'abstenir, en conformité avec l'opinion exprimée par le Bureau, de toute mesure pour lancer une revue de l'URSI qui couvrirait le même domaine que « Radio Science »;

7. de publier en 1981 un nouveau volume intitulé « Review of Radio Science 1978-1980 », le Rédacteur en chef étant le Prof. Bowhill, ainsi que de poursuivre et d'amplifier en 1980-81 les efforts pour en augmenter la vente.

UC.8. — Admission de l'Irlande

Le Conseil de l'URSI,

considérant

a) la demande d'admission en Catégorie 1 soumise par l'Académie royale irlandaise de la République d'Irlande;

b) la suppression, dans les Statuts de l'Union, de la clause qui limitait l'adhésion à l'URSI aux seuls territoires déjà affiliés au Conseil International des Unions Scientifiques;

décide d'admettre le Comité qui sera formé sous les auspices de l'Académie royale irlandaise comme Membre de l'Union en Catégorie 1.

C.9. — Admission de l'Egypte

Le Conseil de l'URSI,

considérant qu'en vertu de l'autorisation qui lui en avait été donnée par la XVI^e Assemblée générale en 1969 (Ottawa, Résolution 4), le Bureau a admis en 1975 l'Académie de la Recherche Scientifique et de la Technologie du Caire, République arabe d'Egypte, comme Membre en Catégorie 1;

décide de donner son approbation officielle à cette admission.

UC.10. — Demande d'admission de l'Indonésie

Le Conseil de l'URSI,

considérant

a) qu'une demande d'admission provisoire a été reçue de l'Institut indonésien de la recherche spatiale à Bandung;

b) que l'organisme chargé de la coordination des recherches scientifiques en Indonésie est l'Institut des Sciences à Jakarta;

c) que le Secrétaire général a invité l'Institut de la recherche spatiale à consulter l'Institut des Sciences à ce sujet;

décide d'autoriser le Bureau

1. à recevoir la demande d'admission qui sera probablement soumise par l'un de ces Instituts; 2. à admettre l'Indonésie comme Membre si cette demande est jugée satisfaisante.

UC.11. — TITRE DE LA COMMISSION E

Le Conseil de l'URS1,

considérant la recommandation de la Commission E visant à la modification de son titre;

décide de modifier comme suit le titre de la Commission E : Bruits et brouillages électromagnétiques.

UC.12. — Election des Vice-Présidents des Commissions

Le Conseil de l'URSI,

considérant

a) qu'il n'y a pas de règle statutaire pour la sélection des candidats à la vice-présidence des Commissions;

b) qu'il serait souhaitable que les noms des candidats soient annoncés avant le début de l'Assemblée générale (voir Rec. A.8);

décide d'inviter le Bureau

1. à étudier la possibilité d'introduire une procédure uniforme pour la sélection des candidats dans toutes les Commissions;

2. à informer en temps opportun les Présidents des Commissions sur la procédure à suivre dans la préparation de l'Assemblée de 1981.

UC.13. — DÉSIGNATION DE PRÉSIDENTS D'HONNEUR

Le Conseil de l'URSI,

considérant qu'il est autorisé à conférer le titre de Président d'honneur à d'anciens membres du Bureau ou Présidents de Commission qui ont contribué de façon exceptionnelle à la réalisation des buts de l'Union;

décide de conférer le titre de Président d'honneur :

au Prof. H. G. Booker (Président de la Commission IV de 1966 à 1969 et Vice-Président de l'Union de 1969 à 1975), et

au Prof. W. Dieminger (Vice-Président de 1963 à 1969 et Président de l'Union de 1969 à 1972)

en reconnaissance des services insignes qu'ils ont rendus à l'URSI.

UC.14. — Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

considérant

a) qu'une invitation a été reçue pour tenir la XXI^e Assemblée générale en Bulgarie en 1984;

b) qu'il est souhaitable de solliciter d'autres invitations pour 1984 et 1987;

décide

1. de maintenir le Comité permanent pour les Assemblées générales, composé des membres suivants :

Prof. A. Smolinski (Président, Pologne),

D^r J. L. Locke (Canada),

Prof. S. Lundquist (Suède),

Prof. V. A. Padula-Pintos (Argentine);

2. d'inviter ce Comité à présenter un rapport sur les invitations reçues pour 1984 et 1987, en temps opportun pour examen à la XX^e Assemblée générale en 1981;

3. d'exprimer ses remerciements au Comité bulgare de l'URSI pour son invitation.

UC.15. — Comité permanent pour la participation à l'URSI

Le Conseil de l'URSI,

considérant qu'il est souhaitable d'encourager l'adhésion de nouveaux Comités Membres à l'Union;

décide

1. de maintenir le Comité permanent pour la participation à l'URSI, composé des membres suivants :

Dr A. P. Mitra (Président, représentant le Bureau),

Prof. V. V. Migulin (URSS, Président sortant du Comité),

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Prof. O. Awe (Nigéria) : Afrique,
Prof. K. Géher (Hongrie) : Europe,
D^r A. A. Giesecke (Pérou) : Amérique latine,
Prof. S. Okamura (Japon) : Asie;

2. de réaffirmer le mandat du Comité, à savoir : proposer des moyens propres à porter les activités de l'URSI à l'attention des scientifiques radioélectriciens dans les territoires où il n'y a pas de Comité Membre de l'URSI et présenter ses recommandations au Bureau.

UC.16. — COMITÉ DE LIAISON URSI-CCIR-CCITT

Le Conseil de l'URSI,

considérant

a) la création en 1977 du Comité de Liaison URSI-CCIR-CCITT, en conformité avec la Résolution C.8 de Lima;

b) la nécessité de maintenir et de renforcer les relations entre l'URSI et les Comités consultatifs de l'Union Internationale des Télécommunications;

décide

1. de maintenir le Comité de Liaison;

2. d'inviter ce Comité à présenter au Bureau des recommandations pour améliorer la collaboration entre l'URSI et l'UIT.

UC.17. — 60^e Anniversaire de l'URSI

Le Conseil de l'URS1,

considérant

a) les démarches préalables effectuées par le Prof. Hontoy, à la demande du Bureau, pour organiser une réunion de 2 jours environ à Bruxelles, en 1979 pour marquer le 60^e anniversaire de la création de l'URSI;

b) l'appui donné à ce projet par le Comité belge de l'URSI et le groupe de travail restreint qui s'est réuni à Helsinki;

recommande

1. de poursuivre les travaux préparatoires en vue de cette réunion com-

mémorative, en consultation avec le Bureau et le Comité du programme qui sera nommé par le Bureau;

2. de limiter le coût pour l'URSI de cette réunion à 10 % de la somme prévue pour les activités scientifiques en 1979;

3. d'inviter les Comités Membres de l'URSI

- (i) à proposer les noms de scientifiques radio-électriciens éminents qui pourraient présenter des communications lors de la réunion, et
- (ii) à y déléguer des représentants.

UC.18. — TÉLÉDÉTECTION PAR ONDES RADIOÉLECTRIQUES

Le Conseil de l'URSI,

considérant

a) que la télédétection de la Terre inclut l'utilisation de détecteurs orientés vers la Terre (p. ex. dans les satellites et avions), destinés à recevoir les ondes émises, réfléchies ou diffusées par les surfaces solide et liquide de la Terre;

b) que les techniques de télédétection revêtent une importance croissante dans l'étude des ressources terrestres et de leur conservation, dans l'étude de la pollution de l'environnement, etc.;

c) que la physique fondamentale de la télédétection, ainsi que les applications de la théorie de l'information et des méthodes mathématiques au traitement de l'image, sont des sujets d'étude appropriés pour l'URSI;

d) que le Comité britannique de l'URSI a proposé la formation, au sein de l'Union, d'une Commission pour la télédétection par ondes radioélectriques;

e) que plusieurs Commissions de l'URSI s'occupent déjà d'aspects particuliers de la télédétection et s'opposent à la création, à l'heure actuelle, d'une seule Commission pour couvrir l'ensemble du sujet;

décide

1. d'ajourner toute décision sur la formation, au sein de l'Union, d'une Commission pour la télédétection;

2. d'inviter le Bureau à former dès que possible un groupe de travail composé des représentants des Commissions intéressées pour étudier la possibilité d'organiser un Colloque de l'URSI sur un aspect déterminé de la télédétection.

UC.19. — Le Programme de la Moyenne Atmosphère et le Statut du SCOSTEP

Le Conseil de l'URSI,

considérant

a) que le Comité Spécial du CIUS pour la Physique Solaire-Terrestre (SCOSTEP) a proposé l'organisation du Programme de la Moyenne Atmosphère (PMA), en tant qu'entreprise de collaboration internationale pendant la période 1982-1985;

b) qu'un comité d'organisation central composé de spécialistes en physique de la moyenne atmosphère sera nécessaire pour la planification et la coordination du PMA;

c) que, si ce programme est accepté par le CIUS, il serait plus simple, du point de vue administratif, de modifier le mandat et la structure du SCOSTEP, plutôt que de créer un nouveau Comité du CIUS pour le PMA;

d) que la physique solaire-terrestre est généralement considérée comme un domaine qui requiert une coordination internationale à long terme des observations de routine et des programmes interdisciplinaires, tels que le PMA et les programmes dont la coordination est déjà assurée par le SCOSTEP;

e) que le mandat du SCOSTEP expirera en décembre 1980 à moins que le CIUS n'en décide autrement;

recommande

1. que le Programme de la Moyenne Atmosphère soit reconnu en tant qu'entreprise du CIUS à condition qu'un nombre suffisant d'Académies des Sciences accepte de participer activement au programme scientifique et de fournir les fonds nécessaires au fonctionnement d'un comité d'organisation central, au moins jusqu'à 1985;

2. que le statut du SCOSTEP soit modifié pour qu'il devienne, au lieu d'un Comité spécial, un Comité scientifique du CIUS, à condition qu'un nombre suffisant d'Académies des Sciences accepte de fournir les fonds nécessaires au fonctionnement du Comité pendant une période éventuelle de plusieurs décennies;

3. que la composition du SCOSTEP soit révisée au fur et à mesure de l'évolution du PMA et des programmes ultérieurs.

UC.20. — L'URSI ET LES PAYS EN DÉVELOPPEMENT

Le Conseil de l'URSI,

considérant

a) qu'il est souhaitable de faire connaître les activités de l'URSI auprès des scientifiques et des organismes gouvernementaux des pays en développement, et d'encourager leur participation à ces activités;

b) qu'il conviendrait de déterminer les difficultés auxquelles se heurte la radioélectricité scientifique dans les pays en développement et de formuler des recommandations concernant des solutions adéquates;

recommande

1. que l'URSI considère la possibilité d'envoyer des scientifiques compétents dans les pays en développement avec pour mission d'aider à la mise en œuvre des buts ci-dessus;

2. que l'appui financier de l'UNESCO soit sollicité pour faciliter ces visites;

3. que le Trésorier examine la possibilité de rétablir le « Programme des jeunes scientifiques de l'URSI » pour permettre à de jeunes chercheurs des pays en développement d'assister aux réunions de l'URSI.

UC.21. — XX^e Assemblée générale de l'URSI

Le Conseil de l'URSI,

considérant

a) les invitations reçues des Comités Membres en Inde et aux Etats-Unis pour la XX^e Assemblée générale de l'Union;

b) les résultats du vote qui a eu lieu en son sein;

décide

1. d'accepter l'invitation du Comité de l'URSI aux Etats-Unis de tenir la XX^e Assemblée à Washington (D.C.) en 1981;

2. d'exprimer sa gratitude aux deux Comités cités pour leurs aimables invitations.

UC.22. — REMERCIEMENTS À L'UNESCO

Le Conseil de l'URSI,

considérant que la subvention annuelle reçue de l'UNESCO, par l'intermédiaire du CIUS, constitue un soutien précieux qui s'ajoute à celui des Comités Membres, pour les activités scientifiques de l'URSI, en particulier l'organisation de colloques internationaux et autres conférences scientifiques, ainsi que l'impression des publications;

décide d'exprimer à l'UNESCO la vive gratitude de l'Union pour ces subventions.

UC.23. — Remerciements au Comité finlandais de l'URSI

Le Conseil de l'URSI,

notant

a) l'excellente organisation matérielle mise en place à l'Université de Technologie d'Helsinki à Otaniemi pour le déroulement des séances scientifiques et administratives de la XIX^e Assemblée générale de l'URSI et des colloques ouverts associés;

b) l'accueil cordial qui a été réservé aux participants et à leurs familles pendant l'Assemblée;

décide d'exprimer ses plus vifs remerciements

1. au Comité finlandais de l'URSI pour son invitation de tenir l'Assemblée générale à Helsinki, et au Comité d'organisation pour ses méticuleux travaux préparatoires qui ont contribué au succès de l'Assemblée;

2. aux membres du Comité des Dames finlandaises, dont le chaleureux accueil a été hautement apprécié par les personnes qui accompagnaient les participants.

RÉSOLUTIONS ET RECOMMANDATIONS DES COMMISSIONS

COMMISSION A MÉTROLOGIE ÉLECTROMAGNÉTIQUE

A.1. — ETALONS DE FRÉQUENCE

La Commission A,

considérant

a) la nécessité de mesurer les fréquences, y compris les fréquences optiques, en se référant à la seconde, unité de temps du Système International d'Unités (SI);

b) la nécessité d'établir une nouvelle définition du mètre, unité de longueur du SI;

c) la possibilité de définir un « étalon unique de longueur et de temps » se fondant sur une valeur fixe pour la vitesse de la lumière (voir Rec. I/VII.1 de l'URSI, Varsovie 1972);

recommande

1. d'encourager l'étude et la mise au point d'étalons de fréquence dans toutes les gammes de fréquences;

2. de fournir l'appui nécessaire pour favoriser le développement de méthodes permettant de mesurer toutes les fréquences concernées avec la précision que les étalons primaires de temps et de fréquence peuvent atteindre.

A.2. — ETALONS DE FRÉQUENCE PRIMAIRES AU CÉSIUM

La Commission A,

considérant

a) que la seconde, unité de base du Système International d'Unités (SI) est définie au moyen d'étalons de fréquence primaires au césium;

b) que l'unité de l'échelle du Temps Atomique International (TAI) doit être régulièrement définie au moyen d'étalons de fréquence primaires

au césium et qu'elle doit être maintenue aussi voisine que possible de la seconde;

c) qu'il est nécessaire d'améliorer encore la précision tant de l'unité de l'échelle du TAI que celle de la seconde;

d) qu'il est probable que la seconde continuera d'être définie en se fondant sur le césium;

e) qu'il n'existe qu'un nombre restreint d'étalons de fréquence primaires;

recommande

1. que les travaux consacrés aux étalons de fréquence primaires au césium, y compris les études visant à l'obtention d'améliorations essentielles et celles sur le fonctionnement continu des horloges, soient poursuivis en tant qu'aspect important de la métrologie;

2. que le nombre de laboratoires qui effectuent ces travaux soit augmenté.

A.3. — Conférences sur le temps et la fréquence

La Commission A,

considérant

a) que le Groupe de travail spécial sur la mesure du temps et de la fréquence a été constitué à la XVIII^e Assemblée générale en raison surtout du problème que posait le grand nombre de conférences consacrées au temps et à la fréquence;

b) qu'il semble y avoir un manque de coordination en ce qui concerne tant les programmes que les dates de ces conférences;

c) qu'en 1978 l'URST elle-même a copatronné en juin la Conférence sur les mesures électromagnétiques de précision et patronné en août le Colloque ouvert sur le temps et la fréquence;

d) que certaines de ces conférences ont comme sujet unique le temps et la fréquence (p. ex. la Conférence internationale de chronométrie, les colloques organisés par la Commission 31 de l'Union Astronomique Internationale, le Colloque annuel « Frequency Control », le « Annual Strategic Planning Meeting on Precise Time and Time Interval (PTTI) », et quelques réunions spécialisées telles que les colloques sur les étalons de fréquence et la métrologie) alors que, pour d'autres conférences, ce sujet n'est qu'une partie d'un programme plus large (p. ex. la Conférence sur les mesures électromagnétiques de précision (CPEM), la réunion de l'IEEE sur la navigation, etc.); e) que les aspects métrologiques de la fréquence et du temps (atomique) présentent un intérêt important pour la Commission A;

reconnaît

f) qu'il y a, au sein de la communauté des spécialistes du temps et de la fréquence, des besoins nettement différents, tels que : communications de synthèse, communications technologiques et communications scientifiques traitant, d'une part, les applications technologiques et, de l'autre, des sujets spécifiques dans le domaine de la métrologie et de la physique fondamentale;

g) que si, dans la plupart des cas, les conférences existantes semblent destinées à satisfaire des besoins différents, leurs objectifs ne sont souvent pas suffisamment clairement exprimés;

recommande

1. que les objectifs des conférences ayant pour thème le temps et la fréquence soient le plus clairement possible exprimés par leurs organisateurs pour éviter les doubles emplois dans les programmes et la coïncidence des dates;

2. que l'URSI offre son patronage à certaines de ces conférences dans le but d'y attirer des spécialistes internationaux, d'en rendre la participation plus représentative et de leur donner ainsi un caractère plus cohérent;

3. que le niveau et la qualité de ces conférences soient améliorés et que, dans tous les cas possibles, leur fréquence soit diminuée pour éviter la prolifération de communications qui se répètent en grande partie;

4. que les responsables et les Comités Membres de l'URSI, associés à ces conférences, s'emploient à faire connaître la présente recommandation à leurs organisateurs.

A.4. — Utilisation du Système International d'Unités

La Commission A,

considérant

a) que le Système International d'Unités (SI) n'est pas toujours utilisé dans tous les domaines de la radioélectricité scientifique et, par exemple, dans les domaines de la haute atmosphère, des matériaux magnétiques et de la radioocéanographie;

b) que l'emploi général des unités du Système International faciliterait considérablement la communication entre les différentes disciplines; réaffirme les idées exprimées dans la Recommendation I.1 de la XV^e Assemblée générale de l'URSI (1966), et

recommande

1. que le Système International, adopté par la Conférence Générale des Poids et Mesures (CGPM) et publié en 1977 par le Bureau des Poids et Mesures (BIPM) dans la troisième édition de « Le Système International d'Unités » soit accepté et utilisé dans la plus large mesure possible;

2. qu'à tous les niveaux des systèmes d'enseignement, les mesures nécessaires soient prises pour faire connaître de manière générale les unités du Système International.

A.5. — LABORATOIRES NATIONAUX D'ÉTALONS

La Commission A,

considérant

a) qu'une édition révisée du « URSI Register of National Standards Laboratories », compilée par le groupe de travail présidé par M. A. E. Bailey, a été publiée en juillet 1978;

b) que ce Registre est considéré comme un document très utile, plus spécialement dans les pays en développement;

c) que les données contenues dans le Registre ont été mises sur ordinateur pour stockage et mise à jour ultérieure;

recommande

1. le maintien du Groupe de travail sur les Laboratoires nationaux d'étalons;

2. la publication par l'URSI d'une édition révisée du Registre.

A.6. — Groupe de travail sur les mesures relatives à l'interaction entre les champs électromagnétiques et les systèmes biologiques

La Commission A,

considérant

a) l'intérêt général manifesté à l'égard des effets biologiques des rayonnements électromagnétiques et, en particulier, l'intérêt de l'URSI pour ce sujet interdisciplinaire; b) les efforts préalables faits par l'URSI dans ce domaine, spécialement au sein du Comité national des Etats-Unis, ainsi que les colloques internationaux organisés récemment;

c) la nécessité de la collaboration entre les physiciens et les organisations et spécialistes biomédicaux;

décide

1. de maintenir le Groupe de travail sur les mesures relatives à l'interaction entre les champs électromagnétiques et les systèmes biologiques (Président : Prof. S. Rosenthal);

2. de lui demander de poursuivre ses efforts dans le but

- (i) d'examiner les possibilités d'organiser des colloques qui mettraient l'accent sur les problèmes de la mesure dans l'interaction entre les rayonnements électromagnétiques et les systèmes biologiques;
- (ii) d'assurer la liaison avec les autres organismes intéressés par l'organisation de tels colloques;
- (iii) de fournir un soutien actif aux organisations internationales intéressées par les rayonnements électromagnétiques considérés du point de vue de la santé et de la sécurité.

A.7. — COLLOQUE SUR LES MESURES DANS LES TÉLÉCOMMUNICATIONS

La Commission A,

considérant

a) le grand succès remporté par le Colloque de l'URSI sur les mesures dans les télécommunications (Lannion, France, 3-7 octobre 1977) qui a été organisé par le CNET, en collaboration avec le Comité National Français de l'URSI, et patronné par les Commissions A, C et E de l'URSI;

b) la conclusion qui a pu être tirée des discussions menées à Lannion en 1977 et au cours de l'Assemblée de l'URSI en 1978, à savoir qu'il serait désirable d'organiser un colloque analogue dans un avenir assez proche;

recommande

1. que les Commissions A, C, D et E patronnent un deuxième Colloque sur les Mesures dans les télécommunications pendant la période entre la XIX^e et la XX^e Assemblée générale de l'URSI;

2. que le CCIR et le CCITT soient invités à participer à la planification du colloque;

3. que les décisions concernant les date, lieu, membres du comité du programme et patronage soient prises par un Comité de coordination composé du Prof. S. Okamura (Président) et des D^{rs} H. M. Altschuler, W. G. Farnell, G. Hagn, J. Le Mézec et V. Zima, et soumises au Bureau de l'URSI.

A.8. — VICE-PRÉSIDENTS DES COMMISSIONS DE L'URSI

La Commission A,

considérant

a) que les Présidents des Commissions de l'URSI jouent un rôle prédominant dans l'organisation des activités de leur Commission;

b) que, dans la plupart des cas, les Vice-Présidents des Commissions sont appelés à succéder aux Présidents;

c) qu'il importe dès lors que les Comités Membres de l'URSI examinent avec soin les titres des candidats à la vice-présidence des Commissions;

recommande que le Secrétariat de l'Union communique aux Comités Membres, trois mois au moins avant le début de l'Assemblée générale, les propositions de candidature pour les vice-présidents des Commissions.

COMMISSION B ONDES ET CHAMPS

B.1. — Colloque de l'URSI sur la théorie des ondes électromagnétiques

La Commission B,

considérant

a) la série des colloques de l'URSI sur la théorie des ondes électromagnétiques qui se sont tenus depuis 1953 à intervalles de 3 ans;

b) le caractère capital de ces colloques qui marquent le sommet des activités de la Commission entre les Assemblées générales;

décide d'accepter l'invitation de tenir le Colloque suivant de cette série à Munich (Allemagne, Rép. féd.).

B.2. — GROUPES DE TRAVAIL

La Commission B,

considérant qu'il sera probablement nécessaire de constituer des groupes de travail pour étudier (i) les techniques utilisant les ondes millimétriques et optiques et (ii) les techniques unifiées en électromagnétisme (y compris l'optique) et en acoustique;

décide de ne procéder à la formation de ces deux Groupes qu'après l'avoir soigneusement préparée et avoir établi le degré d'intérêt réel à l'égard de ces sujets, ainsi que le nombre de spécialistes susceptibles d'y participer.

COMMISSION C SIGNAUX ET SYSTÈMES

C.1. — Programme de la XX^e Assemblée générale (1981)

La Commission C,

considérant la structure des séances scientifiques organisées dans le cadre de la XIX^e Assemblée générale de l'URSI;

recommande

1. de donner, lors de l'Assemblée de 1981, à la présentation de communications de synthèse par des conférenciers spécialement invités plus d'importance qu'à la discussion de sujets spécialisés d'intérêt limité;

2. d'inscrire au programme de l'Assemblée de 1981 l'un des sujets d'intérêt général suivants :

- communications à accès multiples,
- traitement du signal,
- communications par satellite et par ordinateur,
- circuits et systèmes non linéaires.

C.2. — Colloques futurs

La Commission C,

considérant que la contribution la plus efficace qu'elle pourrait apporter aux activités internationales consisterait à collaborer avec les organisateurs des colloques à caractère international;

recommande

- 1. que la Commission participe aux manifestations suivantes :
 - 1.1. Colloque international sur les circuits et les systèmes (IEEE) Tokyo, Japon, 1979;
 - 1.2. Conférence Internationale sur les Communications, Boston, Etats-Unis, juin 1979;
- 2. que l'Union envisage d'accorder son patronage aux colloques suivants :
 - 2.1. Théorie de l'information, Tbilisi, URSS, juin 1979;
 - 2.2. Théorie des réseaux, Bled, Yougoslavie, septembre 1979;
 - 2.3. Systèmes numériques (séminaire), Zurich, Suisse, 1980;
 - 2.4. Théorie des circuits, Prague, Tchécoslovaquie, juillet 1980;
 - 2.5. Performance des systèmes de télégraphie et de communication par ordinateur, Paris, France, mai 1980.

COMMISSION D PHYSIQUE ÉLECTRONIQUE

D.1. -- RÔLE DE LA COMMISSION D

La Commission D,

considérant

a) que l'Assemblée générale de l'URSI n'est pas le lieu où les chercheurs de son domaine se réunissent spontanément pour présenter les derniers résultats de leurs recherches;

b) que son rôle a un caractère éducatif, à savoir : fournir aux autres Commissions les données concernant les dispositifs et systèmes électroniques susceptibles de contribuer, dans l'avenir, au progrès de la radioélectricité scientifique;

c) qu'elle n'est pas en mesure de remplir ce rôle étant donné le programme surchargé de l'Assemblée qui empêche les membres des autres Commissions intéressées d'assister aux séances de la Commission D;

recommande

1. qu'aux Assemblées futures de l'URSI, le nombre des séances scientifiques devrait être limité de manière à ne pas entraver les échanges d'idées entre les spécialistes des différentes disciplines;

2. que, en particulier, la Commission D ne devrait pas être empêchée de

jouer son rôle éducatif par suite de l'approbation d'un programme trop chargé de séances scientifiques;

3. que l'essentiel des activités de la Commission D à l'Assemblée générale devrait être consacré à la présentation de communications de synthèse;

4. que les sujets d'intérêt général suivants devraient être inscrits au programme de l'Assemblée de 1981 :

- amplificateurs et détecteurs à faible bruit à l'état solide,

- dispositifs pour le traitement rapide du signal.

D.2. — Communications optiques

La Commission D,

considérant l'importance croissante des systèmes de communications optiques;

recommande que l'URSI accorde son patronage :

1) à la Conférence internationale sur les ondes infra-rouges et submillimétriques, Floride, Etats-Unis, 1979;

2) à la Conférence internationale sur l'optique intégrée et les communications par fibres optiques, Pays-Bas, 1979.

COMMISSION E BRUITS ET BROUILLAGES ÉLECTROMAGNÉTIQUES

E.1. — TITRE ET MANDAT

La Commission E,

recommande

1. que le Conseil de l'Union approuve la modification de son titre comme suit : Bruits et brouillages électromagnétiques;

2. que les sujets d'étude spécifiés à l'Assemblée générale de Lima en 1975 soient retenus, à savoir :

2.1. sources de bruits naturels et de bruits artificiels,

- 2.2. bruits composites ambiants,
- 2.3. effets des bruits sur la qualité des systèmes,
- 2.4. base scientifique de la supervision des bruits,

2.5. aspects scientifiques de l'utilisation du spectre;

- 3. que la Commission poursuive sa collaboration avec :
- la Commission A dans le domaine de la métrologie des bruits;
- la Commission C pour les effets des bruits sur la qualité des systèmes de télécommunication;
- la Commission J et les autres Commissions.

E.2. — Colloques futurs

La Commission E,

recommande d'établir ou de maintenir des contacts, suivant le cas, avec les organisateurs des colloques suivants, et de leur offrir la participation de l'URSI :

1) Compatibilité électromagnétique, Rotterdam, 1-3 mai 1979 (même série que le colloque de Montreux, 1977);

2) Prévisions solaires-terrestres, Boulder, Etats-Unis, avril 1979 (spécialement pour les séances consacrées aux renforcements brusques des atmosphériques);

3) Protection contre la foudre pour les systèmes électroniques, Uppsala, Suède, juin 1979;

4) Compatibilité électromagnétique (IEEE), Baltimore, Etats-Unis, 1980;

5) Mesures dans les télécommunications (Commissions A et C).

E.3. — GROUPE DE TRAVAIL SUR LES BRUITS ARTIFICIELS ET GROUPE DE TRAVAIL SUR LES BRUITS NATURELS

La Commission E,

considérant

a) que le Directeur du CCIR a soumis à l'URSI pour commentaire plusieurs documents relatifs aux bruits artificiels et aux bruits naturels;

b) que le Groupe de travail sur les bruits naturels, formé par la Commission E en 1972, a développé d'utiles activités en diffusant des informations par correspondance et au cours de réunions tenues pendant les Assemblées de l'URS^I, et en préparant des réponses à l'intention du CCIR;

décide

1. de maintenir le Groupe de travail sur les bruits artificiels, sous la présidence du D^r A. D. Spaulding (EUA);

2. de former un Groupe de travail sur les bruits naturels sous la présidence du Prof. S. Lundquist (Suède).

COMMISSION F PHÉNOMÈNES ONDULATOIRES DANS LES MILIEUX NON IONISÉS

F.1. — STRUCTURE DU PROGRAMME SCIENTIFIQUE DE L'URSI

La Commission F,

recommande

1. pour les Assemblées générales, l'inscription au programme d'un ou plusieurs colloques ouverts traitant des sujets scientifiques originaux d'intérêt courant, organisés de préférence avec la collaboration d'autres Commissions, ainsi que d'une ou plusieurs séances d'exposés affichés sur des sujets sélectionnés relevant de son domaine;

2. pour la période entre les Assemblées générales, l'organisation d'une ou plusieurs conférences internationales ouvertes consacrées à des sujets spécialisés relevant de son domaine;

3. dans chacun de ces cas, la sélection des communications par un comité international.

F.2. — Colloques futurs

La Commission F,

recommande la participation aux colloques suivants :

1) Détection de la surface des océans par satellite (colloque commun IUCRM/COSPAR), Réunion du COSPAR, Hongrie, juin 1980;

2) Effets des hydrométéores sur les systèmes de télécommunications aux fréquences supérieures à 1 GHz (Commission F), Canada, juin 1980 (provisoire);

3) Sujets du Programme de la Moyenne Atmosphère (Commissions F et G), Etats-Unis, fin 1980;

4) Radioélectricité scientifique et utilisation optimale du spectre radioélectrique (Commissions B, C et F), Assemblée de l'URSI, Washington 1981; 5) Modèles mathématiques de propagation radioélectrique (Commissions B et F), Assemblée de l'URSI, Washington 1981;

6) Problèmes de reconnaissance dans la télédétection de la surface de la Terre et de la troposphère (Commission F), Kansas, Etats-Unis, 1980 ou 1981.

F.3. — Commission inter-Unions de Radiométéorologie (IUCRM)

La Commission F,

exprime l'opinion que le domaine de la radio-océanographie a acquis une large reconnaissance internationale et qu'il est couvert par l'IUCRM de façon satisfaisante;

recommande

1. que l'IUCRM organise un colloque sur l'interaction mer/air et ses effets sur la propagation des ondes électromagnétiques (en 1979);

2. que l'IUCRM collabore avec le COSPAR pour l'organisation du Colloque sur la détection de la surface des océans par satellite, Hongrie, juin 1981;

3. que les personnalités suivantes soient désignées comme représentants de l'URSI à l'IUCRM pour les trois années à venir : J. R. Apel (USA), R. Crane (USA), P. Gudmandsen (Danemark), Ya. Melnichuk (URSS), G. Valenzuela (USA), S. Wickerts (Suède).

F.4. — GROUPES DE TRAVAIL

La Commission F,

considérant que la Commission d'études 5 du CCIR a sollicité son avis sur les questions suivantes :

A. absorption anormale de la vapeur d'eau dans les fenêtres entre les raies d'absorption dans la région allant de 22 GHz à plusieurs centaines de GHz;

B. diffusion, atténuation et polarisation par les précipitations, plus spécialement la pluie, y compris les données, à l'échelle internationale, sur les recherches fondamentales concernant la structure des précipitations orageuses (formes des gouttes, distribution des dimensions des gouttes, et concentration en fonction de la hauteur et de l'étendue latérale dans un orage) et leurs caractéristiques radioélectriques;

décide

1. de former deux Groupes de travail pour étudier les questions cidessus :

- A. Vapeur d'eau (coordonnateur : P. Delogne, Belgique),
- B. Précipitations (coordonnateur : F. Fedi, Italie);
- 2. de les inviter à
 - 2.1. préparer pour novembre 1978 des rapports préliminaires comprenant : le point de la situation, l'énoncé des lacunes principales dans l'état des connaissances, des suggestions pour les recherches futures;
 - 2.2. préparer des rapports que la Commission F soumettra à la Commission d'Etudes 5 du CCIR en 1980-81.

FG.1. — PROGRAMME DE LA MOYENNE ATMOSPHÈRE (PMA)

Les Commissions F et G,

considérant

1. que les processus qui se déroulent dans la moyenne atmosphère influencent fortement les radiocommunications dans la gamme allant des ondes à très basse fréquence aux ondes décamétriques;

2. que de nombreuses méthodes radioélectriques différentes sont employées par les scientifiques pour effectuer des observations *in situ* ou par télédétection de la moyenne atmosphère;

recommande

1. que l'URSI appuie l'adoption par le CIUS du Programme de la Moyenne Atmosphère;

2. qu'un Comité de coordination de l'URSI pour le PMA soit formé, avec des représentants des Commissions F et G, pour coordonner la participation des scientifiques radioélectriciens au PMA $(^1)$;

3. que 2 représentants de l'URSI soient désignés au sein du Comité directeur du PMA, qui sera constitué par le SCOSTEP, comme au sein de l'actuel Comité directeur intérimaire du PMA.

^{(&}lt;sup>1</sup>) Les représentants de la Commission F seront choisis parmi les personnalités suivantes : R. Crane (EUA), I. Revah (France), L. Thomas (Royaume-Uni), S. Westerlund (Suède), T. Van Zandt (EUA).

COMMISSION G RADIOÉLECTRICITÉ IONOSPHÉRIQUE ET PROPAGATION

G.1. — RÉSEAU MONDIAL D'IONOSONDES

La Commission G,

considérant

a) que les données fournies par les ionosondes sur la structure et les changements de l'ionosphère sont nécessaires pour le fonctionnement des systèmes de communication et de navigation modernes, même dans les cas où ils utilisent les ondes décimétriques;

b) qu'à l'heure actuelle, les ionosondes fournissent également une importante contribution aux études globales dans le domaine de la physique de la haute atmosphère et à la description de l'environnement de la Terre, laquelle est exigée dans les programmes scientifiques multidisciplinaires;

c) que c'est surtout pour étayer les programmes de recherches nationaux et les services de radiocommunications que les stations de sondage ionosphérique à incidence verticale sont établies et maintenues;

d) que la fermeture de stations existantes est susceptible de porter une atteinte considérable à la valeur des contributions du réseau aux recherches scientifiques internationales et aux systèmes de radiocommunications;

e) que les sondeurs ionosphériques perfectionnés, disponibles depuis quelques années, permettent de réaliser d'importants progrès dans la recherche ionosphérique;

recommande

1. que les administrations nationales chargées de la maintenance des ionosondes soient invitées à tenir compte des contributions apportées par leurs stations respectives au progrès de la science internationale ainsi que des besoins de l'Union Internationale des Télécommunications;

2. que, dans le cas où des changements devraient être apportés à l'actuel réseau mondial d'ionosondes, il soit tenu compte, dans la mesure du possible, des critères de base énumérés dans l'Annexe à la présente Recommandation;

3. que les administrations nationales soient invitées à consulter le Groupe Conseil du Réseau Ionosphérique (INAG) de l'Union Radio-Scientifique Internationale avant de modifier en quoi que ce soit les stations existantes relevant de leur compétence; 4. que, dans les cas où elles envisageraient de remplacer des équipements près de la désuétude, les administrations nationales examinent les avantages des instruments numériques perfectionnés.

ANNEXE

Les critères suivants sont à utiliser pour juger de la valeur particulière des stations :

- a) les stations ayant produit pendant plusieurs décennies une série ininterrompue de données de bonne qualité, en raison surtout de la possibilité de les employer pour la surveillance des changements à long terme et des modifications artificielles;
- b) les stations faisant partie de « chaînes », la plupart nord-sud, qui peuvent étudier la propagation et le développement des perturbations géophysiques de grande envergure;
- c) les stations situées dans des régions intéressantes du point de vue géophysique, telles que les régions des calottes polaires, la zone aurorale et à proximité de l'équateur magnétique;
- d) les stations situées à grande distance d'autres stations, aux points magnétiques conjugués, ou dans l'hémisphère sud;
- e) les stations fonctionnant en conjonction avec des observatoires géophysiques munis d'instruments perfectionnés et de facilités spéciales pour la recherche;
- f) les stations faisant partie d'un groupe régional de stations qui fournissent des données pour des études spécifiques en aéronomie ou en propagation.

G.2. — Appui à l'IUWDS

La Commission G,

reconnaissant

a) que le Service International des Ursigrammes et des Jours Mondiaux (IUWDS) a rendu dans le passé d'éminents services à la communauté scientifique de l'URSI, dans le cadre de programmes coordonnés, tels que l'Année Géophysique Internationale, les Années Internationales du Soleil Calme et l'Etude Magnétosphérique Internationale;

b) que les services rendus par l'IUWDS concernent surtout les activités de trois Commissions de l'URSI (F, G et J);

c) que ces services auront une importance particulière dans les programmes à venir, tels que le Programme de la Moyenne Atmosphère;

d) que les activités de l'IUWDS comprennent l'annonce rapide d'événements géophysiques et solaires, lesquels seront relativement fréquents dans les quelques années à venir;

recommande que l'URSI continue de soutenir les activités de l'IUWDS dans toute la mesure du possible.

G.3. — BULLETIN DE L'INAG

La Commission G,

reconnaissant l'importance du rôle joué par le Bulletin de l'INAG (Groupe Conseil du Réseau Ionosphérique) dans le maintien du Réseau mondial des stations ionosphériques et la qualité des données en provenance de ce Réseau;

tenant compte du fait qu'une aide financière est fournie pour ce Bulletin par le Centre de rassemblement des données A (WDC-A) et quelques administrations nationales;

recommande que l'URSI continue de fournir une aide pour la publication de ce Bulletin pendant les trois années à venir.

G.4. — Nomenclature pour les radars destinés à l'étude de la moyenne atmosphère \hat{A}

La Commission G,

notant que différentes appellations sont utilisées pour désigner les systèmes radar qui sont développés pour les recherches sur la moyenne atmosphère dans les différentes parties du monde;

considérant que toute confusion pourrait être évitée au sein de la communauté scientifique internationale si des équipements à objectifs similaires recevaient la même appellation;

recommande que les nouveaux équipements radar pour les recherches sur la mésophère, la stratosphère et la troposphère soient désignés « radars MST », et que les radars dont le rayon d'action ne s'étend qu'à la stratosphère et à la troposphère soient désignés « radars ST ».

G.5. — Importance des radars MST

La Commission G,

considérant

a) que les radars MST apportent des résultats nouveaux et intéressants concernant la structure et la dynamique de la mésophère, de la stratosphère et de la troposphère;

b) que les observations au moyen de radars MST joueront un rôle primordial dans le Programme de la Moyenne Atmosphère;

recommande d'attirer l'attention des administrations nationales sur l'importance de cette nouvelle méthode et sur la nécessité d'installer des radars MST dans les différentes parties du monde.

G.6. — Application des recherches ionosphériques aux télécommunications

La Commission G,

considérant que de nombreuses méthodes théoriques et expérimentales utilisées par les radioélectriciens spécialistes de l'ionosphère s'appliquent à différents systèmes de télécommunication, dans une large gamme de fréquences, y compris les systèmes modernes de communication et de navigation par satellite;

recommande que les études sur les applications pratiques de ces méthodes soient encouragées lors de l'élaboration des programmes de recherches radioélectriques dans les universités ou autres institutions.

G.7. — Système de diffusion incohérente dans l'hémisphère austral

La Commission G,

considérant les grands progrès qui ont été atteints dans la connaissance de l'atmosphère grâce à l'utilisation des systèmes de diffusion incohérente;

notant qu'il n'existe pas de système de ce genre au sud de l'équateur magnétique;

désigne un groupe chargé d'étudier les possibilités d'établir un système

international de diffusion incohérente dans l'Antarctique ou aux latitudes moyennes dans l'hémisphère austral.

G.8. — GROUPES DE TRAVAIL

La Commission G

recommande que les Groupes de travail suivants soient constitués ou reconstitués, selon le cas, au sein de la Commission G :

- G.1. Groupe Conseil du Réseau Ionosphérique (INAG). Président : W. R. Piggott; Vice-Président : J. V. Lincoln.
- G.2. Echanges logiciels dans la recherche ionosphérique. Président : J. W. Wright.
- G.3. Groupe d'études de l'atmosphère de l'hémisphère austral (SHASG). Co-présidents : J. A. Gledhill et S. Radicella.
- G.4. Ionosphère Internationale de Référence (IRI). Président : K. Rawer.
- G.5. Evaluation des techniques d'analyse dans la recherche ionosphérique. Président : L. F. McNamara.
- G.6. Connaissance des caractéristiques ionosphériques nécessaires pour l'amélioration des systèmes de propagation radioélectrique. Président : C. M. Rush.
- G.7. Cartographie de la couche F2. Président : E. Neske.
- G.8. *Diffusion incohérente*. Président : M. Baron; Vice-Président : M. Blanc.
- G.9. *Propagation ionosphérique anormale*. Président : D. G. Cole.
- G.10. Groupe international pour les ionosondes numériques (IDIG). Président : J. R. Dudeney; Vice-Présidents : K. Bibl et J. W. Wright.
- G.11. Système de diffusion incohérente dans l'hémisphère austral. Président : J. A. Gledhill.

G.9. — GROUPES DE TRAVAIL INTER-UNIONS

La Commission G,

recommande le maintien des Groupes de travail inter-Unions URSI-UGGI (IAGA) sur : 1) La structure et la dynamique de la thermosphère, de l'ionosphère et de l'exosphère.

Président : J. V. Evans;

2) La chimie des particules neutres et ionisées; flux solaires. Président : L. Thomas; Vice-Président : A. D. Danilov.

COMMISSION H ONDES DANS LES PLASMAS

H.1. — GROUPES DE TRAVAIL

La Commission H,

décide de maintenir les deux Groupes de travail suivants :

- 1) Analyse des ondes. Co-présidents : D. Jones et J. L. Lacoume;
- 2) *Expériences actives.* Président : C. T. Russell;

qui travailleront en collaboration étroite avec les Commissions C et G.

H.2. — GROUPES DE TRAVAIL INTER-UNIONS

La Commission H,

recommande de maintenir les Groupes de travail inter-Unions URS!-UGGI (IAGA) sur :

- 1) Le sondage électromagnétique passif de la magnétosphère. Président : D. Carpenter;
- Les instabilités des ondes dans les plasmas spatiaux. Co-présidents à désigner ultérieurement.

H.3. — Colloques futurs

La Commission H,

recommande

- 1. que l'URSI copatronne les manifestations suivantes :
 - 1.1. 4^e Conférence internationale sur les phénomènes dans les gaz ionisés, Grenoble, France, juillet 1979;

- 1.2. Réunion commune comprenant la 4^e Conférence internationale (de Kiev) sur la théorie des plasmas et le 4^e Congrès international sur les ondes et les instabilités dans les plasmas, Nagoya, Japon, juin 1980;
- 1.3. Séance URSI/IAGA sur les ondes non-linéaires dans les plasmas géophysiques, Assemblée générale de l'UGGI, Canberra, Australie, décembre 1979;

2. que le Prof. F. W. Crawford soit désigné comme représentant de l'URS1 au sein des Comités pour les programmes des conférences 1.1 et 1.2 ci-dessus;

3. qu'un représentant de l'URSI soit désigné ultérieurement pour la séance 1.3 ci-dessus.

H.4. — XX^e Assemblée générale : Programme scientifique

La Commission H,

considérant

a) que la théorie des ondes électromagnétiques non-linéaires présente un intérêt scientifique fondamental pour les Commissions B, D, F, G et H;

b) que le lancement de la navette spatiale en 1980 augmentera l'intérêt pour les expériences actives de propagation dans l'espace;

c) que le système de diffusion incohérente européen (EISCAT) sera mis en service en 1980;

recommande d'inclure au programme de la XX^e Assemblée générale de l'URSI des colloques sur les thèmes suivants :

-- théorie électromagnétique non-linéaire,

- expériences actives de propagation,

- premiers résultats d'EISCAT.

COMMISSION J RADIOASTRONOMIE

J.1. — LES COMMISSIONS DE L'URSI ET LE CONSEIL

La Commission J,

considérant

a) que les contacts entre, d'une part, le Conseil et le Bureau de l'Union et, de l'autre, les Présidents des Commissions ne sont pas suffisamment étroits; b) qu'il est souhaitable que les Commissions soient mieux informées des affaires administratives et des questions d'organisation et que les opinions de la communauté des scientifiques radioélectriciens soient portées à la connaissance des membres du Conseil;

recommande

1. que les mesures qui s'imposent soient prises pour inviter les Présidents des Commissions à assister aux séances du Conseil, conformément à l'Article 21 des Statuts;

2. que le Secrétaire général prenne les dispositions nécessaires pour communiquer le plus rapidement possible aux Présidents et aux Vice-Présidents des Commissions toutes les décisions du Bureau susceptibles d'influencer les activités des Commissions.

J.2. — Organisation des colloques de l'URSI

La Commission J,

considérant que les colloques consacrés à des sujets spécialisés devraient avoir lieu de préférence dans la période entre les Assemblées générales;

recommande

1. que le Bureau examine, dans les meilleurs délais, toutes les propositions relatives à l'organisation de colloques;

2. qu'une fois un colloque approuvé, la possibilité soit donnée aux autres Commissions, par l'intermédiaire de leurs Présidents, de copatronner le colloque;

3. que la participation des autres Unions intéressées aux colloques de l'URSI soit encouragée;

4. que l'Union fournisse un appui financier (1.000-2.500 dollars) pour l'organisation des colloques qu'elle patronne et qu'elle invite le pays où doit se tenir le colloque à agir dans le même sens;

5. que, dans la période 1979-1981, la Commission J, de préférence en collaboration avec la Commission D, organise un colloque sur la technologie des ondes millimétriques, plus particulièrement sur les applications à la radioastronomie.

PRESENTATION OF URSI AWARDS

Thanks to the generosity of the respective donors, three awards are presented on the occasion of each General Assembly of URSI :

- The Balthasar van der Pol Gold Medal, sponsored by Mme P. Le Corbeiller, widow of Professor van der Pol;
- The John Howard Dellinger Gold Medal, sdonsored by the United States National Committee of URSI;
- The Appleton Prize sponsored by the Royal Society in London.

During a special afternoon session, chaired by M. J. Voge, President of URSI, the awards were handed over and each of the laureates gave a short outline of the research work, carried out since 1971, for which the award had been made.

The winners of the awards in 1978 were as follows :

Balth. van der Pol Gold Medal :

Dr. James R. Wait, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder (Col.), USA for his work on the propagation of electromagnetic waves in the Earth's crust, and the application of his results in fields such as the problem of communications in underground mine tunnels.

The Medal was handed over by Prof. F. L. Stumpers, Vice-President of URSI, and a former colleague of Prof. van der Pol.

John H. Dellinger Gold Medal :

Prof. D. A. Gurnett, Department of Physics and Astronomy, University of Iowa, Iowa City, USA for his investigations relating to electromagnetic and electrostatic wave propagation in the Earth's plasma environment, including his work on the kilometre-wave radiation emitted by the Earth.

The Medal was handed over by Dr. J. V. Evans, Chairman of the US National Committee of URSI.

Appleton Prize :

Prof. P. M. Banks, Department of Physics, Utah State University, Logan (Utah), USA for his theoretical and observational studies of the plasma flow between the ionosphere and the magnetosphere.

The Prize was handed over by Sir Granville Beynon FRS, Past President of URSI.